COMMONWEALTH OF MASSACHUSETTS

CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

PROPOSAL NO.	614004-129534
P.V. =	$11,000,000.00
PLANS	YES

FOR

MassDOT Berkshire Line Civil Improvements

in the Cities of

LEE, LENOX AND PITTSFIELD

In accordance with the 2025 MassDOT Highway Division Standard Specifications for Highways and Bridges Division I: General Requirements and Covenants, as amended herein, certain subsections of Divisions II: Construction Details and III: Materials Specifications referenced herein, Supplemental Specifications thereto (March 31, 2025), and the 2024 edition of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

This Proposal to be opened and read: **THURSDAY, August 7, 2025, at 2:00 P.M.**

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT 00010

TABLE OF CONTENTS

DOCUMENT 00010
TABLE OF CONTENTS ..... 00010-1 through 2

DOCUMENT 00102
NOTICE TO CONTRACTORS ..... 00102- 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 PERFORMANCE EVALUATION RECORD ..... 00439-1 through 8

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS ..... 00710-1 through 3

DOCUMENT 00718
SPECIAL PROVISION FOR PARTICIPATION BY MINORITY OR WOMEN'S
BUSINESS ENTERPRISES AND SERVICE- DISABLED VETERAN- OWNED
BUSINESS ENTERPRISES ..... 00718-1 through 10

DOCUMENT 00761
SPECIAL PROVISIONS FOR CERTIFICATION REGARDING DEBARMENT,
SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION ..... 00761-1 through 4

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

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 86

TABLE OF CONTENTS (Continued)

DOCUMENT A00801
SPECIAL PROVISIONS ..... A00801-1 through 231

DOCUMENT A00803
DRAWINGS AND SKETCHES ..... A00803-1 through 2

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

DOCUMENT A00830
PERMIT APPLICATIONS ..... A00830-1 through 115

DOCUMENT A00831
ARMY CORPS OF ENGINEERS VERIFICATION AND GENERAL PERMIT ..... A00830-1 through 120

DOCUMENT A00896
MASSDOT MW-1 ..... A00896-1 through 291

DOCUMENT A00900
HOUSATONIC RAILROAD COMPANY PROCEDURES FOR THE INSTALLATION, ADJUSTMENT, MAINTENANCE AND INSPECTION OF CWR AS REQUIRED BY 49 CFR 213.118 ..... A00900-1 through 40

DOCUMENT A00901
HOUSATONIC RAILROAD ON TRACK SAFETY MANUAL ..... A00901-1 through 37

DOCUMENT A00902
HOUSATONIC RAILROAD TIMETABLE ..... A00902-1 through 9

DOCUMENT A00903
GEOTECHNICAL REPORTS ..... A00903-1 through 182

DOCUMENT A00904
TRAFFIC MANAGEMENT PLAN ..... A00904-1 through 6

DOCUMENT B00420
PROPOSAL ..... B00420-1 through 22

DOCUMENT B00421
DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER ..... B00421-1 through 5

DOCUMENT B00842
SCHEDULE OF PARTICIPATION BY MINORITY OR WOMEN BUSINESS ENTERPRISE (M/WBE) ..... B00842-1 through 2

DOCUMENT B00843
MINORITY OR WOMENS BUSINESS ENTERPRISE PARTICIPATION LETTER OF INTENT ..... B00843-1 through 2

DOCUMENT B00846
M/WBE OR SDVOBE JOINT CHECK ARRANGEMENT APPROVAL FORM ..... B00846-1 through 2

DOCUMENT B00847
JOINT VENTURE AFFIDAVIT ..... B00847-1 through 4

*** END OF DOCUMENT ***

DOCUMENT 00102

NOTICE TO CONTRACTORS

Electronic proposals for the following project will be received through the internet on www.commbuys.com ("COMMBUYS") until the date and time stated below. No paper copies of bids will be accepted. Bid results will be posted on www.commbuys.com forthwith after the bid submission deadline.

Bidders must be registered with COMMBUYS in order to bid on this project. If Bidders are not currently registered with COMMBUYS, it is recommended that bidders register with COMMBUYS at least seven days prior to the scheduled bid opening date. COMMBUYS provides Seller registration functionality at no charge. To register, go to www.COMMBUYS.com and click on the "Register" link on the home or landing page.

Thursday August 7, 2025 at 2:00 P.M. **

LEE, LENOX AND PITTSFIELD

MassDOT Berkshire Line Civil Improvements (614004)

****Date Subject to Change**

PROJECT VALUE = $11,000,000.00

The contract's scope of work includes Replace and Clean existing culverts; Replacement of Berkshire Line Bridge at Milepost 74.17, with associated approach work; Superstructure Replacement and Substructure Strengthening of Bridge No. 76.23, with associated approach work; Rehabilitation of Bridge Numbers 77.28, 80.72, 85.32 and 85.52; Surface and align track in designated areas; Furnish and install ballast for all work including surface and align; Spot ditching in designated areas; Track bed stabilization in designated areas; Install track underdrain in designated areas; Clean and replace ballast in designated areas; and Perform miscellaneous work as directed by the Engineer.

It is highly recommended that bidders attend the Pre-Bid Meeting/Pre-Bid Site Walk which will be held at 10:00 A.M. on Wednesday July 9, 2025 at the grade crossing at Utility Drive in Pittsfield, MA. It is strongly suggested that prospective Bidders have a representative attend this meeting/site walk. The purpose of this meeting/site walk is to discuss any outstanding questions relating to the proposed work, the bidding procedures, or the required contract provisions. Prospective bidders shall bring with them all personal protective equipment which must be worn to access the project site.

Bidders must be prequalified to bid on the project. Prequalification requirements, as well as supporting documentation that bidders must submit, are as follows:
1) MBTA Prequalification. Bidders must be prequalified in MBTA Class 1 – General Transit Construction (>$10,000,000 for Maximum Single Project Rating), MBTA Class 4A- Steel

Superstructures (>$10,000,000 for Maximum Single Project Rating) and Class 4B – Concrete Superstructures (>$10,000,000 for Maximum Single Project Rating) to bid on the project. In addition, if the bidders are not also prequalified in MBTA Class 3 – Trackage, then a subcontractor prequalified in MBTA Class 3 – Trackage must perform the track work. The names of any proposed subcontractors to be used on the project must be submitted to the MassDOT Rail & Transit Division for approval.

Go to the MBTA website below to find MBTA Prequalification Procedures.
https://bc.mbta.com/uploadedfiles/Business_Center/Bidding_and_Solicitations/Design_and_Construction/Contractor%20Prequalification%20Application%202022.pdf

Bidders must submit MBTA-issued certificates showing that they are prequalified in the required classes of work for the project.

2) MassDOT Rail & Transit Prequalification. Bidders must be prequalified in the following classes of work: General Rail Construction on or Around Active Rail Lines, Track Work and Bridge Construction.

The definitions of the MassDOT Rail & Transit Division classes of work identified above and the MassDOT Rail & Transit Division Prequalification Procedures are set forth in the Special Provisions of the contract.

All prospective bidders who intend to bid on this project must submit MBTA certificates showing prequalification in the required classes of work, as well as all documentation required to apply for MassDOT Rail & Transit Division prequalification in the required classes of work, to Scott Conti at the MassDOT Rail and Transit Division by email at Scott.Conti@dot.state.ma.us and June Wu at HDR at June.Wu@hdrinc.com before 5:00 P.M. seven (7) calendar days prior to the bid opening date. The Project Proposal No. should be placed in the subject line. If the prequalification information is submitted late, there is no guarantee that the Rail & Transit Division will be able to complete its evaluation of the information and determine whether a bidder is prequalified to bid on the project. An award will not be made to a contractor who is not prequalified by the MassDOT Rail & Transit Division prior to the opening of Proposals.

Proposal documents, including the Contract Documents, Special Provisions, and Plans, will be posted on the COMMBUYS website on or about June 30, 2025 after 2:00 PM EST.

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

All bids shall be accompanied by a bid deposit in the amount of 5% of the value of the bid.

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.

The Project has an M/WBE participation goal of 6 % for the work performed under this contract.

Please note that Contract work includes work on an active freight rail corridor, over which the

Housatonic Railroad Company, Inc. ("Railroad") has a right-of-way. **All Contractors and Subcontractors working on the Railroad Right-of-Way must have an approved Drug and Alcohol testing plan in compliance with all statutes and regulations administered by the Federal Railroad Administration ("FRA") in implementing the required 49 CFR Part 219 Drug and Alcohol Program. Contractors are required to submit their approved Drug and Alcohol Testing Program along with their bids.**

Train Operations are dictated by MassDOT and the Railroad. Contractor work hours and Railroad coordination provisions are set forth in the Contract Documents and Special Provisions.

PRICE ADJUSTMENTS

This Contract contains price adjustment provisions for hot mix asphalt, Portland cement mixtures, diesel fuel, gasoline, structural steel and reinforcing steel. For reference the base prices for this Contract are as follows: liquid asphalt $635.00 per ton, Portland cement $425.53 per ton, diesel fuel $2.569 per gallon, and gasoline $2.45 per gallon, and Steel Base Price Index 340.6. 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
Meredith Slesinger, Administrator, MassDOT Rail and Transit Division
Saturday, June 28, 2025

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.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner of capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b).

M.G.L. c. 30, § 39O: Suspension, Delay, or Interruption or Failure to Act by Awarding Authority; Adjustment in Contract Price; Submission of Claims.

Section 39O. Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

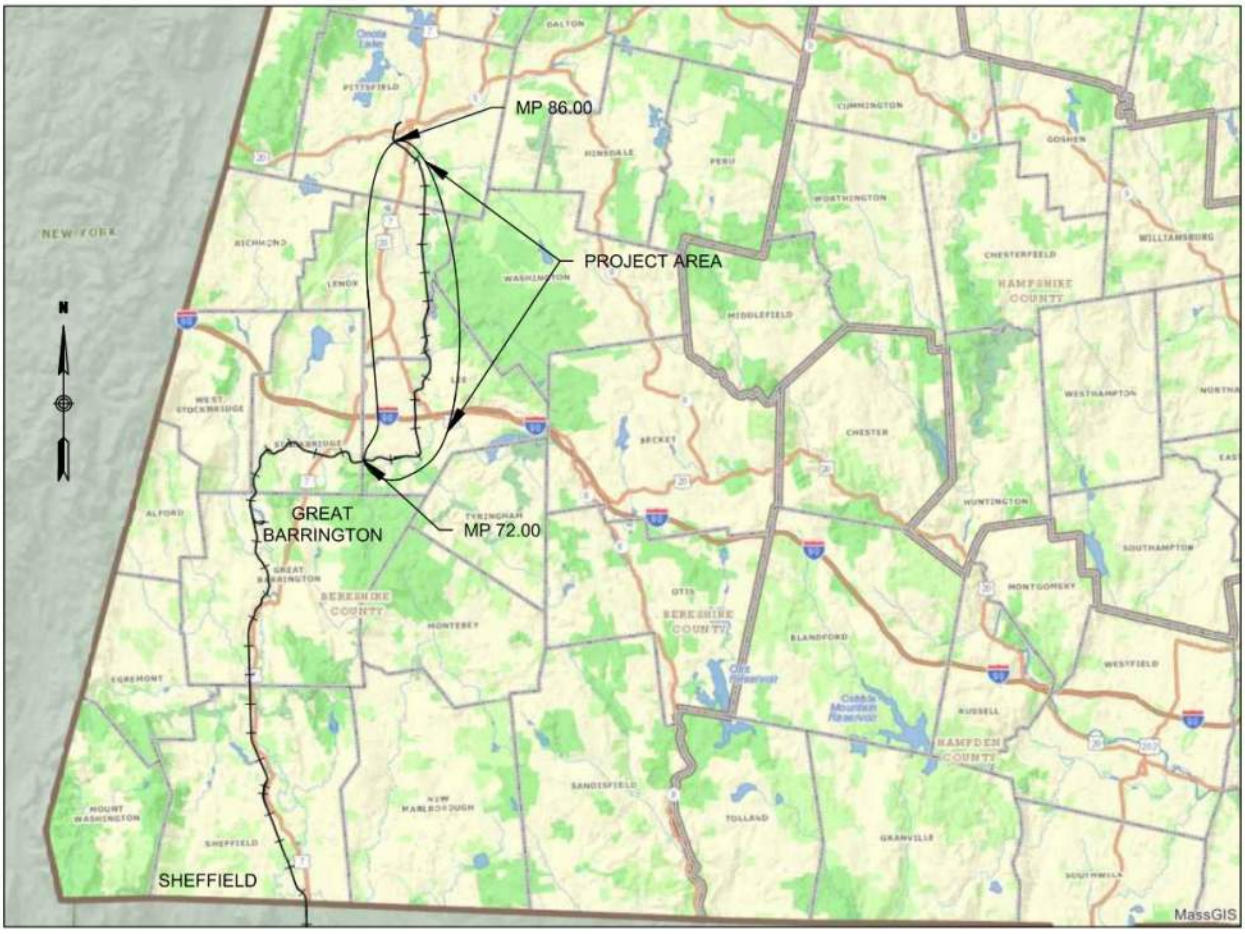
<<<<<<<<<<>>>>>>>>>>
END OF DOCUMENT

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT 00331

LOCUS MAP

LEE, LENOX AND PITTSFIELD
MassDOT Berkshire Line Civil Improvements



THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT 00439

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION (MASSDOT)
CONTRACTOR PROJECT PERFORMANCE EVALUATION RECORD

DATE: MM/DD/YYYY	**INTERIM REPORT NO.: (PROJECT MANAGER ASSIGNS)**
MASSDOT CONTRACT#:	**FINAL REPORT NO.: (PROJECT MANAGER ASSIGNS)**
PROJECT NAME:	
RAIL & TRANSIT PROJECT MANAGER:	**GENERAL ENGINEERING CONSULTANT (IF APPLICABLE):**
GENERAL CONTRACTOR:	**GENERAL CONTRACTOR PROJECT MANAGER:**
CONTRACT AWARD AMOUNT: $ -	**CONTRACT AMENDMENT ADJUSTED VALUE AMOUNT:** $ -
PERCENT OF PROJECT COMPLETE TO DATE: %	**WORK PERFORMED BY PRIME CONTRACTOR - PERCENTAGE OF PROJECT SCHEDULE COMPLETED - MUST BE MINIMUM OF 50%** %

Partial Instructions (See Contractor Performance Evaluation Reports SOP for full instruction

1. The Project Manager (PM) and/or Assistant Project Manager (APM) will review criteria listed for each subcategory on the **Ratings Tab [Green Tab]** of this workbook. The PM or APM will use the attached guidelines in determining the rating for each subcategory. These guidelines provide overall guidance for ratings of 10, 8 and 4 specific to each category. Other whole number ratings may also be used if the description of the performance falls between the upper and lower ratings (10 and 4).

2. The PM or APM will select the most appropriate whole number grade from drop down for each subcategory in the **Green Shaded Box** at the right side of the table. If subcategory is not applicable at this time, select "0" and note N/A in comments. Ratings will be automatically adjusted on the summary tab.

3. When all of the lines for the subcategory have been completed, the overall average for that category will automatically calculate and be shown in the **Yellow Shaded Box** at the bottom of that category.

4. Explanations must be entered in the green comments box on the Ratings Tab or below in the Project Managers Explanation section of the Form. If any subcategory entry is 10, or if the average for any subcategory is below 8. Please include specific examples.

5. The PM will provide the evaluation to the Deputy Administrator for Rail for review and concurrence. If the Deputy Administrator disagrees with any portion of the evaluation, the Deputy Administrator will outline their rationale and recommended changes to the PM. Further discussions will be held between the PM, APM, Deputy Administrator, Other staff and consultants (e.g., General Consulting Engineers), if appropriate. The PM or APM shall document this meeting.

6. If the group cannot reach agreement, the Deputy Administrator for Rail shall bring the matter to the attention of the attention of the Rail & Transit Administrator.

7. If the General Contractor ratings are modified, the original rating and notes shall be preserved.

8. Once review is finalized, PM forwards to General Contractor for receipt and acknowledgement.

9. General Contractor is allowed 10 days to review. If not returned, process continues. Lack of response is noted in General Contractor Signature section DOES NOT change the rating or prevent the rating from being recorded by the MassDOT Rail & Transit Division for use as an evaluation tool in future construction procurements.

10. General Contractor may request a meeting with the PM and the Deputy Administrator for Rail to discuss the ratings.

		Excellent	Average	Poor	% Rating	% Rating	% Rating	% Rating	Weighted
		10	8	4		without C	without E	w/out C & E	
A.	**Safety**				**x 2.0=**	x 2.0	x 2.0=	x 2.5=	
B.	**Overall Quality and Workmanship**				**x 2.0=**	x 2.5	x 2.0=	x 2.5=	
C.	**Resolution of Construction Deficiencies**				**x 1.0=**	0	x 1.0=	0	
D.	**Project Management**				**x 1.0=**	x 1.5	x 1.5=	x 1.5=	
E.	**Change Orders**				**x 1.0=**	x 1.0=	x 1.0=	x 1.0=	
F.	**Home Office Support**				**x 0.5=**	x 0.5=	x 0.5=	x 0.5=	
G.	**Equipment**				**x 0.5=**	x 0.5=	x 0.5=	x 0.5=	
H.	**On-Site Supervisory Personnel Rating**				**x 1.0=**	x 0.5=	x 0.5=	x 0.5=	
I.	**General Compliance with Contract Requirements**				**x 1.0=**	x 0.5=	x 1.0=	x 1.0=	
				Overall Rating w/o Subs (Maximum Score = 100)					
J.	**Subcontractor Performance & Mgmt:**				**x 1.0=**	x 1.0=	0	0	
				Add'l Rating w/Subs Only (Included if applicable by PM)					

Project Manager's Signature/Date: _____ **DATE:** _____

Deputy Administrator for Rail Signature/Date: _____ **DATE:** _____

General Contractor Acknowledging Report/Date: _____ **DATE:** _____

General Contractor Requests Meeting - Please Enter **YES** or **NO:** _____

Contractor's Comments/Meeting Notes: _____

INFORMATION FOR RAIL DIVISION RELATING TO FUTURE PROCUREMENTS

- The Rail Division has calculated Maximum, Average & Minimum Scores that apply to the Contractor Performance Evaluation Form.
- The Maximum Score is 100, The Average Score is 80. The Minimum acceptable Score for any Contractor is 70 for Categories A. through I.
- A deduction **shall** be recommended for unsatisfactory performance if the "Overall Rating" Score is under 70. This may impact the Contractor on the next Procurement.
- A deduction **may** be recommended for this project, if the Contractor completes this project late.

RECOMMENDATIONS FOR DEDUCTIONS FROM CONTRACTORS' ASSIGNED FACTOR

Recommend a deduction for Contractor's unstatisfactory performance - _____

Recommend a deduction for Project Completed Late - Please Enter **YES** or **NO**: _____

Deputy Administrator for Rail Signature/Date: _____

PROJECT MANAGERS EXPLANATION - RATINGS NO. 1 - NO. 10 ABOVE: (extra sheets may be appended to this form, if needed): _____

Excellent	Average	Fair
10	8	6

Score each sub category in whole numbers in the range between 10 and 4, with 10 = Excellent, 8= Average, and 4 = Poor. Overall score for each category will be the average of all questions rated below. The weights for each category on the Summary Tab set the final score.

A. Safety			
A) Using the Rating Scale noted above, please rate the Contractor's Safety on this project. Please note if there were any OSHA violations or serious safety accidents. Did the Contractor have a culture of Safety on this project? Provide specific examples to support your rating.			
10	**8**	**4**	**Score**
Full FRA, MassDOT, and Railroad compliance (based on results of safety requirements).	General FRA, MassDOT, and Railroad compliance (minor infractions found during safety requirements and review).	Disregard for FRA, MassDOT, and Railroad requirements (documented safety infractions).	
Full time safety manager on-site, all shifts.	Full time safety manager on-site, at least one shift.	Safety manager rarely on-site.	
Active safety program including: regular toolbox meetings, housekeeping, full fall protection.	Adequate housekeeping.	Poor onsite safety procedures.	
Regularly scheduled safety meetings.	Periodic safety meetings.	Deficient, on site safety procedures.5	
Worker injuries rare.	Occasional, minor injuries.	Frequent worker injuries or at least one serious injury.	
Workers fully engaged in safety issues.	Workers generally aware of safety issues.	Workers are unable to speak up about safety issues.	
Actively notifies MassDOT Rail Division of a safety incident onsite ASAP.	Notifies MassDOT Rail Division of a safety incident within 24 hrs.	Lack of notification to MassDOT Rail Division when safety incident occurs.	
Performs monthly safety walks with MassDOT Rail Division Project Manager.	MassDOT Rail Division occasionally (less than 20% of the time) has to remind contractor to perform monthly safety walks with MassDOT Project Manager.	No monthly safety walks with MassDOT Project Manager.	
Maintains an updated database of all required ROW and other Trainings and Certifications.	MassDOT Project Manager occasionally has to remind contractor of the required ROW Training and Certifications.	Contractor personal accessing site without the proper training and certifications.	
			Average

Excellent	Average	Fair	
10	8	6	
B. Overall Quality and Workmanship			
B) Using the Rating Scale noted above, please rate Contractor's Overall Quality and Workmanship. Were there quality or workmanship problems? Was there a culture of quality on this project: Please provide specific examples to support your rating:			
10	**8**	**4**	Score
Full compliance with the contract specifications, plans and approved quality control plan.	General conformance with the contract specifications and plans.	Substantial deviations from the contract plans and specifications.	
Quality Control Manager (QCM) on-site full time and focused exclusively on QC.	QCM on-site full time but occasionally performing non-QC related duties.	QCM frequently not on-site, or frequently not performing QC related tasks.	
QCM initiates inspections/testing without need for MassDOT staff intervention.	The Resident Engineer or staff is occasionally required to remind QCM to initiate inspections.	Requires constant oversight by the resident Engineer and Field Inspector.	
Testing/inspection performed at a greater frequent than specified ensuring higher level of quality.	Performing only minimum required testing/inspection.	Performing less than specified minimum testing and/or not fully supervising independent testing agencies.	
			Average

C. Resolution of Construction Deficiencies			
C) Using the Rating Scale noted above, please rate the rate the Contractor's ability to resolve quality issues (e.g., Construction Deficiencies). Note if Contractor identified problems independently or if MassDOT Rail & Transit Division was required to issue a Non-Conformance Report (NCR). Please indicated if the Contractor proactively proposed resolution of any deficiencies.			
10	**8**	4	Score
Any deficiencies quickly identified by Contractor's Quality Control process. Items reworked or marked and documented within reasonable time frame.	Deficiencies noted and isolated but not reworked or documented within a week of identification.	Repeated, substantive corrective actions required on work performed.	
NCRs complete with proposed resolution and preventive action.	NCRs typically complete. Only occasionally incomplete (i.e. 20% or less do not include preventive action or lack sufficient detail of proposed resolution).	NCRs issued by engineer and NCR defect repeatedly occurred. After repeated reminders by MassDOT, NCRs rarely complete.	
			Average

Excellent	Average	Fair	
10	8	6	
D. Project Management:			
D) Using the Rating Scale noted above, please rate the rate this Contractor's performance with regard to adhering to contract schedules and milestones.			
10	8	4	Score
Closely adhered to contract schedules and milestones.	General adherence to contract schedules and milestones.	Monthly updates are late each month and 3 week look ahead does not reflect actual work in the field.	
Provided accurate schedule updates at frequency specified (i.e.. 3 week look ahead, monthly updates, recovery).	Typically submitted schedule updates (80%+) but occasionally needed to be prompted.	Rarely revised schedule (50% or less) even when prompted or when current schedule did not reflect actual work performed.	
Contractor continued to meet schedule even when origin of delay was outside of the contractor's control.	General adherence to revised schedule with only occasional difficulty adjusting to items outside of their control.	Unable to adjust to any change in schedule regardless of cause or impact.	
			Average

E. Change Orders			
E) Using the Rating Scale noted above, please rate the Contractor's Change Order submissions (e.g., identification, scope, detail) and process. Please provide specific examples to support the rating.			
10	8	4	Score
Change Orders (COs) identified and submitted within 1 month of identification.	Some Potential Change Orders (PCOs) submissions delayed up to 5 months.	General Contractor submissions of PCOs six or more months late.	
Proposed value is essentially equal to independent cost and time estimate.	Proposed value is above independent cost and time estimate rates but willing to negotiate.	Proposed value is double or greater than estimated rates and resistance to negotiating.	
Contractor willing and able reach resolution during initial negotiations.	Some negotiations require more than two rounds of negotiations but 80% or greater do not.	All COs require three or more rounds of negotiations.	
Willing to continue work under work directive, while actively preparing CO in a short period of time. No impact to project schedule.	Willing to continue work under work directive, but CO proposals take more time than usual. No impact to project schedule.	Not willing to start the work with a work directive in place, requires CO processed. Causing schedule delay.	
			Average

Excellent	Average	Fair	
10	8	6	
F. Home Office Support			
F) Using the Rating Scale noted above, please rate the rate the Contractor's overall ability to support the fieldwork. Please provide specific examples to support rating.			
10	8	4	Score
Submittals at least 30 days in advance of the work.	Majority of submittals (90%) produced prior to scheduled work.	Majority of submittals forwarded for review less than 30 days prior to work.	
RFIs submitted once issue is recognized.	Majority of RFIs are submitted in a timely fashion, but some delay has potential to impact schedule.	RFIs not submitted in a timely fashion and contractor proceeds at their own risk without formal response.	
Paperwork includes all required information including backup.	Majority of paperwork includes required information. Any resubmissions are complete.	Paperwork consistently contains errors or missing information. Resubmissions require additional revisions.	
Submitted complete, accurate invoices each month during the last 6 months.	Submitted complete, accurate invoices during 5 of the last 6 months.	All other situations.	
No delay in acquiring materials and equipment when needed.	Occasional delay in acquiring material or equipment but not a frequent pattern.	Consistent delay in obtaining material or equipment negatively influencing schedule.	
			Average

G. Equipment			
G) Using the Rating Scale noted above, please rate the rate this Contractor's ability to provide functioning, appropriate equipment along with skilled operators. Sub-contractors equipment/operators are included in this rating.			
10	8	4	Score
Equipment available and appropriate for the task whenever needed.	Occasional delay in obtaining appropriate equipment (such as high-rail, or special track equipment) but minimal impact to planned work.	Frequent delay in obtaining proper equipment. Work plan must be changed an average of once a week due to lack of appropriate equipment.	
Equipment well maintained. Appropriate measures taken to ensure operation in extreme conditions.	Under normal conditions equipment runs properly more than 90% of time.	Frequent equipment breakdowns.	
Equipment operators are highly skilled and proficient.	Operators are proficient.	Efficiency of work impacted due to equipment limitations or not functioning more than 10% of time. Operator actions result in damage to property or "near miss" incidents.	
All required equipment submitted for inspection prior to use on MassDOT property (i.e. Hi-rail equipment inspected by MOW prior to use on rail).	All equipment submitted and in good working condition. (i.e. no oil leaks, proper safety guards in place, etc.).	Equipment not submitted for inspection by MassDOT prior to use on property.	
Specialized Equipment is as specified in the contract documents.	Specialized Equipment is in close conformance with the specified limits in the contract documents.	Specialized Equipment is not in conformance with the specified limits in the contract documents.	
			Average

Excellent	Average	Fair	
10	8	6	
H. On-Site Supervisory Personnel Rating			
H) Using the Rating Scale noted above, please rate the rate the general performance of the Contractor's on-site supervisory personnel. Please provide specific examples to support rating.			
10	**8**	**4**	Score
Demonstrates full knowledge of contract requirements and revisions.	Reasonable knowledge of contract requirements.	Does not demonstrate working knowledge of contract requirements.	
Fully cooperates with all reasonable requests.	Generally cooperates with reasonable requests.	Refuses to cooperate with reasonable requests.	
Effectively manages workforce.	Generally capable of managing workforce.	Unable to properly manage workforce.	
Fully authorized and capable of making jobsite decisions.	Able to make jobsite decisions.	Not authorized to make jobsite decisions.	
Onsite personnel have required licenses and are trained above contract requirements, i.e. superintendent's license, safety Rep has OSHA certifications in multiple disciplines, QCM has NETTCP, AWS, NACE certifications.	Onsite personnel have required licenses and certifications i.e. superintendent's license, safety Rep is familiar with OSHA regulations, but not certified, QCM has field experience, but not certified in any fields.	Onsite personnel lack field experience and/or required licenses.	
			Average

I. General Compliance with Contract Requirements			
I) Using the Rating Scale noted above, please rate the rate Contractor's general compliance with overall contract requirements. This includes ability to work well with MassDOT stakeholders, designer, municipalities and Authority Having Jurisdiction. For final payment, score should summarize ability to close out project (warranty, as-built documentation, etc.),			
10	**8**	**4**	Score
Required documentation not directly tied to work is submitted without prompting (certified payroll, as-built plan updates, material certifications, etc.).	Generally complies with administrative requirements (90%+). If information missing or error found, corrected on subsequent submission.	Administrative submittals rarely complete or accurate (less than 20% of time). Similar errors occur repeatedly.	
Good working relationship with all outside parties (MassDOT, Utilities and/or Other Authorities having Jurisdiction).	Good working relationship with majority of outside parties (MassDOT, Utilities or Other Authorities having Jurisdiction). Occasional difficulty in dealing with outside entities (less than 20% of the time).	Confrontational relationship with multiple outside parties (MassDOT Departments, Utilities and/or Other Authorities having Jurisdiction).	
Fully understands and complies with (MassDOT and Utility) requirements.	Require only occasional guidance from MassDOT regarding project requirements.	Lacks understanding of the required documents for MassDOT acceptance.	
			Average

Excellent	Average	Fair	
10	8	6	
J. Subcontractor Performance & Management:			
J) Using the Rating Scale noted above, please rate the rate this Contractor's ability, effort, and success in managing, administering, and coordinating subcontractors (if no subcontractors, rate this contractor's overall project management). Please			
10	8	4	Score
Subcontractor(s) in full compliance with requirements for safety, quality, and schedule as defined in other portions of this evaluation.	Subcontractor(s) in general compliance with requirements as defined in other portions of this evaluation.	Subcontractor(s) not complying with requirements as defined in other portions of this evaluation.	
General Contractor is actively assisting subcontractor meet requirements.	General Contractor usually (90%+) assisting subcontractor meet requirements.	No evidence the General Contractor has is actively managing the subcontractor.	
Subcontractor acceptance request submitted 30 days prior to scheduled activity.	Subcontractor acceptance submitted and approved less than 30 days but prior to scheduled activity.	Subcontractor acceptance not always submitted, before arriving onsite.	
Certified payrolls submitted in accordance with contract documents.	Certified payrolls submitted infrequently.	Constantly reminding contractor to submit certified payrolls.	Select
Using the Contractually provided information, provide below the Contractor's current DBE goal and DBE Paid Through Last percentage achieved by the Contractor. If the current DBE Paid through last is below the DBE goal, please request the Contractor to explain how they plans to achieve the DBE goal.			
		Project DBE Goal (From CMS):	%
		Current DBE Paid Through Last % (From CMS):	%
			Average

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 03-21-25

NOTICE OF AVAILABILITY

The 2025 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DIVISION I: GENERAL REQUIREMENTS AND COVENANTS, as amended herein, certain subsections of DIVISIONS II: CONSTRUCTION DETAILS AND III: MATERIALS SPECIFICIATONS referenced herein, the SUPPLEMENTAL SPECIFICATIONS thereto (03/31/2025), and the American Railway Engineering and Maintenance-of-Way Association ("AREMA") Manual for Railway Engineering dated 2024 are incorporated into this contract.

The 2025 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES and SUPPLEMENTAL SPECIFICATIONS (03/31/2025) are available online at https://www.mass.gov/massdot-highway-division-manuals-and-publications

The American Railway Engineering and Maintenance-of-Way Association ("AREMA") Manual for Railway Engineering dated 2024, incorporated by reference herein, is available for purchase at MRE.

AMENDMENTS to the 2025 MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DIVISION I: GENERAL REQUIREMENTS AND COVENANTS

Amendments to the 2025 Massachusetts Department of Transportation Highway Division Standard Specifications for Highways and Bridges Division I: General Requirements and Covenants are set forth in Document A00801 Special Provisions, and in this Document 00710 General Contract Provisions, as follows.

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 00718

SPECIAL PROVISION FOR PARTICIPATION BY MINORITY OR WOMEN'S BUSINESS ENTERPRISES AND SERVICE- DISABLED VETERAN- OWNED BUSINESS ENTERPRISES

(Implementing Chapter 102, Section 24 and
Chapter 273, Section 124, of the Acts of 1994 and Chapter 56, Sections 1 to 5 of the Acts of 2010
and subsequent Acts)
Revised: September 27, 2021

I. PARTICIPATION

M/WBE PARTICIPATION GOAL
On this Contract, the Massachusetts Department of Transportation (MassDOT) has established a goal for participation by Minority or Women Business Enterprise(s) (M/WBE). One half of the goal shall be met in the form of contractor activity. This goal shall remain in effect throughout the life of the Contract.

☒ Design-Bid-Build Projects: M/WBE Participation Goal **6 %**
(*One half of this goal shall be met in the form of Subcontractor construction activity*)

☐ Design-Build Projects: M/WBE Design Participation Goal **___%** and M/WBE Construction Participation Goal **___%**
(One half of the Construction Goal shall be met in the form of Subcontractor construction activity)

SDVOBE PARTICIPATION BENCHMARK
On this Contract, the Massachusetts Department of Transportation (MassDOT) has established a goal for participation by Service- Disabled Veteran- Owned Business Enterprise(s) (SDVOBE). This goal shall remain in effect throughout the life of the Contract.

☐ Design-Bid-Build Projects: SDVOBE Participation Goal **____%**

☐ Design-Build Projects: SDVOBE Design Participation Goal **___%** and SDVOBE Construction Participation Goal **___%**

II. POLICY

It is the policy of the MassDOT that Minority, Women Business Enterprises (M/WBEs) and Service- Disabled Veteran- Owned Business Enterprises (SDVOBEs) have equal opportunity to receive and participate in the performance of its state funded Contracts.

III. M/WBE and SDVOBE OBLIGATION

The Contractor agrees to take all necessary and reasonable steps to ensure that MBE, WBE, and SDVOBEs have the maximum opportunity to compete for, and to perform, Department Contracts.

IV. FAILURE TO COMPLY WITH M/WBE OR SDVOBE REQUIREMENTS

All Contractors and Subcontractors are hereby advised that failure to carry out the requirements of these Provisions constitutes a breach of Contract which may result in termination of the Contract, a determination that the Contractor or Subcontractor be barred from bidding on Department Contracts for up to three (3) years, or any other remedy as the Department may impose under Section XIV of these Special Provisions.

V. REQUIRED SUBCONTRACT PROVISIONS

The Prime Contractor shall include the Provisions of Sections II, III, and IV above in every subcontract making those provisions binding on each subcontractor, supplier, manufacturer, consultant or service provider.

VI. DEFINITIONS

For the purpose of these Special Provisions, the terms listed below are defined as follows:

Minority Business Enterprise or MBE means any individual, business organization, or non-profit corporation certified as a MBE by the Supplier Diversity Office (SDO), formerly known as the State Office of Minority and Women Business Assistance (SOMWBA), or by the Department for the purposes of a particular bid or proposal to be submitted to the Department.

Women Business Enterprise or WBE means any individual, business or organization, or non-profit corporation certified as a WBE by SDO, or by the Department for the purposes of a particular bid or proposal to be submitted to the Department.

Service- Disabled Veterans- Owned Businesses or SDVOBE means a business not less than 51 percent of which is owned by one or more service- disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and the management and daily business operations of which are controlled by one or more service- disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

"Contractor activity" means any work, including but not limited to, construction, demolition, renovation, survey, test boring services, or maintenance work performed under the Contract.

"Approved Joint Venture" means a joint venture between M/WBEs and non-M/WBEs, or SDVOBEs and non-SDVOBEs, which has been established for the purpose of participation on a particular contract, where:

1. The M/WBE or SDVOBE partner(s) shares in the ownership, control, management responsibilities, risks and profits of the joint venture; and

2. The Joint Venture has been approved by the Department for M/WBE or SDVOBE participation on the particular contract.

"Equipment Rental Firm" means a firm that owns equipment and assumes actual and contractual responsibility to rent said equipment to perform a useful function of the work of the contract consistent with normal industry practice.

"Material Supplier" means a vendor engaged in sales to the highway construction industry from an established place of business or source of supply, which:

(a) Manufactures goods from raw materials or substantially alters them before resale, or

(b) Provides and maintains a storage facility for materials used in the work, consistent with normal industry practice.

“Department” means the Massachusetts Department of Transportation (MassDOT).

"SDO" means the Massachusetts Supplier Diversity Office.

VII. ELIGIBILITY of M/WBEs

Only firms, *OTHER THAN THE PRIME CONTRACTOR*, which have been certified by SDO and/or the Department as eligible to participate on state funded contracts as MBEs or WBEs may be used on this contract for credit toward the toward the M/WBE participation goal.

1. SDO Directory of Certified M/WBEs: The Supplier Diversity Office publishes a Directory of certified MBE and WBEs. This Directory can be obtained from SDO at https://www.sdo.osd.state.ma.us/. This site lists those firms which have been certified as minority owned (MBEs) or women owned (WBEs) in accordance with the criteria of 425 CMR 2.00 et seq to participate as M/WBEs on state funded contracts. It also lists the kinds of work in which each firm engages but does not constitute an endorsement of the quality or performance of any business and does not represent Department subcontractor approval.

2. Application for Certification by the Department for a Particular Project: A firm which has (1) submitted a fully completed M/WBE application to SDO at least 30 days previously, (2) has provided in a timely manner, any additional information which may have been requested by SDO, and (3) can provide evidence, satisfactory to the Department, of a bidder's conditional commitment to subcontract with the firm, if certified, may apply directly to the MassDOT Office of Civil Rights to be certified for participation on the particular contract.

3. Joint Venture Approval: To obtain recognition as an approved joint venture between M/WBEs and non-/M/WBEs, the Joint Venture must provide to the MassDOT Office of Civil Rights, at least 14 business days before the bid opening date, the Joint Venture Affidavit Document B00847, and a copy of the Joint Venture Agreement, which shall include a detailed breakdown of the following:

   (a) Capital participation by the M/WBE,

   (b) Specific equipment to be provided to the Joint Venture by the M/WBE,

   (c) Specific responsibilities of the M/WBE in the management of the Joint Venture,

   (d) Workforce and specific skills to be provided to the Joint Venture by the M/WBE, and

   (e) Percentage distribution to the M/WBE of the projected profit or loss incurred by the Joint Venture.

   (f) The Joint Venture shall provide all such additional information as may be requested by the Department for the purpose of determining joint venture eligibility.

VIII. ELIGIBILITY of SDVOBEs

Only firms, *OTHER THAN THE PRIME CONTRACTOR*, which have demonstrated that they are listed as a service-disabled veteran- owned small businesses within the VetBiz database may be used on this contract for credit toward the SDVOBE participation goal.

1. VetBiz Database: The website, located at www.VetBiz.gov, listing verified service- disabled veteran- owned businesses.

2. Joint Venture Approval: To obtain recognition as an approved joint venture between SDVOBEs and non-/SDVOBEs, the joint venture must provide to the MassDOT Office of Civil Rights, at least 14 business days before the bid opening date, an application for joint venture participation approval, and a copy of the Joint Venture Agreement, which shall include a detailed breakdown of the following:

   (a) Capital participation by the SDVOBE,

   (b) Specific equipment to be provided to the joint venture by the SDVOBE,

   (c) Specific responsibilities of the SDVOBE in the management of the Joint Venture,

   (d) Workforce and specific skills to be provided to the joint venture by the SDVOBE, and

(e) Percentage distribution to the SDVOBE of the projected profit or loss incurred by the Joint Venture.

(f) The Joint Venture shall provide all such additional information as may be requested by the Department for the purpose of determining joint venture eligibility.

IX. COUNTING M/WBE PARTICIPATION AND SDVOBE BENCHMARKS TOWARDS M/WBE AND SDVOBE GOALS

In order for M/WBE participation and SDVOBE benchmarks to count toward the Contract goal, the M/WBE and SDVOBE must have independently managed, supervised and performed the Contract work with its own workforce, equipment and resources. M/WBE and SDVOBE participation which fulfills these requirements shall be counted toward meeting the M/WBE and SDVOBE goals in accordance with the following rules:

1 If a firm has been determined to be an eligible MBE, WBE or SDVOBE, the total dollar value of the contract performed by the M/WBE or SDVOBE is counted toward the applicable goal as follows:

a. Except as provided below, in Section IX (1)(g), work performed by a M/WBE or a SDVOBE Prime Contractor shall not be counted toward the M/WBE or SDVOBE goal, and all Prime Contractors, including M/WBE or SDVOBE Prime Contractors, must comply with the M/WBE and SDVOBE requirements of this Contract.

b. For a M/WBE or SDVOBE material supplier, sixty percent (60%) of the amount to be paid for materials and supplies required under this Contract shall be credited toward the goal.

c. For a M/WBE or SDVOBE who provides a bonafide service such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials, or supplies required for performance of the contract, reasonable fees or commissions charged for the service shall be listed, but the cost of items themselves shall not be credited.

d. For a M/WBE or SDVOBE hauler, trucker, or delivery service, which is not also the manufacturer of or a regular dealer in the materials and supplies, reasonable fees charged for delivery of materials and supplies required on the job site shall be credited; the cost of the materials and supplies themselves shall not be credited.

e. For a M/WBE or SDVOBE who provides any bonds or insurance specifically required for the performance of the contract, reasonable fees or commissions charged for such service shall be listed, but the face amount or actual premium paid for the bond or insurance shall not be credited.

f. The Department shall determine if the fees or commissions listed in accordance with paragraphs (c), (d), and (e) are not excessive as compared with fees or commissions customarily allowed for similar services.

g. That portion of the contract total dollar value equal to the percentage of ownership and control of the M/WBE partner(s) or SDVOBE partner(s) in an approved Joint Venture shall be counted toward the Contract goal, except that credit for M/WBE and SDVOBE participation in an approved Prime Joint Venture shall not exceed one half of the Contract goal.

X. JOINT CHECK POLICY

1. 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 M/WBE or SDVOBE third party such as a regular dealer of material or supplies. The Prime Contractor issues the check as payor to the M/WBE or SDVOBE 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 M/WBE or SDVOBE. MassDOT has established criteria to ensure that M/WBEs or SDVOBEs are in fact performing a commercially useful function ("CUF") while using a joint check arrangement. Contractors and M/WBEs or SDVOBEs must meet and conform to these conditions and criteria governing the use of joint checks.

2. In the event that a Contractor, M/WBE or SDVOBE Subcontractor desires to a use joint check, MassDOT will require prior notice and will closely monitor the arrangement for compliance. MassDOT may allow a joint check arrangement and give credit to a Contractor for use of the M/WBE or SDVOBE 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 (M/WBEs, SDVOBE and non-M/WBEs or non-SDVOBEs); 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 M/WBE or SDVOBE (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.

3. Other factors MassDOT may consider:

   - Whether there is a requirement by the Prime Contractor that a M/WBE or SDVOBE should use a specific vendor or supplier to meet their Subcontractor specifications;
   - Whether there is a requirement that a M/WBE or SDVOBE use the Prime Contractor's negotiated price;
   - The independence of the M/WBE or SDVOBE;
   - 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 M/WBE or SDVOBE has made an effort to establish alternate arrangements for following periods (i.e., the M/WBE or SDVOBE 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 M/WBE or SDVOBE remain responsible for compliance with all other elements of the Special Provisions, and must still be able to prove that a commercially useful function is being performed for the Contractor.

XI. JOINT CHECK PROCEDURES

- The M/WBE or SDVOBE 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 B00846) and by notification on the M/WBE Letter of Intent (Document B00843) or SDVOBE Letter of Intent (Document B00845), 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 Contractor and M/WBE or SDVOBE must have:

  (a) a written agreement with the material supplier/vendor;
  (b) applied for credit with the subject material supplier and has supplied the vendor's response;

(c) shown that it will place all orders to the subject material supplier/vendor;
(d) made and retains all decision-making responsibilities concerning the materials; and
(e) provided a Joint Check Agreement that is acceptable to MassDOT;

- The MassDOT Office of Civil Rights will review the request and render a decision as part of the approval process for M/WBE or SDVOBE 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 M/WBE or SDVOBE 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 M/WBE or SDVOBE (i.e. if possible, funds or the joint check should be processed by the M/WBE or SDVOBE and sent by the M/WBE or SDVOBE 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 M/WBE or SDVOBE 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 M/WBE or SDVOBE Program policies and procedures as part of the Subcontractor approval process.

XII. AWARD DOCUMENTATION AND PROCEDURES

1. The two lowest bidders/the two bidders with the lowest price per quality score point, including any M/WBE bidder or SDVOBE bidder, shall submit, by the close of business on the third business day after the bid opening, a completed Schedule of M/WBE and SDVOBE participation, in the form attached, which shall list:

   a. The full company name, address and telephone number of each M/WBE or SDVOBE with whom the bidder intends to make a commitment;

   b. The Contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each M/WBE or SDVOBE 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 Section XII of these Special Provisions.

   c. The total dollar amount to be paid to each M/WBE or SDVOBE. (Bidders are cautioned that at least one half of the participation goal must be met with Contract work.)

   d. The total dollar amount to be paid to each M/WBE or SDVOBE which is eligible for credit toward the M/WBE or SDVOBE goal under the crediting rules set out in Section IX.

   e. The total creditable M/WBE or SDVOBE participation as a percentage of the total bid price.

2. All firms listed on the Schedule must be currently certified.

3. The two lowest bidders/the two bidders with the lowest price per quality score point shall submit with their Schedules of Participation, fully completed, signed Letters of Intent from each of the M/WBEs or SDVOBEs listed on the Schedule. The Letters of Intent shall be in the form attached and shall identify specifically the contract activity the M/WBE or SDVOBE proposes to perform, expressed as contract item number, if applicable, description of the activity, 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.

4. Evidence of good faith efforts will be evaluated by the Department in the selection of the lowest responsible bidder/best value bidder. All information requested by the Department for the purpose of evaluating the bidder's efforts to achieve the goal must be provided within three calendar days and must be accurate and complete in every detail. The apparent low bidder's/best value bidder's attainment of the M/WBE or SDVOBE goal or a satisfactory demonstration of good faith efforts is a prerequisite for Award of the Contract.

5. 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 on the Schedule of Participation, and provide the required Letters of Intent for, M/WBE or SDVOBE 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 the Department, that good faith efforts were made to achieve the goal.

6. If the Department finds that the percentage of M/WBE or SDVOBE participation submitted by the bidder on its Schedule does not meet the Contract goal, or that the 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 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.

7. If, after administrative reconsideration, the Department 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.

8. Actions which constitute evidence of good faith efforts to meet the M/WBE or SDVOBE goals include, but are not limited to, all of the following examples:

    a. Efforts made to select portions of the work proposed to be performed by M/WBEs or SDVOBEs in order to increase the likelihood of achieving the stated goal, including, where appropriate, but not limited to, breaking down contracts into economically feasible units to facilitate M/WBE and SDVOBE participation. The value of such work is required to at least equal the M/WBE and SDVOBE goal.

    b. Reasonable written notification prior to the opening of bids soliciting individual M/WBEs or SDVOBEs interested in participation in the contract as subcontractors, regular dealers, manufacturers, consultants, or service providers and identifying the specific items or type of work being solicited.

    c. Written notification to M/WBE or SDVOBE economic development assistance agencies and organizations which provide assistance in recruitment and placement of M/WBEs and SDVOBEs, describing the type of work, supplies or services being considered for M/WBE or SDVOBE subcontracting on this contract.

    d. Efforts made to negotiate with M/WBEs or SDVOBEs for specific items of work including evidence of:
        (1) The names, addresses, telephone numbers of M/WBEs or SDVOBEs who were contacted, the dates of initial contact and whether initial solicitations of interest were followed up by contacts with M/WBEs or SDVOBEs to determine with certainty whether the M/WBEs or SDVOBEs were interested. Personal or phone contacts are expected.

        (2) A description of the information provided by the M/WBEs or SDVOBEs regarding the plans and specifications and estimated quantities for portions of the work to be performed.

        (3) A statement of why additional agreements with M/WBEs or SDVOBEs were not reached.

        (4) Documentation of each M/WBE or SDVOBE contacted but rejected and the reasons for the rejection.

    e. Absence of any agreements between the Contractor and the M/WBE or SDVOBE in which M/WBE or SDVOBE promises not to provide subcontracting quotations to other bidders.

    f. Efforts made to assist the M/WBEs or SDVOBEs that need assistance in obtaining bonding, insurance, or lines of credit required by the Contractor.

g. Documentation that qualified M/WBEs or SDVOBEs are not available, or are not interested.

h. Attendance at any meeting scheduled by the Department to encourage better Contractor-M/WBE or Contractor- SDVOBE relationships and/or to inform M/WBEs or SDVOBEs of forthcoming M/WBE or SDVOBE utilization opportunities.

i. Advertisement, in general circulation media, in trade association publications and in disadvantaged business enterprise-focused media, of interest in utilizing M/WBEs or SDVOBEs and the area of interest.

j. Efforts to effectively use the services of available minority community organizations; women organizations, veteran organizations, minority, women disadvantaged and veteran contractor's groups; local, state and federal disadvantaged business assistance offices; and other organizations that provide assistance in recruitment and placement of M/WBEs or SDVOBEs.

9. The demonstration of good faith efforts must establish that the Contractor has actively and aggressively sought out M/WBEs or SDVOBEs to participate in the project and has taken all actions which could be reasonably expected to achieve the goal. Examples of circumstances or actions not acceptable as reasons for failure to meet the M/WBE or SDVOBE goal, include, but are not limited to:

a. The M/WBE or SDVOBE was unable to provide performance and/or payment bonds.

b. The M/WBEs or SDVOBEs commercially reasonable bid was rejected based on price.

c. The M/WBE or SDVOBE would not agree to perform items of work at the unit bid price.

d The Contractor does not want to subcontract a percentage of the work sufficient to meet the goal.

e. Solicitation by mail or fax only.

XIII. COMPLIANCE

1. All activity performed by a M/WBE or SDVOBE for credit toward the Contract goal must be performed, managed and supervised by the M/WBE or SDVOBE. Prime Contractor shall not enter into, or condone, any other arrangement.

2. The Prime Contractor shall not perform with its own organization, or assign to any other business, any activity designated for the M/WBEs or SDVOBEs named on the Schedule submitted by the Prime Contractor under Section IX, or under Section XII(6), without the approval of the Department in accordance with the requirements of Sections XIII(6) and XIII(10).

3. The Department may suspend payment for any activity which was not performed by the M/WBE or SDVOBE to whom the activity was committed on the approved Schedule of Participation, or which was not performed in accordance with the requirements of Section XIII(1).

4. The Department retains the right to approve or disapprove all subcontractors. Requests by the Prime Contractor for approval of participation by a M/WBE or SDVOBE subcontractor for credit toward the Contract goal must include, in addition to any other requirements for subcontractor approval, the following:

a. A copy of the proposed subcontract. The subcontract must be for at least the dollar amount, and for the work described, in the Prime Contractor's Schedule of Participation.

b. A resume stating the qualifications and experience of the M/WBE or SDVOBE 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.

c. A Schedule of Operations indicating when the M/WBE or SDVOBE is expected to perform the work.

d. A list of (1) equipment owned by the M/WBE or SDVOBE to be used on the Project, and (2) equipment to be leased by the M/WBE or SDVOBE for use on the Project.

e. A list of: (1) all projects (public and private) which the M/WBE or SDVOBE is currently performing, (2) all projects (public and private) to which the M/WBE or SDVOBE is committed, (3) all projects (public and private) to which the M/WBE or SDVOBE 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 M/WBEs or SDVOBEs work schedule for each project.

5. If, pursuant to the subcontractor approval process, the Department finds that a M/WBE or SDVOBE subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of Section XIII(1), approval of the M/WBE or SDVOBE subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements of Sections XIII(6) and XIII(10).

6. If, for reasons beyond its control, the Prime Contractor cannot comply with its M/WBE or SDVOBE commitment in accordance with the Schedule of participation submitted under Section IX and the terms of these Special Provisions, the Prime Contractor shall submit to the Department the reasons for its inability to comply with its obligations under Section I and shall submit, and request approval for, a revised Schedule of Participation. If approved by the Department, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these special provisions.

7. A Prime Contractor's compliance with the participation goal in Section I shall be determined by reference to the required percentage of the total Contract price, including any additions and modifications thereto, provided, however, that no decrease in the dollar amount of a bidder's commitment to any M/WBE or SDVOBE shall be allowed without the approval of the Department.

8. If the Contract amount is increased, the Prime Contractor shall submit a revised Schedule of Participation in accordance with Sections XIII(6) and XIII(10).

9. In the event of the decertification of a M/WBE or SDVOBE participating or scheduled to participate on the contract for credit toward the goal, the Contractor shall proceed in accordance with Sections XIII(6) and XIII(10).

10. The Prime Contractor shall notify the Department immediately of any facts which come to its attention indicating that it may or will be unable to comply with any aspect of its M/WBE or SDVOBE obligation under this Contract.

11. Any notice required by these Special Provisions shall be given in writing to the Resident Engineer and the designated Compliance Officer with a copy to the Director of Compliance, Office of Diversity and Civil Rights, 10 Park Plaza, Room 3170, Boston MA 02116.

12. The Prime Contractor and its subcontractors shall comply with the Department’s Electronic Reporting System Requirements (Contract Document 00821) and submit all information required by the Department related to the M/WBE Special Provisions and SDVOBE Special Provisions through the Equitable Business Opportunity Solution (EBO). The Department reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.

13. The Contractor shall pay each M/WBE or SDVOBE for satisfactory performance of its Contract no later than 10 days from receipt of payment for the work from the Department. Any delay or postponement of payment to the M/WBEs or SDVOBEs must be for good cause and only with the prior approval of the Department.

14. The Department may withhold the Contractor's next periodic payment if each M/WBE or SDVOBE is not paid in accordance with Section XIII(13).

15. The Department may require specific performance of the Prime Contractor's commitment under the Contract by requiring the Prime Contractor to subcontract with a M/WBE or SDVOBE for any contract or specialty item.

XIV. SANCTIONS

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

1. Retain, in connection with final acceptance and final payment, an amount determined by multiplying the total contract amount by the percentage in Section I, less the amount paid to approved M/WBEs or SDVOBEs for work performed under the Contract in accordance with the provisions of Section X. The Prime Contractor shall have the right to appeal such retention of funds in accordance with the provisions of M.G.L. c. 30A s.10.

2. 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.

3. 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 5.07.

4. Initiate debarment proceedings under M.G.L. c.29 §29F.

XV. FURTHER INFORMATION

Any proposed M/WBE, SDVOBE, bidder, Contractor or subcontractor shall provide such information as is necessary in the judgement of the Department to ascertain its compliance with the terms of this Special Provision.

XVI. LIST OF ADDITIONAL DOCUMENTS

1. The following documents shall be completed and signed by the bidder and designated M/WBEs or SDVOBEs in accordance with Section XII - Award Documentation and Procedures. These documents must be returned by the bidder to MassDOT's Bid Document Distribution Center:

   □ Schedule of M/WBEs (Document B00842) or SDVOBE Participation (Document B00844)
   □ Letter of Intent: M/WBEs (Document B00843) or SDVOBE (Document B00845)
   □ M/WBEs or SDVOBE Joint Check Arrangement Approval Form (Document B00846), if Contractor and M/WBE or SDVOBE plan, or if M/WBE or SDVOBE is required to use a Joint Check (when applicable)

2. The following document shall be signed and returned by Contractor and Subcontractors/M/WBEs or SDVOBEs to the MassDOT Office overseeing the Project, as applicable:

   □ Contractor/Subcontractor Certification Form (Document No. 00859) (a checklist of other documents to be included with every subcontract (M/WBEs or SDVOBEs and non-M/WBEs or SDVOBEs alike)).

3. 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:

   □ Joint Venture Affidavit of M/WBE or SDVOBE/Non-M/WBE or Non-SDVOBE (Document B00847)

4. The following document shall be provided to MassDOT's 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)

** END OF DOCUMENT ***

DOCUMENT 00761

SPECIAL PROVISIONS FOR CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

Revised: 02/09/16

I. Instructions for Certification - Primary Covered Transactions:

By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

1. 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 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 MassDOT's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

2. The certification in this clause is a material representation of fact upon which reliance was placed when the MassDOT determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available, the MassDOT may terminate this transaction for cause of default.

3. The prospective primary participant shall provide immediate written notice to the MassDOT if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the MassDOT for assistance in obtaining a copy of those regulations.

5. The prospective primary 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 MassDOT.

6. The prospective primary 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 Transaction," provided by the MassDOT, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. 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 may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration and the Debarment Lists compiled by both the Massachusetts Office of the Attorney General and the Department of Capital Asset Management and Maintenance (DCAMM) and published separately in the Central Register.

8. 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.

9. Except for transactions authorized under paragraph 5 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, the MassDOT may terminate this transaction for cause or default.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Primary Covered Transactions

The prospective primary 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 covered transactions by any Federal, State or local department or agency;

2. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 2 of this certification; and

4. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

II. Instructions for Certification - Lower Tier Covered Transactions:

By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

1. 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 the MassDOT may pursue available remedies, including suspension and/or debarment.

2. 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.

3. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the MassDOT for assistance in obtaining a copy of those regulations.

4. 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 MassDOT.

5. 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.

6. 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 may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List and the Debarment Lists.

7. 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.

8. Except for transactions authorized under paragraph 4 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, the MassDOT may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal, State or local department or agency.

Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

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

May 15, 2025

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	$0.54
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	$0.75
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	$0.75
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	$0.77
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	$0.81
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	$0.76
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	$0.81
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	$0.76
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	$0.84
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	$0.77
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	$0.84
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	$0.77
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	$0.88
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	$0.95
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	$1.44
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	$0.84
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	$0.77
18	ASTM A276 Type 316 Stainless Steel	$4.34
19	ASTM A240 Type 316 Stainless Steel	$4.34
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	$1.49
21	ASTM A53 Grade B Structural Steel Pipe	$0.95
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	$0.95
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	$0.75
24	ASTM 252, Grade 2 Permanent Steel Casing	$0.75
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	$0.79
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	$1.42
27	ASTM A572 / A572M, Grade 50 Sheetpiling	$1.42
28	ASTM A36/36M, Grade 50	$0.81
29	ASTM A570, Grade 50	$0.79
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	$0.81
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	$0.95
32	AREA 140 LB Rail and Track Accessories	$0.49

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 l51 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 preceeding 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 MassDOT Rail and Transition Divison 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 Rail and Transit Division 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 ǂ

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

_____ **(Contractor)** **Date:**_____

_____**(Subcontractor)** ☐ Rail and Transit Division Approved Subcontractor

Contract No: 129534 **Project No.** 614004 **Federal Aid No.:** N/A

Location: LEE, LENOX AND PITTSFIELD

Project Description: MassDOT Berkshire Line Civil Improvements

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: _____
_____
_____
Telephone Number:_____
Federal I.D. Number:_____
Estimated Start Date:_____
Estimated Completion Date:_____
Estimated Dollar Amount:_____

_____
(Print Name and Title)

_____
(Authorized Signature)

_____
(Date)

Rev'd 09/02/22

*** END OF DOCUMENT ***

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

THIS PAGE INTENTIONALLY LEFT BLANK

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

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

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	**City/Town:**	LEE
Contract Number:	129534		
Description of Work:	Replacement of ten culverts, clean six culverts, replacement and rehabilitation of bridges and associated track work mileposts 74.14, 76.23,77.28,80.72,85.32,85.52 surface and align up to 5700 track feet		
Job Location:	Lee, Lenox and Pittsfield, MA		

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 form 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.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.95	$15.57	$20.17	$0.00	$0.00	$76.69
	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.02	$15.57	$20.17	$0.00	$0.00	$76.76
	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.14	$15.57	$20.17	$0.00	$0.00	$76.88
	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.29	$9.90	$9.25	$5.53	$0.00	$56.97
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	6/1/2025	$39.42	$14.50	$4.30	$6.25	$0.00	$64.47
	12/1/2025	$40.32	$14.50	$4.30	$6.25	$0.00	$65.37
ASPHALT RAKER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
BACKHOE/FRONT-END LOADER OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
BARCO-TYPE JUMPING TAMPER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
BATCH/CEMENT PLANT - ON SITE OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
BLOCK PAVER, RAMMER / CURB SETTER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.29	$9.90	$9.25	$5.53	$0.00	$56.97
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
BOILER MAKER BOILERMAKERS LOCAL 29 BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3	2/1/2025	$54.21	$11.49	$15.57	$5.89	$0.00	$87.16
	8/1/2025	$56.36	$11.49	$15.57	$5.89	$0.00	$89.31
	2/1/2026	$57.71	$11.49	$15.57	$5.89	$0.00	$90.66

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)	8/1/2026	$59.91	$11.49	$15.57	$5.89	$0.00	$92.86
	2/1/2027	$61.31	$11.49	$15.57	$5.89	$0.00	$94.26

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.11	$11.49	$15.57	$5.89	$0.00	$60.06
2	60.00	$32.53	$11.49	$15.57	$5.89	$0.00	$65.48
3	70.00	$37.95	$11.49	$15.57	$5.89	$0.00	$70.90
4	80.00	$43.37	$11.49	$15.57	$5.89	$0.00	$76.32
5	90.00	$48.79	$11.49	$15.57	$5.89	$0.00	$81.74

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.18	$11.49	$15.57	$5.89	$0.00	$61.13
2	60.00	$33.82	$11.49	$15.57	$5.89	$0.00	$66.77
3	70.00	$39.45	$11.49	$15.57	$5.89	$0.00	$72.40
4	80.00	$45.09	$11.49	$15.57	$5.89	$0.00	$78.04
5	90.00	$50.72	$11.49	$15.57	$5.89	$0.00	$83.67

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$48.85	$9.90	$9.25	$9.80	$0.00	$77.80
	12/1/2025	$50.35	$9.90	$9.25	$9.80	$0.00	$79.30
	6/1/2026	$51.90	$9.90	$9.25	$9.80	$0.00	$80.85
	12/1/2026	$53.40	$9.90	$9.25	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$48.03	$9.90	$9.25	$9.80	$0.00	$76.98
	12/1/2025	$49.53	$9.90	$9.25	$9.80	$0.00	$78.48
	6/1/2026	$51.08	$9.90	$9.25	$9.80	$0.00	$80.03
	12/1/2026	$52.58	$9.90	$9.25	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"							
CARPENTER CARPENTERS CARPENTERS LOCAL 336 - BERKSHIRE COUNTY	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Apprentice: CARPENTER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

CARPENTER WOOD FRAME CARPENTERS CARPENTERS-ZONE 3 (Wood Frame) All Aspects of New Wood Frame Work	10/1/2024	$26.65	$7.02	$3.80	$1.00	$0.00	$38.47
	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01

Construction

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

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
3	65.00	$17.32	$7.02	$0.00	$1.00	$0.00	$25.34
4	70.00	$18.66	$7.02	$0.00	$1.00	$0.00	$26.68
5	75.00	$19.99	$7.02	$3.80	$1.00	$0.00	$31.81
6	80.00	$21.32	$7.02	$3.80	$1.00	$0.00	$33.14
7	85.00	$22.65	$7.02	$3.80	$1.00	$0.00	$34.47
8	90.00	$23.99	$7.02	$3.80	$1.00	$0.00	$35.81

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3	65.00	$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4	70.00	$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5	75.00	$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6	80.00	$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7	85.00	$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8	90.00	$24.98	$7.02	$3.80	$1.00	$0.00	$36.80

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)	7/1/2024	$44.56	$13.20	$16.30	$2.93	$1.69	$78.68

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 7/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.28	$13.20	$16.30	$0.00	$0.00	$51.78
2	60.00	$26.74	$13.20	$16.30	$2.93	$1.69	$60.86
3	65.00	$28.96	$13.20	$16.30	$2.93	$1.69	$63.08
4	70.00	$31.19	$13.20	$16.30	$2.93	$1.69	$65.31
5	75.00	$33.42	$13.20	$16.30	$2.93	$1.69	$67.54
6	80.00	$35.65	$13.20	$16.30	$2.93	$1.69	$69.77
7	90.00	$40.10	$13.20	$16.30	$2.93	$1.69	$74.22

CHAIN SAW OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

For apprentice rates see "Apprentice- LABORER"

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CRANE OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$43.06	$13.78	$12.15	$3.00	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

DEMO: ADZEMAN LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: CONCRETE CUTTER/SAWYER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$78.11	$10.08	$11.62	$12.67	$0.00	$112.48
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
ELECTRICIAN (Including Core Drilling) ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 41 ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$62.83	$16.28	$10.96	$10.40	$0.00	$100.47
	1/1/2026	$63.68	$16.38	$11.06	$10.70	$0.00	$101.82
	1/1/2027	$64.53	$16.48	$11.16	$11.00	$0.00	$103.17

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.42	$16.28	$0.00	$0.00	$0.00	$47.70

Construction

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

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	55.00	$34.56	$16.28	$10.96	$10.40	$0.00	$72.20
3	65.00	$40.84	$16.28	$10.96	$10.40	$0.00	$78.48
4	70.00	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
5	80.00	$50.26	$16.28	$10.96	$10.40	$0.00	$87.90

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.84	$16.38	$0.00	$0.00	$0.00	$48.22
2	55.00	$35.02	$16.38	$11.06	$10.70	$0.00	$73.16
3	65.00	$41.39	$16.38	$11.06	$10.70	$0.00	$79.53
4	70.00	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
5	80.00	$50.94	$16.38	$11.06	$10.70	$0.00	$89.08

ELEVATOR CONSTRUCTOR HELPER ELEVATOR CONSTRUCTORS LOCAL 41 ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
	1/1/2026	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
	1/1/2027	$45.17	$16.48	$11.16	$11.00	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & BEAM RAIL ERECTOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	6/1/1999	$18.84	$4.80	$4.10	$0.00	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	6/1/1999	$21.33	$4.80	$4.10	$0.00	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	6/1/1999	$22.33	$4.80	$4.10	$0.00	$0.00	$31.23
FIRE ALARM INSTALLER ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
ELECTRICIANS LOCAL 7	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							

Apprentice: FIREMAN

Effective Date: 12/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$23.42	$13.78	$12.15	$3.00	$0.00	$52.35
2	70.00	$27.32	$13.78	$12.15	$3.00	$0.00	$56.25
3	80.00	$31.22	$13.78	$12.15	$3.00	$0.00	$60.15
4	90.00	$35.13	$13.78	$12.15	$3.00	$0.00	$64.06

FLAGGER & SIGNALER (HEAVY & HIGHWAY)	6/1/2025	$28.09	$9.90	$9.25	$6.60	$0.00	$53.84
LABORERS	12/1/2025	$28.09	$9.90	$9.25	$6.60	$0.00	$53.84
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$29.21	$9.90	$9.25	$6.60	$0.00	$54.96
	12/1/2026	$29.21	$9.90	$9.25	$6.60	$0.00	$54.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FLOORCOVERER	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
FLOORCOVERERS LOCAL 2168	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
FLOORCOVERERS LOCAL 2168 ZONE III	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Apprentice: FLOORCOVERER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Construction

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

Apprentice: FLOORCOVERER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: FLOORCOVERER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

FORK LIFT OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.25	$13.78	$12.15	$3.00	$0.00	$68.18

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATORS/LIGHTING PLANTS OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 1333 GLAZIERS LOCAL 1333	6/1/2020	$39.18	$10.80	$6.70	$3.75	$0.00	$60.43

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 6/1/2020

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.59	$10.80	$1.50	$0.30	$0.00	$32.19
2	56.25	$22.04	$10.80	$1.50	$0.30	$0.00	$34.64
3	62.50	$24.49	$10.80	$1.95	$0.50	$0.00	$37.74
4	68.75	$26.94	$10.80	$1.95	$0.50	$0.00	$40.19
5	75.00	$29.39	$10.80	$2.50	$0.65	$0.00	$43.34
6	81.25	$31.83	$10.80	$2.50	$0.65	$0.00	$45.78
7	87.50	$34.28	$10.80	$6.70	$3.75	$0.00	$55.53
8	93.75	$36.73	$10.80	$6.70	$3.75	$0.00	$57.98

GRADER/TRENCHING MACHINE/DERRICK	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER) PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	9/1/2024	$45.54	$14.75	$9.52	$10.09	$0.00	$79.90
	9/1/2025	$48.27	$14.75	$9.52	$10.09	$0.00	$82.63
	9/1/2026	$51.01	$14.75	$9.52	$10.09	$0.00	$85.37

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.77	$14.75	$9.27	$5.05	$0.00	$51.84
2	60.00	$27.32	$14.75	$9.32	$6.05	$0.00	$57.44
3	70.00	$31.88	$14.75	$9.37	$7.06	$0.00	$63.06
4	80.00	$36.43	$14.75	$9.42	$8.07	$0.00	$68.67

Construction

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

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.14	$14.75	$9.27	$5.05	$0.00	$53.21
2	60.00	$28.96	$14.75	$9.32	$6.05	$0.00	$59.08
3	70.00	$33.79	$14.75	$9.37	$7.06	$0.00	$64.97
4	80.00	$38.62	$14.75	$9.42	$8.07	$0.00	$70.86

IRONWORKER/WELDER IRONWORKERS LOCAL 7 IRONWORKERS LOCAL 7 (SPRINGFIELD AREA)	3/16/2024	$40.66	$8.25	$12.70	$10.00	$0.00	$71.61

Apprentice: IRONWORKER/WELDER

Effective Date: 3/16/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$24.40	$8.25	$12.70	$10.00	$0.00	$55.35
2	70.00	$28.46	$8.25	$12.70	$10.00	$0.00	$59.41
3	75.00	$30.50	$8.25	$12.70	$10.00	$0.00	$61.45
4	80.00	$32.53	$8.25	$12.70	$10.00	$0.00	$63.48
5	85.00	$34.56	$8.25	$12.70	$10.00	$0.00	$65.51
6	90.00	$36.59	$8.25	$12.70	$10.00	$0.00	$67.54

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
LABORER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22

Apprentice: LABORER

Effective Date: 12/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$18.92	$9.90	$9.25	$5.53	$0.00	$43.60
2	70.00	$22.08	$9.90	$9.25	$5.53	$0.00	$46.76
3	80.00	$25.23	$9.90	$9.25	$5.53	$0.00	$49.91
4	90.00	$28.39	$9.90	$9.25	$5.53	$0.00	$53.07

LABORER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.23	$9.90	$9.25	$6.60	$0.00	$60.98
	12/1/2025	$36.46	$9.90	$9.25	$6.60	$0.00	$62.21
	6/1/2026	$38.50	$9.90	$9.25	$6.60	$0.00	$64.25
	12/1/2026	$39.79	$9.90	$9.25	$6.60	$0.00	$65.54

Construction

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

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$21.14	$9.90	$9.25	$6.60	$0.00	$46.89
2	70.00	$24.66	$9.90	$9.25	$6.60	$0.00	$50.41
3	80.00	$28.18	$9.90	$9.25	$6.60	$0.00	$53.93
4	90.00	$31.71	$9.90	$9.25	$6.60	$0.00	$57.46

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$21.88	$9.90	$9.25	$6.60	$0.00	$47.63
2	70.00	$25.52	$9.90	$9.25	$6.60	$0.00	$51.27
3	80.00	$29.17	$9.90	$9.25	$6.60	$0.00	$54.92
4	90.00	$32.81	$9.90	$9.25	$6.60	$0.00	$58.56

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/1/2025	$34.40	$9.65	$9.00	$5.41	$0.00	$58.46
	12/1/2025	$35.63	$9.65	$9.00	$5.41	$0.00	$59.69
	6/1/2026	$37.67	$9.65	$9.00	$5.41	$0.00	$61.73
	12/1/2026	$38.96	$9.65	$9.00	$5.41	$0.00	$63.02
	6/1/2027	$40.26	$9.65	$9.00	$5.41	$0.00	$64.32
	12/1/2027	$41.56	$9.65	$9.00	$5.41	$0.00	$65.62
	6/5/2028	$42.91	$9.65	$9.00	$5.41	$0.00	$66.97
	12/4/2028	$44.26	$9.65	$9.00	$5.41	$0.00	$68.32
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$33.54	$9.90	$9.25	$5.53	$0.00	$58.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
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 LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$43.84	$11.49	$15.10	$5.68	$0.00	$76.11
	8/1/2025	$44.75	$11.49	$15.10	$5.68	$0.00	$77.02
	2/1/2026	$45.83	$11.49	$15.10	$5.68	$0.00	$78.10
	8/1/2026	$47.59	$11.49	$15.10	$5.68	$0.00	$79.86
	2/1/2027	$48.71	$11.49	$15.10	$5.68	$0.00	$80.98

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$21.92	$11.49	$15.10	$5.68	$0.00	$54.19
2	60.00	$26.30	$11.49	$15.10	$5.68	$0.00	$58.57
3	70.00	$30.69	$11.49	$15.10	$5.68	$0.00	$62.96
4	80.00	$35.07	$11.49	$15.10	$5.68	$0.00	$67.34
5	90.00	$39.46	$11.49	$15.10	$5.68	$0.00	$71.73

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.38	$11.49	$15.10	$5.68	$0.00	$54.65
2	60.00	$26.85	$11.49	$15.10	$5.68	$0.00	$59.12
3	70.00	$31.33	$11.49	$15.10	$5.68	$0.00	$63.60
4	80.00	$35.80	$11.49	$15.10	$5.68	$0.00	$68.07
5	90.00	$40.28	$11.49	$15.10	$5.68	$0.00	$72.55

MECH. SWEEPER OPERATOR (ON CONST. SITES)	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANIC/WELDER/BOOM TRUCK OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
MILLWRIGHT (Zone 3) MILLWRIGHTS LOCAL 1121 MILLWRIGHTS LOCAL 1121 - Zone 3	1/6/2025 1/5/2026	$43.48 $45.76	$10.08 $10.08	$11.47 $11.47	$9.75 $9.75	$0.00 $0.00	$74.78 $77.06

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/6/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$23.91	$10.08	$0.00	$5.36	$0.00	$39.35
2	65.00	$28.26	$10.08	$0.00	$6.34	$0.00	$44.68
3	75.00	$32.61	$10.08	$11.47	$7.31	$0.00	$61.47
4	85.00	$36.96	$10.08	$11.47	$8.29	$0.00	$66.80

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$25.17	$10.08	$0.00	$5.36	$0.00	$40.61
2	65.00	$29.74	$10.08	$0.00	$6.34	$0.00	$46.16
3	75.00	$34.32	$10.08	$11.47	$7.31	$0.00	$63.18
4	85.00	$38.90	$10.08	$11.47	$8.29	$0.00	$68.74

MORTAR MIXER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
OILER OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$35.02	$13.78	$12.15	$3.00	$0.00	$63.95
OTHER POWER DRIVEN EQUIPMENT - CLASS VI OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$32.74	$13.78	$12.15	$3.00	$0.00	$61.67
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Construction

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

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

PAINTER (SPRAY OR SANDBLAST, NEW) * 1/1/2025 $41.23 $9.65 $11.85 $8.05 $0.00 $70.78
* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$20.62	$9.95	$0.00	$0.00	$0.00	$30.57
2	55.00	$22.68	$9.95	$0.00	$4.43	$0.00	$37.06
3	60.00	$24.74	$9.95	$0.00	$4.83	$0.00	$39.52
4	65.00	$26.80	$9.95	$0.00	$5.23	$0.00	$41.98
5	70.00	$28.86	$9.95	$11.85	$5.64	$0.00	$56.30
6	75.00	$30.92	$9.95	$11.85	$6.04	$0.00	$58.76
7	80.00	$32.98	$9.95	$11.85	$6.44	$0.00	$61.22
8	90.00	$37.11	$9.95	$11.85	$7.25	$0.00	$66.16

PAINTER (SPRAY OR SANDBLAST, REPAINT) 1/1/2025 $38.55 $9.95 $11.85 $8.05 $0.00 $68.40
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.28	$9.95	$0.00	$0.00	$0.00	$29.23
2	55.00	$21.20	$9.95	$0.00	$4.43	$0.00	$35.58
3	60.00	$23.13	$9.95	$0.00	$4.83	$0.00	$37.91
4	65.00	$25.06	$9.95	$0.00	$5.23	$0.00	$40.24
5	70.00	$26.99	$9.95	$11.85	$5.64	$0.00	$54.43
6	75.00	$28.91	$9.95	$11.85	$6.04	$0.00	$56.75

Construction

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

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$30.84	$9.95	$11.85	$6.44	$0.00	$59.08
8	90.00	$34.70	$9.95	$11.85	$7.25	$0.00	$63.75

PAINTER / TAPER (BRUSH, NEW) *	1/1/2025	$39.83	$9.95	$11.85	$8.05	$0.00	$69.68

* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.92	$9.95	$0.00	$0.00	$0.00	$29.87
2	55.00	$21.91	$9.95	$0.00	$4.43	$0.00	$36.29
3	60.00	$23.90	$9.95	$0.00	$4.83	$0.00	$38.68
4	65.00	$25.89	$9.95	$0.00	$5.23	$0.00	$41.07
5	70.00	$27.88	$9.95	$11.85	$5.64	$0.00	$55.32
6	75.00	$29.87	$9.95	$11.85	$6.04	$0.00	$57.71
7	80.00	$31.86	$9.95	$11.85	$6.44	$0.00	$60.10
8	90.00	$35.85	$9.95	$11.85	$7.25	$0.00	$64.90

PAINTER / TAPER (BRUSH, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$37.15	$9.95	$11.85	$8.05	$0.00	$67.00

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.58	$9.95	$0.00	$0.00	$0.00	$28.53
2	55.00	$20.43	$9.95	$0.00	$4.43	$0.00	$34.81
3	60.00	$22.29	$9.95	$0.00	$4.83	$0.00	$37.07
4	65.00	$24.15	$9.95	$0.00	$5.23	$0.00	$39.33
5	70.00	$26.01	$9.95	$11.85	$5.64	$0.00	$53.45
6	75.00	$27.86	$9.95	$11.85	$6.04	$0.00	$55.70
7	80.00	$29.72	$9.95	$11.85	$6.44	$0.00	$57.96
8	90.00	$33.44	$9.95	$11.85	$7.25	$0.00	$62.49

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	6/1/2025	$35.23	$9.90	$9.25	$6.60	$0.00	$60.98
LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	12/1/2025	$36.46	$9.90	$9.25	$6.60	$0.00	$62.21
	6/1/2026	$38.50	$9.90	$9.25	$6.60	$0.00	$64.25
	12/1/2026	$39.79	$9.90	$9.25	$6.60	$0.00	$65.54

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.78	$15.57	$20.17	$0.00	$0.00	$76.52
	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56

Apprentice: PILE DRIVER

Effective Date: 8/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$10.08	$0.00	$2.53	$0.00	$34.75
2	55.00	$27.05	$10.08	$0.00	$5.07	$0.00	$42.20
3	70.00	$34.43	$10.08	$11.62	$7.60	$0.00	$63.73
4	80.00	$39.35	$10.08	$11.62	$10.14	$0.00	$71.19

PIPELAYER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBER & PIPEFITTER PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$9.55	$10.10	$0.00	$0.00	$41.79
2	50.00	$24.61	$9.55	$10.10	$0.00	$0.00	$44.26

Construction

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

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	55.00	$27.07	$9.55	$10.10	$0.00	$0.00	$46.72
4	60.00	$29.53	$9.55	$10.10	$0.00	$0.00	$49.18
5	65.00	$31.99	$9.55	$10.10	$0.00	$0.00	$51.64
6	70.00	$34.45	$9.55	$10.10	$0.00	$0.00	$54.10
7	75.00	$36.91	$9.55	$10.10	$0.00	$0.00	$56.56
8	80.00	$39.37	$9.55	$10.10	$0.00	$0.00	$59.02
9	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02
10	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PNEUMATIC CONTROLS (TEMP.) PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
POWDERMAN & BLASTER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$32.54	$9.90	$9.25	$5.53	$0.00	$57.22
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$36.23	$9.90	$9.25	$6.19	$0.00	$61.57
	12/1/2025	$37.46	$9.90	$9.25	$6.19	$0.00	$62.80
	6/1/2026	$39.50	$9.90	$9.25	$6.19	$0.00	$64.84
	12/1/2026	$40.79	$9.90	$9.25	$6.19	$0.00	$66.13
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER TEAMSTERS 404 - Construction Service (Northampton) TEAMSTERS 404 - Construction Service (Northampton)	5/1/2024	$26.14	$11.82	$7.25	$0.00	$0.00	$45.21
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 4 (BUILDING & SITE)							
For apprentice rates see "Apprentice- LABORER"							
ROLLER OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Coal tar pitch) ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$41.88	$10.35	$8.70	$9.30	$0.00	$70.23
	7/16/2025	$43.38	$10.35	$8.70	$9.30	$0.00	$71.73
	10/2/2025	$44.38	$10.35	$8.70	$9.30	$0.00	$72.73
	7/16/2026	$46.38	$10.35	$8.70	$9.30	$0.00	$74.73

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 10/2/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.13	$10.35	$0.00	$0.00	$0.00	$35.48
2	65.00	$27.22	$10.35	$8.70	$9.30	$0.00	$55.57
3	70.00	$29.32	$10.35	$8.70	$9.30	$0.00	$57.67
4	75.00	$31.41	$10.35	$8.70	$9.30	$0.00	$59.76
5	80.00	$33.50	$10.35	$8.70	$9.30	$0.00	$61.85
6	85.00	$35.60	$10.35	$8.70	$9.30	$0.00	$63.95
7	90.00	$37.69	$10.35	$8.70	$9.30	$0.00	$66.04
8	95.00	$39.79	$10.35	$8.70	$9.30	$0.00	$68.14

ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
SCRAPER OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-PROPELLED POWER BROOM OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30

Apprentice: SHEETMETAL WORKER

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.00	$5.49	$4.86	$0.00	$0.85	$30.20
2	50.00	$21.12	$6.10	$5.40	$0.00	$0.94	$33.56
3	55.00	$23.23	$6.71	$9.71	$0.00	$1.15	$40.80
4	60.00	$25.34	$7.32	$9.71	$0.00	$1.23	$43.60
5	65.00	$27.45	$7.93	$9.71	$0.00	$1.31	$46.40
6	70.00	$29.56	$8.54	$9.71	$0.00	$1.39	$49.20
7	75.00	$31.67	$9.15	$9.71	$0.00	$1.47	$52.00
8	80.00	$33.78	$9.76	$9.71	$7.95	$1.78	$62.98
9	85.00	$35.90	$10.37	$9.71	$7.95	$1.86	$65.79
10	90.00	$38.01	$10.98	$9.71	$7.95	$1.94	$68.59

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.53	$15.57	$20.17	$0.00	$0.00	$77.27
	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 669 SPRINKLER FITTERS LOCAL 669	4/1/2023	$47.43	$11.45	$7.20	$9.41	$0.00	$75.49

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$21.34	$8.22	$0.00	$0.00	$0.00	$29.56
2	50.00	$23.72	$8.22	$0.00	$0.00	$0.00	$31.94
3	55.00	$26.09	$11.45	$7.20	$0.00	$0.00	$44.74
4	60.00	$28.46	$11.45	$7.20	$1.15	$0.00	$48.26

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
ELECTRICIANS LOCAL 7	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	65.00	$30.83	$11.45	$7.20	$1.15	$0.00	$50.63
6	70.00	$33.20	$11.45	$7.20	$1.40	$0.00	$53.25
7	75.00	$35.57	$11.45	$7.20	$1.40	$0.00	$55.62
8	80.00	$37.94	$11.45	$7.20	$1.40	$0.00	$57.99
9	85.00	$40.32	$11.45	$7.20	$1.40	$0.00	$60.37
10	90.00	$42.69	$11.45	$7.20	$1.40	$0.00	$62.74

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

TERRAZZO FINISHERS	2/1/2025	$64.74	$11.49	$15.57	$8.02	$0.00	$99.82
BRICKLAYERS LOCAL 3	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/10/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TERRAZZO MECHANIC BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$65.82	$11.49	$15.57	$7.99	$0.00	$100.87
	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.37	$11.49	$15.57	$8.02	$0.00	$67.45
2	60.00	$38.84	$11.49	$15.57	$8.02	$0.00	$73.92
3	70.00	$45.32	$11.49	$15.57	$8.02	$0.00	$80.40
4	80.00	$51.79	$11.49	$15.57	$8.02	$0.00	$86.87
5	90.00	$58.27	$11.49	$15.57	$8.02	$0.00	$93.35

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.45	$11.49	$15.57	$8.02	$0.00	$68.53
2	60.00	$40.13	$11.49	$15.57	$8.02	$0.00	$75.21
3	70.00	$46.82	$11.49	$15.57	$8.02	$0.00	$81.90
4	80.00	$53.51	$11.49	$15.57	$8.02	$0.00	$88.59
5	90.00	$60.20	$11.49	$15.57	$8.02	$0.00	$95.28

Apprentice: TERRAZZO MECHANIC

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.91	$11.49	$15.57	$7.99	$0.00	$67.96
2	60.00	$39.49	$11.49	$15.57	$7.99	$0.00	$74.54
3	70.00	$46.07	$11.49	$15.57	$7.99	$0.00	$81.12
4	80.00	$52.66	$11.49	$15.57	$7.99	$0.00	$87.71
5	90.00	$59.24	$11.49	$15.57	$7.99	$0.00	$94.29

Apprentice: TERRAZZO MECHANIC

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2	60.00	$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3	70.00	$47.58	$11.49	$15.57	$7.99	$0.00	$82.63

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: TERRAZZO MECHANIC							
Effective Date: 8/1/2025							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
4 / 80.00		$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5 / 90.00		$61.17	$11.49	$15.57	$7.99	$0.00	$96.22
TEST BORING DRILLER	6/1/2025	$51.70	$9.90	$9.25	$9.80	$0.00	$80.65
LABORERS	12/1/2025	$53.20	$9.90	$9.25	$9.80	$0.00	$82.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$54.75	$9.90	$9.25	$9.80	$0.00	$83.70
	12/1/2026	$56.25	$9.90	$9.25	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	6/1/2025	$47.82	$9.90	$9.25	$9.80	$0.00	$76.77
LABORERS	12/1/2025	$49.32	$9.90	$9.25	$9.80	$0.00	$78.27
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.87	$9.90	$9.25	$9.80	$0.00	$79.82
	12/1/2026	$52.37	$9.90	$9.25	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
LABORERS	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	6/1/2025	$41.82	$15.57	$20.17	$0.00	$0.00	$77.56
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR	6/1/2025	$59.93	$9.90	$9.25	$10.25	$0.00	$89.33
LABORERS	12/1/2025	$61.43	$9.90	$9.25	$10.25	$0.00	$90.83
LABORERS (COMPRESSED AIR)	6/1/2026	$62.98	$9.90	$9.25	$10.25	$0.00	$92.38
	12/1/2026	$64.48	$9.90	$9.25	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	6/1/2025	$61.93	$9.90	$9.25	$10.25	$0.00	$91.33
LABORERS	12/1/2025	$63.43	$9.90	$9.25	$10.25	$0.00	$92.83
LABORERS (COMPRESSED AIR)	6/1/2026	$64.98	$9.90	$9.25	$10.25	$0.00	$94.38
	12/1/2026	$66.48	$9.90	$9.25	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR	6/1/2025	$52.00	$9.90	$9.25	$10.25	$0.00	$81.40
LABORERS	12/1/2025	$53.50	$9.90	$9.25	$10.25	$0.00	$82.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$55.05	$9.90	$9.25	$10.25	$0.00	$84.45
	12/1/2026	$56.55	$9.90	$9.25	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	6/1/2025	$54.00	$9.90	$9.25	$10.25	$0.00	$83.40
LABORERS	12/1/2025	$55.50	$9.90	$9.25	$10.25	$0.00	$84.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$57.05	$9.90	$9.25	$10.25	$0.00	$86.45
	12/1/2026	$58.55	$9.90	$9.25	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
LABORERS	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WATER METER INSTALLER	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
PLUMBERS & PIPEFITTERS LOCAL 104							
PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION							
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

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

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

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	**City/Town:**	LENOX
Contract Number:	129534		
Description of Work:	Replacement of ten culverts, clean six culverts, replacement and rehabilitation of bridges and associated track work mileposts 74.14, 76.23,77.28,80.72,85.32,85.52 surface and align up to 5700 track feet		
Job Location:	Lee, Lenox and Pittsfield, MA		

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 form 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.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.95	$15.57	$20.17	$0.00	$0.00	$76.69
	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.02	$15.57	$20.17	$0.00	$0.00	$76.76
	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.14	$15.57	$20.17	$0.00	$0.00	$76.88
	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.29	$9.90	$9.25	$5.53	$0.00	$56.97
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	6/1/2025	$39.42	$14.50	$4.30	$6.25	$0.00	$64.47
	12/1/2025	$40.32	$14.50	$4.30	$6.25	$0.00	$65.37
ASPHALT RAKER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
BACKHOE/FRONT-END LOADER OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
BARCO-TYPE JUMPING TAMPER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
BATCH/CEMENT PLANT - ON SITE OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
BLOCK PAVER, RAMMER / CURB SETTER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.29	$9.90	$9.25	$5.53	$0.00	$56.97
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
BOILER MAKER BOILERMAKERS LOCAL 29 BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3	2/1/2025	$54.21	$11.49	$15.57	$5.89	$0.00	$87.16
	8/1/2025	$56.36	$11.49	$15.57	$5.89	$0.00	$89.31
	2/1/2026	$57.71	$11.49	$15.57	$5.89	$0.00	$90.66

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)	8/1/2026	$59.91	$11.49	$15.57	$5.89	$0.00	$92.86
	2/1/2027	$61.31	$11.49	$15.57	$5.89	$0.00	$94.26

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.11	$11.49	$15.57	$5.89	$0.00	$60.06
2	60.00	$32.53	$11.49	$15.57	$5.89	$0.00	$65.48
3	70.00	$37.95	$11.49	$15.57	$5.89	$0.00	$70.90
4	80.00	$43.37	$11.49	$15.57	$5.89	$0.00	$76.32
5	90.00	$48.79	$11.49	$15.57	$5.89	$0.00	$81.74

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.18	$11.49	$15.57	$5.89	$0.00	$61.13
2	60.00	$33.82	$11.49	$15.57	$5.89	$0.00	$66.77
3	70.00	$39.45	$11.49	$15.57	$5.89	$0.00	$72.40
4	80.00	$45.09	$11.49	$15.57	$5.89	$0.00	$78.04
5	90.00	$50.72	$11.49	$15.57	$5.89	$0.00	$83.67

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$48.85	$9.90	$9.25	$9.80	$0.00	$77.80
	12/1/2025	$50.35	$9.90	$9.25	$9.80	$0.00	$79.30
	6/1/2026	$51.90	$9.90	$9.25	$9.80	$0.00	$80.85
	12/1/2026	$53.40	$9.90	$9.25	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$48.03	$9.90	$9.25	$9.80	$0.00	$76.98
	12/1/2025	$49.53	$9.90	$9.25	$9.80	$0.00	$78.48
	6/1/2026	$51.08	$9.90	$9.25	$9.80	$0.00	$80.03
	12/1/2026	$52.58	$9.90	$9.25	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"							
CARPENTER CARPENTERS CARPENTERS LOCAL 336 - BERKSHIRE COUNTY	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Apprentice: CARPENTER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

CARPENTER WOOD FRAME CARPENTERS CARPENTERS-ZONE 3 (Wood Frame) All Aspects of New Wood Frame Work	10/1/2024	$26.65	$7.02	$3.80	$1.00	$0.00	$38.47
	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01

Construction

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

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
3	65.00	$17.32	$7.02	$0.00	$1.00	$0.00	$25.34
4	70.00	$18.66	$7.02	$0.00	$1.00	$0.00	$26.68
5	75.00	$19.99	$7.02	$3.80	$1.00	$0.00	$31.81
6	80.00	$21.32	$7.02	$3.80	$1.00	$0.00	$33.14
7	85.00	$22.65	$7.02	$3.80	$1.00	$0.00	$34.47
8	90.00	$23.99	$7.02	$3.80	$1.00	$0.00	$35.81

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3	65.00	$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4	70.00	$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5	75.00	$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6	80.00	$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7	85.00	$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8	90.00	$24.98	$7.02	$3.80	$1.00	$0.00	$36.80

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)	7/1/2024	$44.56	$13.20	$16.30	$2.93	$1.69	$78.68

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 7/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.28	$13.20	$16.30	$0.00	$0.00	$51.78
2	60.00	$26.74	$13.20	$16.30	$2.93	$1.69	$60.86
3	65.00	$28.96	$13.20	$16.30	$2.93	$1.69	$63.08
4	70.00	$31.19	$13.20	$16.30	$2.93	$1.69	$65.31
5	75.00	$33.42	$13.20	$16.30	$2.93	$1.69	$67.54
6	80.00	$35.65	$13.20	$16.30	$2.93	$1.69	$69.77
7	90.00	$40.10	$13.20	$16.30	$2.93	$1.69	$74.22

CHAIN SAW OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

For apprentice rates see "Apprentice- LABORER"

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CRANE OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$43.06	$13.78	$12.15	$3.00	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

DEMO: ADZEMAN LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: CONCRETE CUTTER/SAWYER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$78.11	$10.08	$11.62	$12.67	$0.00	$112.48
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
ELECTRICIAN (Including Core Drilling) ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 41 ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$62.83	$16.28	$10.96	$10.40	$0.00	$100.47
	1/1/2026	$63.68	$16.38	$11.06	$10.70	$0.00	$101.82
	1/1/2027	$64.53	$16.48	$11.16	$11.00	$0.00	$103.17

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.42	$16.28	$0.00	$0.00	$0.00	$47.70

Construction

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

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	55.00	$34.56	$16.28	$10.96	$10.40	$0.00	$72.20
3	65.00	$40.84	$16.28	$10.96	$10.40	$0.00	$78.48
4	70.00	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
5	80.00	$50.26	$16.28	$10.96	$10.40	$0.00	$87.90

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.84	$16.38	$0.00	$0.00	$0.00	$48.22
2	55.00	$35.02	$16.38	$11.06	$10.70	$0.00	$73.16
3	65.00	$41.39	$16.38	$11.06	$10.70	$0.00	$79.53
4	70.00	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
5	80.00	$50.94	$16.38	$11.06	$10.70	$0.00	$89.08

ELEVATOR CONSTRUCTOR HELPER	1/1/2025	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2026	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2027	$45.17	$16.48	$11.16	$11.00	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & BEAM RAIL ERECTOR	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
LABORERS							
LABORERS - ZONE 4 (BUILDING & SITE)							
For apprentice rates see "Apprentice- LABORER"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
LABORERS	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY	6/1/1999	$18.84	$4.80	$4.10	$0.00	$0.00	$27.74
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY	6/1/1999	$21.33	$4.80	$4.10	$0.00	$0.00	$30.23
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY	6/1/1999	$22.33	$4.80	$4.10	$0.00	$0.00	$31.23
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
FIRE ALARM INSTALLER	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
ELECTRICIANS LOCAL 7	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
ELECTRICIANS LOCAL 7	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							

Apprentice: FIREMAN

Effective Date: 12/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$23.42	$13.78	$12.15	$3.00	$0.00	$52.35
2	70.00	$27.32	$13.78	$12.15	$3.00	$0.00	$56.25
3	80.00	$31.22	$13.78	$12.15	$3.00	$0.00	$60.15
4	90.00	$35.13	$13.78	$12.15	$3.00	$0.00	$64.06

FLAGGER & SIGNALER (HEAVY & HIGHWAY)	6/1/2025	$28.09	$9.90	$9.25	$6.60	$0.00	$53.84
LABORERS	12/1/2025	$28.09	$9.90	$9.25	$6.60	$0.00	$53.84
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$29.21	$9.90	$9.25	$6.60	$0.00	$54.96
	12/1/2026	$29.21	$9.90	$9.25	$6.60	$0.00	$54.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FLOORCOVERER	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
FLOORCOVERERS LOCAL 2168	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
FLOORCOVERERS LOCAL 2168 ZONE III	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Apprentice: FLOORCOVERER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Construction

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

Apprentice: FLOORCOVERER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: FLOORCOVERER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

FORK LIFT OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.25	$13.78	$12.15	$3.00	$0.00	$68.18
GENERATORS/LIGHTING PLANTS OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 1333 GLAZIERS LOCAL 1333	6/1/2020	$39.18	$10.80	$6.70	$3.75	$0.00	$60.43

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 6/1/2020

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.59	$10.80	$1.50	$0.30	$0.00	$32.19
2	56.25	$22.04	$10.80	$1.50	$0.30	$0.00	$34.64
3	62.50	$24.49	$10.80	$1.95	$0.50	$0.00	$37.74
4	68.75	$26.94	$10.80	$1.95	$0.50	$0.00	$40.19
5	75.00	$29.39	$10.80	$2.50	$0.65	$0.00	$43.34
6	81.25	$31.83	$10.80	$2.50	$0.65	$0.00	$45.78
7	87.50	$34.28	$10.80	$6.70	$3.75	$0.00	$55.53
8	93.75	$36.73	$10.80	$6.70	$3.75	$0.00	$57.98

GRADER/TRENCHING MACHINE/DERRICK	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER) PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	9/1/2024	$45.54	$14.75	$9.52	$10.09	$0.00	$79.90
	9/1/2025	$48.27	$14.75	$9.52	$10.09	$0.00	$82.63
	9/1/2026	$51.01	$14.75	$9.52	$10.09	$0.00	$85.37

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.77	$14.75	$9.27	$5.05	$0.00	$51.84
2	60.00	$27.32	$14.75	$9.32	$6.05	$0.00	$57.44
3	70.00	$31.88	$14.75	$9.37	$7.06	$0.00	$63.06
4	80.00	$36.43	$14.75	$9.42	$8.07	$0.00	$68.67

Construction

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

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.14	$14.75	$9.27	$5.05	$0.00	$53.21
2	60.00	$28.96	$14.75	$9.32	$6.05	$0.00	$59.08
3	70.00	$33.79	$14.75	$9.37	$7.06	$0.00	$64.97
4	80.00	$38.62	$14.75	$9.42	$8.07	$0.00	$70.86

IRONWORKER/WELDER IRONWORKERS LOCAL 12 IRONWORKERS LOCAL 12	7/1/2019	$31.55	$6.75	$15.91	$3.75	$0.00	$57.96

Apprentice: IRONWORKER/WELDER

Effective Date: 7/1/2019

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$18.93	$6.75	$0.00	$3.50	$0.00	$29.18
2	70.00	$22.09	$6.75	$11.14	$3.50	$0.00	$43.48
3	80.00	$25.24	$6.75	$12.72	$3.50	$0.00	$48.21
4	90.00	$28.40	$6.75	$14.32	$3.50	$0.00	$52.97

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22

Apprentice: LABORER

Effective Date: 12/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$18.92	$9.90	$9.25	$5.53	$0.00	$43.60
2	70.00	$22.08	$9.90	$9.25	$5.53	$0.00	$46.76
3	80.00	$25.23	$9.90	$9.25	$5.53	$0.00	$49.91
4	90.00	$28.39	$9.90	$9.25	$5.53	$0.00	$53.07

LABORER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.23	$9.90	$9.25	$6.60	$0.00	$60.98
	12/1/2025	$36.46	$9.90	$9.25	$6.60	$0.00	$62.21
	6/1/2026	$38.50	$9.90	$9.25	$6.60	$0.00	$64.25
	12/1/2026	$39.79	$9.90	$9.25	$6.60	$0.00	$65.54

Construction

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

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$21.14	$9.90	$9.25	$6.60	$0.00	$46.89
2	70.00	$24.66	$9.90	$9.25	$6.60	$0.00	$50.41
3	80.00	$28.18	$9.90	$9.25	$6.60	$0.00	$53.93
4	90.00	$31.71	$9.90	$9.25	$6.60	$0.00	$57.46

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$21.88	$9.90	$9.25	$6.60	$0.00	$47.63
2	70.00	$25.52	$9.90	$9.25	$6.60	$0.00	$51.27
3	80.00	$29.17	$9.90	$9.25	$6.60	$0.00	$54.92
4	90.00	$32.81	$9.90	$9.25	$6.60	$0.00	$58.56

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/1/2025	$34.40	$9.65	$9.00	$5.41	$0.00	$58.46
	12/1/2025	$35.63	$9.65	$9.00	$5.41	$0.00	$59.69
	6/1/2026	$37.67	$9.65	$9.00	$5.41	$0.00	$61.73
	12/1/2026	$38.96	$9.65	$9.00	$5.41	$0.00	$63.02
	6/1/2027	$40.26	$9.65	$9.00	$5.41	$0.00	$64.32
	12/1/2027	$41.56	$9.65	$9.00	$5.41	$0.00	$65.62
	6/5/2028	$42.91	$9.65	$9.00	$5.41	$0.00	$66.97
	12/4/2028	$44.26	$9.65	$9.00	$5.41	$0.00	$68.32
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$33.54	$9.90	$9.25	$5.53	$0.00	$58.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
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 LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$43.84	$11.49	$15.10	$5.68	$0.00	$76.11
	8/1/2025	$44.75	$11.49	$15.10	$5.68	$0.00	$77.02
	2/1/2026	$45.83	$11.49	$15.10	$5.68	$0.00	$78.10
	8/1/2026	$47.59	$11.49	$15.10	$5.68	$0.00	$79.86
	2/1/2027	$48.71	$11.49	$15.10	$5.68	$0.00	$80.98

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$21.92	$11.49	$15.10	$5.68	$0.00	$54.19
2	60.00	$26.30	$11.49	$15.10	$5.68	$0.00	$58.57
3	70.00	$30.69	$11.49	$15.10	$5.68	$0.00	$62.96
4	80.00	$35.07	$11.49	$15.10	$5.68	$0.00	$67.34
5	90.00	$39.46	$11.49	$15.10	$5.68	$0.00	$71.73

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.38	$11.49	$15.10	$5.68	$0.00	$54.65
2	60.00	$26.85	$11.49	$15.10	$5.68	$0.00	$59.12
3	70.00	$31.33	$11.49	$15.10	$5.68	$0.00	$63.60
4	80.00	$35.80	$11.49	$15.10	$5.68	$0.00	$68.07
5	90.00	$40.28	$11.49	$15.10	$5.68	$0.00	$72.55

MECH. SWEEPER OPERATOR (ON CONST. SITES)	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANIC/WELDER/BOOM TRUCK OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
MILLWRIGHT (Zone 3) MILLWRIGHTS LOCAL 1121 MILLWRIGHTS LOCAL 1121 - Zone 3	1/6/2025 1/5/2026	$43.48 $45.76	$10.08 $10.08	$11.47 $11.47	$9.75 $9.75	$0.00 $0.00	$74.78 $77.06

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/6/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$23.91	$10.08	$0.00	$5.36	$0.00	$39.35
2	65.00	$28.26	$10.08	$0.00	$6.34	$0.00	$44.68
3	75.00	$32.61	$10.08	$11.47	$7.31	$0.00	$61.47
4	85.00	$36.96	$10.08	$11.47	$8.29	$0.00	$66.80

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$25.17	$10.08	$0.00	$5.36	$0.00	$40.61
2	65.00	$29.74	$10.08	$0.00	$6.34	$0.00	$46.16
3	75.00	$34.32	$10.08	$11.47	$7.31	$0.00	$63.18
4	85.00	$38.90	$10.08	$11.47	$8.29	$0.00	$68.74

MORTAR MIXER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
OILER OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$35.02	$13.78	$12.15	$3.00	$0.00	$63.95
OTHER POWER DRIVEN EQUIPMENT - CLASS VI OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$32.74	$13.78	$12.15	$3.00	$0.00	$61.67
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Construction

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

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

PAINTER (SPRAY OR SANDBLAST, NEW) * 1/1/2025 $41.23 $9.65 $11.85 $8.05 $0.00 $70.78
* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$20.62	$9.95	$0.00	$0.00	$0.00	$30.57
2	55.00	$22.68	$9.95	$0.00	$4.43	$0.00	$37.06
3	60.00	$24.74	$9.95	$0.00	$4.83	$0.00	$39.52
4	65.00	$26.80	$9.95	$0.00	$5.23	$0.00	$41.98
5	70.00	$28.86	$9.95	$11.85	$5.64	$0.00	$56.30
6	75.00	$30.92	$9.95	$11.85	$6.04	$0.00	$58.76
7	80.00	$32.98	$9.95	$11.85	$6.44	$0.00	$61.22
8	90.00	$37.11	$9.95	$11.85	$7.25	$0.00	$66.16

PAINTER (SPRAY OR SANDBLAST, REPAINT) 1/1/2025 $38.55 $9.95 $11.85 $8.05 $0.00 $68.40
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.28	$9.95	$0.00	$0.00	$0.00	$29.23
2	55.00	$21.20	$9.95	$0.00	$4.43	$0.00	$35.58
3	60.00	$23.13	$9.95	$0.00	$4.83	$0.00	$37.91
4	65.00	$25.06	$9.95	$0.00	$5.23	$0.00	$40.24
5	70.00	$26.99	$9.95	$11.85	$5.64	$0.00	$54.43
6	75.00	$28.91	$9.95	$11.85	$6.04	$0.00	$56.75

Construction

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

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$30.84	$9.95	$11.85	$6.44	$0.00	$59.08
8	90.00	$34.70	$9.95	$11.85	$7.25	$0.00	$63.75

PAINTER / TAPER (BRUSH, NEW) *	1/1/2025	$39.83	$9.95	$11.85	$8.05	$0.00	$69.68

* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.92	$9.95	$0.00	$0.00	$0.00	$29.87
2	55.00	$21.91	$9.95	$0.00	$4.43	$0.00	$36.29
3	60.00	$23.90	$9.95	$0.00	$4.83	$0.00	$38.68
4	65.00	$25.89	$9.95	$0.00	$5.23	$0.00	$41.07
5	70.00	$27.88	$9.95	$11.85	$5.64	$0.00	$55.32
6	75.00	$29.87	$9.95	$11.85	$6.04	$0.00	$57.71
7	80.00	$31.86	$9.95	$11.85	$6.44	$0.00	$60.10
8	90.00	$35.85	$9.95	$11.85	$7.25	$0.00	$64.90

PAINTER / TAPER (BRUSH, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$37.15	$9.95	$11.85	$8.05	$0.00	$67.00

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.58	$9.95	$0.00	$0.00	$0.00	$28.53
2	55.00	$20.43	$9.95	$0.00	$4.43	$0.00	$34.81
3	60.00	$22.29	$9.95	$0.00	$4.83	$0.00	$37.07
4	65.00	$24.15	$9.95	$0.00	$5.23	$0.00	$39.33
5	70.00	$26.01	$9.95	$11.85	$5.64	$0.00	$53.45
6	75.00	$27.86	$9.95	$11.85	$6.04	$0.00	$55.70
7	80.00	$29.72	$9.95	$11.85	$6.44	$0.00	$57.96
8	90.00	$33.44	$9.95	$11.85	$7.25	$0.00	$62.49

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	6/1/2025	$35.23	$9.90	$9.25	$6.60	$0.00	$60.98
LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	12/1/2025	$36.46	$9.90	$9.25	$6.60	$0.00	$62.21
	6/1/2026	$38.50	$9.90	$9.25	$6.60	$0.00	$64.25
	12/1/2026	$39.79	$9.90	$9.25	$6.60	$0.00	$65.54

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.78	$15.57	$20.17	$0.00	$0.00	$76.52
	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56

Apprentice: PILE DRIVER

Effective Date: 8/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$10.08	$0.00	$2.53	$0.00	$34.75
2	55.00	$27.05	$10.08	$0.00	$5.07	$0.00	$42.20
3	70.00	$34.43	$10.08	$11.62	$7.60	$0.00	$63.73
4	80.00	$39.35	$10.08	$11.62	$10.14	$0.00	$71.19

PIPELAYER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBER & PIPEFITTER PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$9.55	$10.10	$0.00	$0.00	$41.79
2	50.00	$24.61	$9.55	$10.10	$0.00	$0.00	$44.26

Construction

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

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	55.00	$27.07	$9.55	$10.10	$0.00	$0.00	$46.72
4	60.00	$29.53	$9.55	$10.10	$0.00	$0.00	$49.18
5	65.00	$31.99	$9.55	$10.10	$0.00	$0.00	$51.64
6	70.00	$34.45	$9.55	$10.10	$0.00	$0.00	$54.10
7	75.00	$36.91	$9.55	$10.10	$0.00	$0.00	$56.56
8	80.00	$39.37	$9.55	$10.10	$0.00	$0.00	$59.02
9	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02
10	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PNEUMATIC CONTROLS (TEMP.) PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
POWDERMAN & BLASTER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.54	$9.90	$9.25	$5.53	$0.00	$57.22
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	6/1/2025	$36.23	$9.90	$9.25	$6.19	$0.00	$61.57
	12/1/2025	$37.46	$9.90	$9.25	$6.19	$0.00	$62.80
	6/1/2026	$39.50	$9.90	$9.25	$6.19	$0.00	$64.84
	12/1/2026	$40.79	$9.90	$9.25	$6.19	$0.00	$66.13
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
READY-MIX CONCRETE DRIVER TEAMSTERS 404 - Construction Service (Northampton) TEAMSTERS 404 - Construction Service (Northampton)	5/1/2024	$26.14	$11.82	$7.25	$0.00	$0.00	$45.21
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 4 (BUILDING & SITE)							
For apprentice rates see "Apprentice- LABORER"							
ROLLER OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Coal tar pitch) ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$41.88	$10.35	$8.70	$9.30	$0.00	$70.23
	7/16/2025	$43.38	$10.35	$8.70	$9.30	$0.00	$71.73
	10/2/2025	$44.38	$10.35	$8.70	$9.30	$0.00	$72.73
	7/16/2026	$46.38	$10.35	$8.70	$9.30	$0.00	$74.73

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 10/2/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.13	$10.35	$0.00	$0.00	$0.00	$35.48
2	65.00	$27.22	$10.35	$8.70	$9.30	$0.00	$55.57
3	70.00	$29.32	$10.35	$8.70	$9.30	$0.00	$57.67
4	75.00	$31.41	$10.35	$8.70	$9.30	$0.00	$59.76
5	80.00	$33.50	$10.35	$8.70	$9.30	$0.00	$61.85
6	85.00	$35.60	$10.35	$8.70	$9.30	$0.00	$63.95
7	90.00	$37.69	$10.35	$8.70	$9.30	$0.00	$66.04
8	95.00	$39.79	$10.35	$8.70	$9.30	$0.00	$68.14

ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
SCRAPER OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-PROPELLED POWER BROOM OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30

Apprentice: SHEETMETAL WORKER

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.00	$5.49	$4.86	$0.00	$0.85	$30.20
2	50.00	$21.12	$6.10	$5.40	$0.00	$0.94	$33.56
3	55.00	$23.23	$6.71	$9.71	$0.00	$1.15	$40.80
4	60.00	$25.34	$7.32	$9.71	$0.00	$1.23	$43.60
5	65.00	$27.45	$7.93	$9.71	$0.00	$1.31	$46.40
6	70.00	$29.56	$8.54	$9.71	$0.00	$1.39	$49.20
7	75.00	$31.67	$9.15	$9.71	$0.00	$1.47	$52.00
8	80.00	$33.78	$9.76	$9.71	$7.95	$1.78	$62.98
9	85.00	$35.90	$10.37	$9.71	$7.95	$1.86	$65.79
10	90.00	$38.01	$10.98	$9.71	$7.95	$1.94	$68.59

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.53	$15.57	$20.17	$0.00	$0.00	$77.27
	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 669 SPRINKLER FITTERS LOCAL 669	4/1/2023	$47.43	$11.45	$7.20	$9.41	$0.00	$75.49

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$21.34	$8.22	$0.00	$0.00	$0.00	$29.56
2	50.00	$23.72	$8.22	$0.00	$0.00	$0.00	$31.94
3	55.00	$26.09	$11.45	$7.20	$0.00	$0.00	$44.74
4	60.00	$28.46	$11.45	$7.20	$1.15	$0.00	$48.26

Construction

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

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	65.00	$30.83	$11.45	$7.20	$1.15	$0.00	$50.63
6	70.00	$33.20	$11.45	$7.20	$1.40	$0.00	$53.25
7	75.00	$35.57	$11.45	$7.20	$1.40	$0.00	$55.62
8	80.00	$37.94	$11.45	$7.20	$1.40	$0.00	$57.99
9	85.00	$40.32	$11.45	$7.20	$1.40	$0.00	$60.37
10	90.00	$42.69	$11.45	$7.20	$1.40	$0.00	$62.74

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$64.74	$11.49	$15.57	$8.02	$0.00	$99.82
	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
	2/10/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TERRAZZO MECHANIC BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$65.82	$11.49	$15.57	$7.99	$0.00	$100.87
	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.37	$11.49	$15.57	$8.02	$0.00	$67.45
2	60.00	$38.84	$11.49	$15.57	$8.02	$0.00	$73.92
3	70.00	$45.32	$11.49	$15.57	$8.02	$0.00	$80.40
4	80.00	$51.79	$11.49	$15.57	$8.02	$0.00	$86.87
5	90.00	$58.27	$11.49	$15.57	$8.02	$0.00	$93.35

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.45	$11.49	$15.57	$8.02	$0.00	$68.53
2	60.00	$40.13	$11.49	$15.57	$8.02	$0.00	$75.21
3	70.00	$46.82	$11.49	$15.57	$8.02	$0.00	$81.90
4	80.00	$53.51	$11.49	$15.57	$8.02	$0.00	$88.59
5	90.00	$60.20	$11.49	$15.57	$8.02	$0.00	$95.28

Apprentice: TERRAZZO MECHANIC

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.91	$11.49	$15.57	$7.99	$0.00	$67.96
2	60.00	$39.49	$11.49	$15.57	$7.99	$0.00	$74.54
3	70.00	$46.07	$11.49	$15.57	$7.99	$0.00	$81.12
4	80.00	$52.66	$11.49	$15.57	$7.99	$0.00	$87.71
5	90.00	$59.24	$11.49	$15.57	$7.99	$0.00	$94.29

Apprentice: TERRAZZO MECHANIC

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2	60.00	$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3	70.00	$47.58	$11.49	$15.57	$7.99	$0.00	$82.63

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: TERRAZZO MECHANIC							
Effective Date: 8/1/2025							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
4 / 80.00		$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5 / 90.00		$61.17	$11.49	$15.57	$7.99	$0.00	$96.22
TEST BORING DRILLER	6/1/2025	$51.70	$9.90	$9.25	$9.80	$0.00	$80.65
LABORERS	12/1/2025	$53.20	$9.90	$9.25	$9.80	$0.00	$82.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$54.75	$9.90	$9.25	$9.80	$0.00	$83.70
	12/1/2026	$56.25	$9.90	$9.25	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	6/1/2025	$47.82	$9.90	$9.25	$9.80	$0.00	$76.77
LABORERS	12/1/2025	$49.32	$9.90	$9.25	$9.80	$0.00	$78.27
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.87	$9.90	$9.25	$9.80	$0.00	$79.82
	12/1/2026	$52.37	$9.90	$9.25	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
LABORERS	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	6/1/2025	$41.82	$15.57	$20.17	$0.00	$0.00	$77.56
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR	6/1/2025	$59.93	$9.90	$9.25	$10.25	$0.00	$89.33
LABORERS	12/1/2025	$61.43	$9.90	$9.25	$10.25	$0.00	$90.83
LABORERS (COMPRESSED AIR)	6/1/2026	$62.98	$9.90	$9.25	$10.25	$0.00	$92.38
	12/1/2026	$64.48	$9.90	$9.25	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	6/1/2025	$61.93	$9.90	$9.25	$10.25	$0.00	$91.33
LABORERS	12/1/2025	$63.43	$9.90	$9.25	$10.25	$0.00	$92.83
LABORERS (COMPRESSED AIR)	6/1/2026	$64.98	$9.90	$9.25	$10.25	$0.00	$94.38
	12/1/2026	$66.48	$9.90	$9.25	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR	6/1/2025	$52.00	$9.90	$9.25	$10.25	$0.00	$81.40
LABORERS	12/1/2025	$53.50	$9.90	$9.25	$10.25	$0.00	$82.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$55.05	$9.90	$9.25	$10.25	$0.00	$84.45
	12/1/2026	$56.55	$9.90	$9.25	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	6/1/2025	$54.00	$9.90	$9.25	$10.25	$0.00	$83.40
LABORERS	12/1/2025	$55.50	$9.90	$9.25	$10.25	$0.00	$84.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$57.05	$9.90	$9.25	$10.25	$0.00	$86.45
	12/1/2026	$58.55	$9.90	$9.25	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
LABORERS	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WATER METER INSTALLER	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
PLUMBERS & PIPEFITTERS LOCAL 104							
PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION							
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

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

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

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	**City/Town:**	PITTSFIELD
Contract Number:	129534		
Description of Work:	Replacement of ten culverts, clean six culverts, replacement and rehabilitation of bridges and associated track work mileposts 74.14, 76.23,77.28,80.72,85.32,85.52 surface and align up to 5700 track feet		
Job Location:	Lee, Lenox and Pittsfield, MA		

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 form 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.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.95	$15.57	$20.17	$0.00	$0.00	$76.69
	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.02	$15.57	$20.17	$0.00	$0.00	$76.76
	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.14	$15.57	$20.17	$0.00	$0.00	$76.88
	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.29	$9.90	$9.25	$5.53	$0.00	$56.97
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	6/1/2025	$39.42	$14.50	$4.30	$6.25	$0.00	$64.47
	12/1/2025	$40.32	$14.50	$4.30	$6.25	$0.00	$65.37
ASPHALT RAKER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
ASPHALT RAKER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
BACKHOE/FRONT-END LOADER OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
BARCO-TYPE JUMPING TAMPER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
BATCH/CEMENT PLANT - ON SITE OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
BLOCK PAVER, RAMMER / CURB SETTER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$32.29	$9.90	$9.25	$5.53	$0.00	$56.97
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
BOILER MAKER BOILERMAKERS LOCAL 29 BOILERMAKERS LOCAL 29	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3	2/1/2025	$54.21	$11.49	$15.57	$5.89	$0.00	$87.16
	8/1/2025	$56.36	$11.49	$15.57	$5.89	$0.00	$89.31
	2/1/2026	$57.71	$11.49	$15.57	$5.89	$0.00	$90.66

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)	8/1/2026	$59.91	$11.49	$15.57	$5.89	$0.00	$92.86
	2/1/2027	$61.31	$11.49	$15.57	$5.89	$0.00	$94.26

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.11	$11.49	$15.57	$5.89	$0.00	$60.06
2	60.00	$32.53	$11.49	$15.57	$5.89	$0.00	$65.48
3	70.00	$37.95	$11.49	$15.57	$5.89	$0.00	$70.90
4	80.00	$43.37	$11.49	$15.57	$5.89	$0.00	$76.32
5	90.00	$48.79	$11.49	$15.57	$5.89	$0.00	$81.74

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.18	$11.49	$15.57	$5.89	$0.00	$61.13
2	60.00	$33.82	$11.49	$15.57	$5.89	$0.00	$66.77
3	70.00	$39.45	$11.49	$15.57	$5.89	$0.00	$72.40
4	80.00	$45.09	$11.49	$15.57	$5.89	$0.00	$78.04
5	90.00	$50.72	$11.49	$15.57	$5.89	$0.00	$83.67

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$48.85	$9.90	$9.25	$9.80	$0.00	$77.80
	12/1/2025	$50.35	$9.90	$9.25	$9.80	$0.00	$79.30
	6/1/2026	$51.90	$9.90	$9.25	$9.80	$0.00	$80.85
	12/1/2026	$53.40	$9.90	$9.25	$9.80	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN LABORERS LABORERS - FOUNDATION AND MARINE	6/1/2025	$48.03	$9.90	$9.25	$9.80	$0.00	$76.98
	12/1/2025	$49.53	$9.90	$9.25	$9.80	$0.00	$78.48
	6/1/2026	$51.08	$9.90	$9.25	$9.80	$0.00	$80.03
	12/1/2026	$52.58	$9.90	$9.25	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"							
CARPENTER CARPENTERS CARPENTERS LOCAL 336 - BERKSHIRE COUNTY	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Apprentice: CARPENTER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

CARPENTER WOOD FRAME CARPENTERS CARPENTERS-ZONE 3 (Wood Frame) All Aspects of New Wood Frame Work	10/1/2024	$26.65	$7.02	$3.80	$1.00	$0.00	$38.47
	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01

Construction

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

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	60.00	$15.99	$7.02	$0.00	$0.00	$0.00	$23.01
3	65.00	$17.32	$7.02	$0.00	$1.00	$0.00	$25.34
4	70.00	$18.66	$7.02	$0.00	$1.00	$0.00	$26.68
5	75.00	$19.99	$7.02	$3.80	$1.00	$0.00	$31.81
6	80.00	$21.32	$7.02	$3.80	$1.00	$0.00	$33.14
7	85.00	$22.65	$7.02	$3.80	$1.00	$0.00	$34.47
8	90.00	$23.99	$7.02	$3.80	$1.00	$0.00	$35.81

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3	65.00	$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4	70.00	$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5	75.00	$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6	80.00	$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7	85.00	$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8	90.00	$24.98	$7.02	$3.80	$1.00	$0.00	$36.80

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)	7/1/2024	$44.56	$13.20	$16.30	$2.93	$1.69	$78.68

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 7/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.28	$13.20	$16.30	$0.00	$0.00	$51.78
2	60.00	$26.74	$13.20	$16.30	$2.93	$1.69	$60.86
3	65.00	$28.96	$13.20	$16.30	$2.93	$1.69	$63.08
4	70.00	$31.19	$13.20	$16.30	$2.93	$1.69	$65.31
5	75.00	$33.42	$13.20	$16.30	$2.93	$1.69	$67.54
6	80.00	$35.65	$13.20	$16.30	$2.93	$1.69	$69.77
7	90.00	$40.10	$13.20	$16.30	$2.93	$1.69	$74.22

CHAIN SAW OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

For apprentice rates see "Apprentice- LABORER"

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
CRANE OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$43.06	$13.78	$12.15	$3.00	$0.00	$71.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

DEMO: ADZEMAN LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: CONCRETE CUTTER/SAWYER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.75	$9.90	$9.25	$9.65	$0.00	$77.55
	12/1/2025	$50.25	$9.90	$9.25	$9.65	$0.00	$79.05
	6/1/2026	$51.80	$9.90	$9.25	$9.65	$0.00	$80.60
	12/7/2026	$53.30	$9.90	$9.25	$9.65	$0.00	$82.10
	6/7/2027	$54.90	$9.90	$9.25	$9.65	$0.00	$83.70
	12/6/2027	$56.50	$9.90	$9.25	$9.65	$0.00	$85.30
	6/5/2028	$58.18	$9.90	$9.25	$9.65	$0.00	$86.98
	12/4/2028	$59.85	$9.90	$9.25	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$48.50	$9.90	$9.25	$9.65	$0.00	$77.30
	12/1/2025	$50.00	$9.90	$9.25	$9.65	$0.00	$78.80
	6/1/2026	$51.55	$9.90	$9.25	$9.65	$0.00	$80.35
	12/7/2026	$53.05	$9.90	$9.25	$9.65	$0.00	$81.85
	6/7/2027	$54.65	$9.90	$9.25	$9.65	$0.00	$83.45
	12/6/2027	$56.25	$9.90	$9.25	$9.65	$0.00	$85.05
	6/5/2028	$57.93	$9.90	$9.25	$9.65	$0.00	$86.73
	12/4/2028	$59.60	$9.90	$9.25	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/2/2025	$47.75	$9.90	$9.25	$9.65	$0.00	$76.55
	12/1/2025	$49.25	$9.90	$9.25	$9.65	$0.00	$78.05
	6/1/2026	$50.80	$9.90	$9.25	$9.65	$0.00	$79.60
	12/7/2026	$52.30	$9.90	$9.25	$9.65	$0.00	$81.10
	6/7/2027	$53.90	$9.90	$9.25	$9.65	$0.00	$82.70
	12/6/2027	$55.50	$9.90	$9.25	$9.65	$0.00	$84.30
	6/5/2028	$57.18	$9.90	$9.25	$9.65	$0.00	$85.98
	12/4/2028	$58.85	$9.90	$9.25	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$78.11	$10.08	$11.62	$12.67	$0.00	$112.48
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
For apprentice rates see "Apprentice- PILE DRIVER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
ELECTRICIAN (Including Core Drilling) ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: ELECTRICIAN (Including Core Drilling)

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 41 ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$62.83	$16.28	$10.96	$10.40	$0.00	$100.47
	1/1/2026	$63.68	$16.38	$11.06	$10.70	$0.00	$101.82
	1/1/2027	$64.53	$16.48	$11.16	$11.00	$0.00	$103.17

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.42	$16.28	$0.00	$0.00	$0.00	$47.70

Construction

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

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	55.00	$34.56	$16.28	$10.96	$10.40	$0.00	$72.20
3	65.00	$40.84	$16.28	$10.96	$10.40	$0.00	$78.48
4	70.00	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
5	80.00	$50.26	$16.28	$10.96	$10.40	$0.00	$87.90

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$31.84	$16.38	$0.00	$0.00	$0.00	$48.22
2	55.00	$35.02	$16.38	$11.06	$10.70	$0.00	$73.16
3	65.00	$41.39	$16.38	$11.06	$10.70	$0.00	$79.53
4	70.00	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
5	80.00	$50.94	$16.38	$11.06	$10.70	$0.00	$89.08

ELEVATOR CONSTRUCTOR HELPER	1/1/2025	$43.98	$16.28	$10.96	$10.40	$0.00	$81.62
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2026	$44.58	$16.38	$11.06	$10.70	$0.00	$82.72
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2027	$45.17	$16.48	$11.16	$11.00	$0.00	$83.81
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & BEAM RAIL ERECTOR	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
LABORERS							
LABORERS - ZONE 4 (BUILDING & SITE)							
For apprentice rates see "Apprentice- LABORER"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
LABORERS	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY	6/1/1999	$18.84	$4.80	$4.10	$0.00	$0.00	$27.74
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY	6/1/1999	$21.33	$4.80	$4.10	$0.00	$0.00	$30.23
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY	6/1/1999	$22.33	$4.80	$4.10	$0.00	$0.00	$31.23
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
FIRE ALARM INSTALLER	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
ELECTRICIANS LOCAL 7	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
ELECTRICIANS LOCAL 7	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"							
FIREMAN	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							

Apprentice: FIREMAN

Effective Date: 12/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$23.42	$13.78	$12.15	$3.00	$0.00	$52.35
2	70.00	$27.32	$13.78	$12.15	$3.00	$0.00	$56.25
3	80.00	$31.22	$13.78	$12.15	$3.00	$0.00	$60.15
4	90.00	$35.13	$13.78	$12.15	$3.00	$0.00	$64.06

FLAGGER & SIGNALER (HEAVY & HIGHWAY)	6/1/2025	$28.09	$9.90	$9.25	$6.60	$0.00	$53.84
LABORERS	12/1/2025	$28.09	$9.90	$9.25	$6.60	$0.00	$53.84
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$29.21	$9.90	$9.25	$6.60	$0.00	$54.96
	12/1/2026	$29.21	$9.90	$9.25	$6.60	$0.00	$54.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FLOORCOVERER	3/1/2025	$43.26	$7.91	$11.25	$6.90	$0.00	$69.32
FLOORCOVERERS LOCAL 2168	9/1/2025	$44.21	$7.91	$11.25	$6.90	$0.00	$70.27
FLOORCOVERERS LOCAL 2168 ZONE III	3/1/2026	$45.11	$7.91	$11.25	$6.90	$0.00	$71.17
	9/1/2026	$46.06	$7.91	$11.25	$6.90	$0.00	$72.12
	3/1/2027	$46.96	$7.91	$11.25	$6.90	$0.00	$73.02

Apprentice: FLOORCOVERER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
2	45.00	$19.47	$7.91	$0.00	$1.38	$0.00	$28.76
3	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
4	55.00	$23.79	$7.91	$0.00	$2.76	$0.00	$34.46
5	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
6	70.00	$30.28	$7.91	$11.25	$4.14	$0.00	$53.58
7	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Construction

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

Apprentice: FLOORCOVERER

Effective Date: 3/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
8	80.00	$34.61	$7.91	$11.25	$5.52	$0.00	$59.29

Apprentice: FLOORCOVERER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
2	45.00	$19.89	$7.91	$0.00	$1.38	$0.00	$29.18
3	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
4	55.00	$24.32	$7.91	$0.00	$2.76	$0.00	$34.99
5	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
6	70.00	$30.95	$7.91	$11.25	$4.14	$0.00	$54.25
7	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05
8	80.00	$35.37	$7.91	$11.25	$5.52	$0.00	$60.05

FORK LIFT OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.25	$13.78	$12.15	$3.00	$0.00	$68.18

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATORS/LIGHTING PLANTS OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 1333 GLAZIERS LOCAL 1333	6/1/2020	$39.18	$10.80	$6.70	$3.75	$0.00	$60.43

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 6/1/2020

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.59	$10.80	$1.50	$0.30	$0.00	$32.19
2	56.25	$22.04	$10.80	$1.50	$0.30	$0.00	$34.64
3	62.50	$24.49	$10.80	$1.95	$0.50	$0.00	$37.74
4	68.75	$26.94	$10.80	$1.95	$0.50	$0.00	$40.19
5	75.00	$29.39	$10.80	$2.50	$0.65	$0.00	$43.34
6	81.25	$31.83	$10.80	$2.50	$0.65	$0.00	$45.78
7	87.50	$34.28	$10.80	$6.70	$3.75	$0.00	$55.53
8	93.75	$36.73	$10.80	$6.70	$3.75	$0.00	$57.98

GRADER/TRENCHING MACHINE/DERRICK	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63 For apprentice rates see "Apprentice- SHEET METAL WORKER"	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 7 ELECTRICIANS LOCAL 7 For apprentice rates see "Apprentice- ELECTRICIAN"	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63 For apprentice rates see "Apprentice- SHEET METAL WORKER"	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30
HVAC (TESTING AND BALANCING -WATER) PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
HYDRAULIC DRILLS (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY) For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"	6/1/2025	$35.98	$9.90	$9.25	$6.60	$0.00	$61.73
	12/1/2025	$37.21	$9.90	$9.25	$6.60	$0.00	$62.96
	6/1/2026	$39.25	$9.90	$9.25	$6.60	$0.00	$65.00
	12/1/2026	$40.54	$9.90	$9.25	$6.60	$0.00	$66.29
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)	9/1/2024	$45.54	$14.75	$9.52	$10.09	$0.00	$79.90
	9/1/2025	$48.27	$14.75	$9.52	$10.09	$0.00	$82.63
	9/1/2026	$51.01	$14.75	$9.52	$10.09	$0.00	$85.37

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.77	$14.75	$9.27	$5.05	$0.00	$51.84
2	60.00	$27.32	$14.75	$9.32	$6.05	$0.00	$57.44
3	70.00	$31.88	$14.75	$9.37	$7.06	$0.00	$63.06
4	80.00	$36.43	$14.75	$9.42	$8.07	$0.00	$68.67

Construction

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

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.14	$14.75	$9.27	$5.05	$0.00	$53.21
2	60.00	$28.96	$14.75	$9.32	$6.05	$0.00	$59.08
3	70.00	$33.79	$14.75	$9.37	$7.06	$0.00	$64.97
4	80.00	$38.62	$14.75	$9.42	$8.07	$0.00	$70.86

IRONWORKER/WELDER IRONWORKERS LOCAL 12 IRONWORKERS LOCAL 12	7/1/2019	$31.55	$6.75	$15.91	$3.75	$0.00	$57.96

Apprentice: IRONWORKER/WELDER

Effective Date: 7/1/2019

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$18.93	$6.75	$0.00	$3.50	$0.00	$29.18
2	70.00	$22.09	$6.75	$11.14	$3.50	$0.00	$43.48
3	80.00	$25.24	$6.75	$12.72	$3.50	$0.00	$48.21
4	90.00	$28.40	$6.75	$14.32	$3.50	$0.00	$52.97

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22

Apprentice: LABORER

Effective Date: 12/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$18.92	$9.90	$9.25	$5.53	$0.00	$43.60
2	70.00	$22.08	$9.90	$9.25	$5.53	$0.00	$46.76
3	80.00	$25.23	$9.90	$9.25	$5.53	$0.00	$49.91
4	90.00	$28.39	$9.90	$9.25	$5.53	$0.00	$53.07

LABORER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.23	$9.90	$9.25	$6.60	$0.00	$60.98
	12/1/2025	$36.46	$9.90	$9.25	$6.60	$0.00	$62.21
	6/1/2026	$38.50	$9.90	$9.25	$6.60	$0.00	$64.25
	12/1/2026	$39.79	$9.90	$9.25	$6.60	$0.00	$65.54

Construction

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

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$21.14	$9.90	$9.25	$6.60	$0.00	$46.89
2	70.00	$24.66	$9.90	$9.25	$6.60	$0.00	$50.41
3	80.00	$28.18	$9.90	$9.25	$6.60	$0.00	$53.93
4	90.00	$31.71	$9.90	$9.25	$6.60	$0.00	$57.46

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$21.88	$9.90	$9.25	$6.60	$0.00	$47.63
2	70.00	$25.52	$9.90	$9.25	$6.60	$0.00	$51.27
3	80.00	$29.17	$9.90	$9.25	$6.60	$0.00	$54.92
4	90.00	$32.81	$9.90	$9.25	$6.60	$0.00	$58.56

LABORER: CARPENTER TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	6/1/2025	$34.40	$9.65	$9.00	$5.41	$0.00	$58.46
	12/1/2025	$35.63	$9.65	$9.00	$5.41	$0.00	$59.69
	6/1/2026	$37.67	$9.65	$9.00	$5.41	$0.00	$61.73
	12/1/2026	$38.96	$9.65	$9.00	$5.41	$0.00	$63.02
	6/1/2027	$40.26	$9.65	$9.00	$5.41	$0.00	$64.32
	12/1/2027	$41.56	$9.65	$9.00	$5.41	$0.00	$65.62
	6/5/2028	$42.91	$9.65	$9.00	$5.41	$0.00	$66.97
	12/4/2028	$44.26	$9.65	$9.00	$5.41	$0.00	$68.32
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$33.54	$9.90	$9.25	$5.53	$0.00	$58.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: MULTI-TRADE TENDER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.54	$9.90	$9.25	$5.53	$0.00	$56.22
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 LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$43.84	$11.49	$15.10	$5.68	$0.00	$76.11
	8/1/2025	$44.75	$11.49	$15.10	$5.68	$0.00	$77.02
	2/1/2026	$45.83	$11.49	$15.10	$5.68	$0.00	$78.10
	8/1/2026	$47.59	$11.49	$15.10	$5.68	$0.00	$79.86
	2/1/2027	$48.71	$11.49	$15.10	$5.68	$0.00	$80.98

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$21.92	$11.49	$15.10	$5.68	$0.00	$54.19
2	60.00	$26.30	$11.49	$15.10	$5.68	$0.00	$58.57
3	70.00	$30.69	$11.49	$15.10	$5.68	$0.00	$62.96
4	80.00	$35.07	$11.49	$15.10	$5.68	$0.00	$67.34
5	90.00	$39.46	$11.49	$15.10	$5.68	$0.00	$71.73

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$22.38	$11.49	$15.10	$5.68	$0.00	$54.65
2	60.00	$26.85	$11.49	$15.10	$5.68	$0.00	$59.12
3	70.00	$31.33	$11.49	$15.10	$5.68	$0.00	$63.60
4	80.00	$35.80	$11.49	$15.10	$5.68	$0.00	$68.07
5	90.00	$40.28	$11.49	$15.10	$5.68	$0.00	$72.55

MECH. SWEEPER OPERATOR (ON CONST. SITES)	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANIC/WELDER/BOOM TRUCK OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
MILLWRIGHT (Zone 3) MILLWRIGHTS LOCAL 1121 MILLWRIGHTS LOCAL 1121 - Zone 3	1/6/2025 1/5/2026	$43.48 $45.76	$10.08 $10.08	$11.47 $11.47	$9.75 $9.75	$0.00 $0.00	$74.78 $77.06

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/6/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$23.91	$10.08	$0.00	$5.36	$0.00	$39.35
2	65.00	$28.26	$10.08	$0.00	$6.34	$0.00	$44.68
3	75.00	$32.61	$10.08	$11.47	$7.31	$0.00	$61.47
4	85.00	$36.96	$10.08	$11.47	$8.29	$0.00	$66.80

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$25.17	$10.08	$0.00	$5.36	$0.00	$40.61
2	65.00	$29.74	$10.08	$0.00	$6.34	$0.00	$46.16
3	75.00	$34.32	$10.08	$11.47	$7.31	$0.00	$63.18
4	85.00	$38.90	$10.08	$11.47	$8.29	$0.00	$68.74

MORTAR MIXER LABORERS LABORERS - ZONE 4 (BUILDING & SITE) For apprentice rates see "Apprentice- LABORER"	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
OILER OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$35.02	$13.78	$12.15	$3.00	$0.00	$63.95
OTHER POWER DRIVEN EQUIPMENT - CLASS VI OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98 For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/1/2023	$32.74	$13.78	$12.15	$3.00	$0.00	$61.67
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 3	1/1/2025	$58.46	$9.95	$11.85	$12.10	$0.00	$92.36

Construction

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

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.23	$9.95	$0.00	$0.00	$0.00	$39.18
2	55.00	$32.15	$9.95	$0.00	$6.66	$0.00	$48.76
3	60.00	$35.08	$9.95	$0.00	$7.26	$0.00	$52.29
4	65.00	$38.00	$9.95	$0.00	$7.87	$0.00	$55.82
5	70.00	$40.92	$9.95	$11.85	$8.47	$0.00	$71.19
6	75.00	$43.85	$9.95	$11.85	$9.08	$0.00	$74.73
7	80.00	$46.77	$9.95	$11.85	$9.68	$0.00	$78.25
8	90.00	$52.61	$9.95	$11.85	$10.89	$0.00	$85.30

PAINTER (SPRAY OR SANDBLAST, NEW) * 1/1/2025 $41.23 $9.65 $11.85 $8.05 $0.00 $70.78
* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$20.62	$9.95	$0.00	$0.00	$0.00	$30.57
2	55.00	$22.68	$9.95	$0.00	$4.43	$0.00	$37.06
3	60.00	$24.74	$9.95	$0.00	$4.83	$0.00	$39.52
4	65.00	$26.80	$9.95	$0.00	$5.23	$0.00	$41.98
5	70.00	$28.86	$9.95	$11.85	$5.64	$0.00	$56.30
6	75.00	$30.92	$9.95	$11.85	$6.04	$0.00	$58.76
7	80.00	$32.98	$9.95	$11.85	$6.44	$0.00	$61.22
8	90.00	$37.11	$9.95	$11.85	$7.25	$0.00	$66.16

PAINTER (SPRAY OR SANDBLAST, REPAINT) 1/1/2025 $38.55 $9.95 $11.85 $8.05 $0.00 $68.40
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.28	$9.95	$0.00	$0.00	$0.00	$29.23
2	55.00	$21.20	$9.95	$0.00	$4.43	$0.00	$35.58
3	60.00	$23.13	$9.95	$0.00	$4.83	$0.00	$37.91
4	65.00	$25.06	$9.95	$0.00	$5.23	$0.00	$40.24
5	70.00	$26.99	$9.95	$11.85	$5.64	$0.00	$54.43
6	75.00	$28.91	$9.95	$11.85	$6.04	$0.00	$56.75

Construction

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

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$30.84	$9.95	$11.85	$6.44	$0.00	$59.08
8	90.00	$34.70	$9.95	$11.85	$7.25	$0.00	$63.75

PAINTER / TAPER (BRUSH, NEW) *	1/1/2025	$39.83	$9.95	$11.85	$8.05	$0.00	$69.68

* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used.
PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$19.92	$9.95	$0.00	$0.00	$0.00	$29.87
2	55.00	$21.91	$9.95	$0.00	$4.43	$0.00	$36.29
3	60.00	$23.90	$9.95	$0.00	$4.83	$0.00	$38.68
4	65.00	$25.89	$9.95	$0.00	$5.23	$0.00	$41.07
5	70.00	$27.88	$9.95	$11.85	$5.64	$0.00	$55.32
6	75.00	$29.87	$9.95	$11.85	$6.04	$0.00	$57.71
7	80.00	$31.86	$9.95	$11.85	$6.44	$0.00	$60.10
8	90.00	$35.85	$9.95	$11.85	$7.25	$0.00	$64.90

PAINTER / TAPER (BRUSH, REPAINT)	1/1/2025	$37.15	$9.95	$11.85	$8.05	$0.00	$67.00

PAINTERS LOCAL 35
PAINTERS LOCAL 35 - ZONE 3

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.58	$9.95	$0.00	$0.00	$0.00	$28.53
2	55.00	$20.43	$9.95	$0.00	$4.43	$0.00	$34.81
3	60.00	$22.29	$9.95	$0.00	$4.83	$0.00	$37.07
4	65.00	$24.15	$9.95	$0.00	$5.23	$0.00	$39.33
5	70.00	$26.01	$9.95	$11.85	$5.64	$0.00	$53.45
6	75.00	$27.86	$9.95	$11.85	$6.04	$0.00	$55.70
7	80.00	$29.72	$9.95	$11.85	$6.44	$0.00	$57.96
8	90.00	$33.44	$9.95	$11.85	$7.25	$0.00	$62.49

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	6/1/2025	$35.23	$9.90	$9.25	$6.60	$0.00	$60.98
LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	12/1/2025	$36.46	$9.90	$9.25	$6.60	$0.00	$62.21
	6/1/2026	$38.50	$9.90	$9.25	$6.60	$0.00	$64.25
	12/1/2026	$39.79	$9.90	$9.25	$6.60	$0.00	$65.54

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$40.78	$15.57	$20.17	$0.00	$0.00	$76.52
	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 3)	8/1/2024	$49.19	$10.08	$11.62	$12.67	$0.00	$83.56

Apprentice: PILE DRIVER

Effective Date: 8/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$10.08	$0.00	$2.53	$0.00	$34.75
2	55.00	$27.05	$10.08	$0.00	$5.07	$0.00	$42.20
3	70.00	$34.43	$10.08	$11.62	$7.60	$0.00	$63.73
4	80.00	$39.35	$10.08	$11.62	$10.14	$0.00	$71.19

PIPELAYER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBER & PIPEFITTER PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.14	$9.55	$10.10	$0.00	$0.00	$41.79
2	50.00	$24.61	$9.55	$10.10	$0.00	$0.00	$44.26

Construction

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

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/17/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
3	55.00	$27.07	$9.55	$10.10	$0.00	$0.00	$46.72
4	60.00	$29.53	$9.55	$10.10	$0.00	$0.00	$49.18
5	65.00	$31.99	$9.55	$10.10	$0.00	$0.00	$51.64
6	70.00	$34.45	$9.55	$10.10	$0.00	$0.00	$54.10
7	75.00	$36.91	$9.55	$10.10	$0.00	$0.00	$56.56
8	80.00	$39.37	$9.55	$10.10	$0.00	$0.00	$59.02
9	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02
10	80.00	$39.37	$9.55	$10.10	$7.00	$0.00	$66.02

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PNEUMATIC CONTROLS (TEMP.) PLUMBERS & PIPEFITTERS LOCAL 104 PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
POWDERMAN & BLASTER LABORERS LABORERS - ZONE 4 (BUILDING & SITE)	12/1/2024	$32.54	$9.90	$9.25	$5.53	$0.00	$57.22
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2025	$36.23	$9.90	$9.25	$6.19	$0.00	$61.57
	12/1/2025	$37.46	$9.90	$9.25	$6.19	$0.00	$62.80
	6/1/2026	$39.50	$9.90	$9.25	$6.19	$0.00	$64.84
	12/1/2026	$40.79	$9.90	$9.25	$6.19	$0.00	$66.13
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.56	$13.78	$12.15	$3.00	$0.00	$68.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER TEAMSTERS 404 - Construction Service (Northampton) TEAMSTERS 404 - Construction Service (Northampton)	5/1/2024	$26.14	$11.82	$7.25	$0.00	$0.00	$45.21
RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS	12/1/2024	$31.79	$9.90	$9.25	$5.53	$0.00	$56.47

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 4 (BUILDING & SITE)							
For apprentice rates see "Apprentice- LABORER"							
ROLLER OPERATOR OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Coal tar pitch) ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$41.88	$10.35	$8.70	$9.30	$0.00	$70.23
	7/16/2025	$43.38	$10.35	$8.70	$9.30	$0.00	$71.73
	10/2/2025	$44.38	$10.35	$8.70	$9.30	$0.00	$72.73
	7/16/2026	$46.38	$10.35	$8.70	$9.30	$0.00	$74.73

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 10/2/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.13	$10.35	$0.00	$0.00	$0.00	$35.48
2	65.00	$27.22	$10.35	$8.70	$9.30	$0.00	$55.57
3	70.00	$29.32	$10.35	$8.70	$9.30	$0.00	$57.67
4	75.00	$31.41	$10.35	$8.70	$9.30	$0.00	$59.76
5	80.00	$33.50	$10.35	$8.70	$9.30	$0.00	$61.85
6	85.00	$35.60	$10.35	$8.70	$9.30	$0.00	$63.95
7	90.00	$37.69	$10.35	$8.70	$9.30	$0.00	$66.04
8	95.00	$39.79	$10.35	$8.70	$9.30	$0.00	$68.14

ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 248 ROOFERS LOCAL 248	10/2/2024	$42.38	$10.35	$8.70	$9.30	$0.00	$70.73
	7/16/2025	$43.88	$10.35	$8.70	$9.30	$0.00	$72.23
	10/2/2025	$44.88	$10.35	$8.70	$9.30	$0.00	$73.23
	7/16/2026	$46.88	$10.35	$8.70	$9.30	$0.00	$75.23
For apprentice rates see "Apprentice- ROOFER"							
SCRAPER OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$39.03	$13.78	$12.15	$3.00	$0.00	$67.96
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) OPERATING ENGINEERS LOCAL 98 OPERATING ENGINEERS LOCAL 98	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SELF-PROPELLED POWER BROOM OPERATING ENGINEERS LOCAL 98	12/1/2023	$35.80	$13.78	$12.15	$3.00	$0.00	$64.73

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	1/1/2025	$42.23	$12.20	$10.79	$7.95	$2.13	$75.30

Apprentice: SHEETMETAL WORKER

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.00	$5.49	$4.86	$0.00	$0.85	$30.20
2	50.00	$21.12	$6.10	$5.40	$0.00	$0.94	$33.56
3	55.00	$23.23	$6.71	$9.71	$0.00	$1.15	$40.80
4	60.00	$25.34	$7.32	$9.71	$0.00	$1.23	$43.60
5	65.00	$27.45	$7.93	$9.71	$0.00	$1.31	$46.40
6	70.00	$29.56	$8.54	$9.71	$0.00	$1.39	$49.20
7	75.00	$31.67	$9.15	$9.71	$0.00	$1.47	$52.00
8	80.00	$33.78	$9.76	$9.71	$7.95	$1.78	$62.98
9	85.00	$35.90	$10.37	$9.71	$7.95	$1.86	$65.79
10	90.00	$38.01	$10.98	$9.71	$7.95	$1.94	$68.59

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2025	$41.53	$15.57	$20.17	$0.00	$0.00	$77.27
	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 669 SPRINKLER FITTERS LOCAL 669	4/1/2023	$47.43	$11.45	$7.20	$9.41	$0.00	$75.49

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$21.34	$8.22	$0.00	$0.00	$0.00	$29.56
2	50.00	$23.72	$8.22	$0.00	$0.00	$0.00	$31.94
3	55.00	$26.09	$11.45	$7.20	$0.00	$0.00	$44.74
4	60.00	$28.46	$11.45	$7.20	$1.15	$0.00	$48.26

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN	12/29/2024	$51.06	$13.25	$8.23	$6.83	$0.00	$79.37
ELECTRICIANS LOCAL 7	6/29/2025	$52.16	$13.50	$8.31	$6.90	$0.00	$80.87
ELECTRICIANS LOCAL 7	12/28/2025	$53.26	$13.75	$8.40	$6.96	$0.00	$82.37
	6/28/2026	$54.41	$14.00	$8.43	$7.03	$0.00	$83.87
	1/3/2027	$55.56	$14.25	$8.47	$7.09	$0.00	$85.37

Apprentice: SPRINKLER FITTER

Effective Date: 4/1/2023

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	65.00	$30.83	$11.45	$7.20	$1.15	$0.00	$50.63
6	70.00	$33.20	$11.45	$7.20	$1.40	$0.00	$53.25
7	75.00	$35.57	$11.45	$7.20	$1.40	$0.00	$55.62
8	80.00	$37.94	$11.45	$7.20	$1.40	$0.00	$57.99
9	85.00	$40.32	$11.45	$7.20	$1.40	$0.00	$60.37
10	90.00	$42.69	$11.45	$7.20	$1.40	$0.00	$62.74

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 12/29/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.42	$7.35	$0.61	$0.00	$0.00	$28.38
2	45.00	$22.98	$7.35	$0.69	$0.00	$0.00	$31.02
3	50.00	$25.53	$13.25	$7.47	$0.00	$0.00	$46.25
4	55.00	$28.08	$13.25	$7.54	$0.00	$0.00	$48.87
5	65.00	$33.19	$13.25	$9.74	$0.00	$0.00	$56.18
6	70.00	$35.74	$13.25	$11.19	$0.00	$0.00	$60.18

Apprentice: TELECOMMUNICATION TECHNICIAN

Effective Date: 6/29/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$20.86	$7.50	$0.63	$0.00	$0.00	$28.99
2	45.00	$23.47	$7.50	$0.70	$0.00	$0.00	$31.67
3	50.00	$26.08	$13.50	$7.53	$0.00	$0.00	$47.11
4	55.00	$28.69	$13.50	$7.61	$0.00	$0.00	$49.80
5	65.00	$33.90	$13.50	$9.84	$0.00	$0.00	$57.24
6	70.00	$36.51	$13.50	$11.30	$0.00	$0.00	$61.31

TERRAZZO FINISHERS	2/1/2025	$64.74	$11.49	$15.57	$8.02	$0.00	$99.82
BRICKLAYERS LOCAL 3	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/10/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TERRAZZO MECHANIC BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE	2/1/2025	$65.82	$11.49	$15.57	$7.99	$0.00	$100.87
	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.37	$11.49	$15.57	$8.02	$0.00	$67.45
2	60.00	$38.84	$11.49	$15.57	$8.02	$0.00	$73.92
3	70.00	$45.32	$11.49	$15.57	$8.02	$0.00	$80.40
4	80.00	$51.79	$11.49	$15.57	$8.02	$0.00	$86.87
5	90.00	$58.27	$11.49	$15.57	$8.02	$0.00	$93.35

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.45	$11.49	$15.57	$8.02	$0.00	$68.53
2	60.00	$40.13	$11.49	$15.57	$8.02	$0.00	$75.21
3	70.00	$46.82	$11.49	$15.57	$8.02	$0.00	$81.90
4	80.00	$53.51	$11.49	$15.57	$8.02	$0.00	$88.59
5	90.00	$60.20	$11.49	$15.57	$8.02	$0.00	$95.28

Apprentice: TERRAZZO MECHANIC

Effective Date: 2/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.91	$11.49	$15.57	$7.99	$0.00	$67.96
2	60.00	$39.49	$11.49	$15.57	$7.99	$0.00	$74.54
3	70.00	$46.07	$11.49	$15.57	$7.99	$0.00	$81.12
4	80.00	$52.66	$11.49	$15.57	$7.99	$0.00	$87.71
5	90.00	$59.24	$11.49	$15.57	$7.99	$0.00	$94.29

Apprentice: TERRAZZO MECHANIC

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2	60.00	$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3	70.00	$47.58	$11.49	$15.57	$7.99	$0.00	$82.63

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: TERRAZZO MECHANIC							
Effective Date: 8/1/2025							
Step / Percent		**Apprentice Base Wage**	**Health**	**Pension**	**Annuity**	**Supplemental Unemployment**	**Total Rate**
4 / 80.00		$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5 / 90.00		$61.17	$11.49	$15.57	$7.99	$0.00	$96.22
TEST BORING DRILLER	6/1/2025	$51.70	$9.90	$9.25	$9.80	$0.00	$80.65
LABORERS	12/1/2025	$53.20	$9.90	$9.25	$9.80	$0.00	$82.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$54.75	$9.90	$9.25	$9.80	$0.00	$83.70
	12/1/2026	$56.25	$9.90	$9.25	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER	6/1/2025	$47.82	$9.90	$9.25	$9.80	$0.00	$76.77
LABORERS	12/1/2025	$49.32	$9.90	$9.25	$9.80	$0.00	$78.27
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.87	$9.90	$9.25	$9.80	$0.00	$79.82
	12/1/2026	$52.37	$9.90	$9.25	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER	6/1/2025	$47.70	$9.90	$9.25	$9.80	$0.00	$76.65
LABORERS	12/1/2025	$49.20	$9.90	$9.25	$9.80	$0.00	$78.15
LABORERS - FOUNDATION AND MARINE	6/1/2026	$50.75	$9.90	$9.25	$9.80	$0.00	$79.70
	12/1/2026	$52.25	$9.90	$9.25	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS	12/1/2023	$38.42	$13.78	$12.15	$3.00	$0.00	$67.35
OPERATING ENGINEERS LOCAL 98							
OPERATING ENGINEERS LOCAL 98							
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT	6/1/2025	$41.82	$15.57	$20.17	$0.00	$0.00	$77.56
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR	6/1/2025	$59.93	$9.90	$9.25	$10.25	$0.00	$89.33
LABORERS	12/1/2025	$61.43	$9.90	$9.25	$10.25	$0.00	$90.83
LABORERS (COMPRESSED AIR)	6/1/2026	$62.98	$9.90	$9.25	$10.25	$0.00	$92.38
	12/1/2026	$64.48	$9.90	$9.25	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	6/1/2025	$61.93	$9.90	$9.25	$10.25	$0.00	$91.33
LABORERS	12/1/2025	$63.43	$9.90	$9.25	$10.25	$0.00	$92.83
LABORERS (COMPRESSED AIR)	6/1/2026	$64.98	$9.90	$9.25	$10.25	$0.00	$94.38
	12/1/2026	$66.48	$9.90	$9.25	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR	6/1/2025	$52.00	$9.90	$9.25	$10.25	$0.00	$81.40
LABORERS	12/1/2025	$53.50	$9.90	$9.25	$10.25	$0.00	$82.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$55.05	$9.90	$9.25	$10.25	$0.00	$84.45
	12/1/2026	$56.55	$9.90	$9.25	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	6/1/2025	$54.00	$9.90	$9.25	$10.25	$0.00	$83.40
LABORERS	12/1/2025	$55.50	$9.90	$9.25	$10.25	$0.00	$84.90
LABORERS (FREE AIR TUNNEL)	6/1/2026	$57.05	$9.90	$9.25	$10.25	$0.00	$86.45
	12/1/2026	$58.55	$9.90	$9.25	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	6/1/2025	$41.24	$15.57	$20.17	$0.00	$0.00	$76.98
TEAMSTERS JOINT COUNCIL NO. 10	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	6/1/2025	$35.48	$9.90	$9.25	$6.60	$0.00	$61.23
LABORERS	12/1/2025	$36.71	$9.90	$9.25	$6.60	$0.00	$62.46
LABORERS - ZONE 4 (HEAVY & HIGHWAY)	6/1/2026	$38.75	$9.90	$9.25	$6.60	$0.00	$64.50
	12/1/2026	$40.04	$9.90	$9.25	$6.60	$0.00	$65.79
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
WATER METER INSTALLER	3/17/2024	$49.21	$9.55	$10.10	$7.00	$0.00	$75.86
PLUMBERS & PIPEFITTERS LOCAL 104							
PLUMBERS & PIPEFITTERS LOCAL 104 WESTERN DIVISION							
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"							

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

DOCUMENT A00801

SPECIAL PROVISIONS

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

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.

PROJECT DESCRIPTION

The Berkshire Line is approximately 36.6 miles long and runs from Ashley Falls, MA MP 50.0 north to Pittsfield, MA MP 86.6. It is currently operated at FRA 49 CFR Part 213 Class I (10 mph freight) and Class II (25 mph freight) speeds. The Berkshire Line track structure is recently installed 136lb continuous welded rail (CWR) from approximately MP 50 to MP 72 and older jointed rail from approximately MP 72 to MP 86.6. All track is ballasted with timber crossties.

The culvert improvement work to be completed in this contract includes replacement of ten existing culverts and cleaning six existing culverts.

The major bridge work to be completed includes replacement and rehabilitation of bridges and associated track work at mileposts 74.17, 76.23, 77.28, 80.72, 85.32 and 85.52.

Replacement of Bridge No. 74.17

Berkshire Line Bridge No. 74.17 is a single 11'-0" long span structure carrying the railroad over Willow Brook in the town of Lee, MA. The bridge carries one railroad track and is subjected to freight traffic. The existing bridge superstructure consists of an open timber deck on two built-up timber stringer chords. The existing substructure consists of two stone masonry abutments and wingwalls/retaining walls.

The work to be completed in the Contract is to demolish the existing bridge superstructure, abutments and portions of wingwalls/retaining walls, and replace with a precast concrete box structure. Cast-in-place reinforced concrete walls will be installed to provide transitions between the proposed precast bridge structure and existing stone masonry walls to remain at the four corners of the bridge. Repoint stone masonry joints for the existing stone masonry retaining walls to remain as shown on the plans. There are overhead electrical wires owned by Eversource at approximately 29'-0" above top of rails at the bridge location.

The proposed track work on Bridge 74.17 includes removal and construction of approximately 80 linear feet of track. Work proposed includes: the removal of existing track within approximately 40 feet of the bridge centerline; removal and replacement of subballast and ballast in the construction areas, installation of ballast mat; removal and replacement of tie plates on existing ties, plugging and replating existing timber ties; and install new 136RE rails after the ties have been installed. The existing track outside of the construction area will be surfaced and aligned to meet the existing track profile. The elevation of the track will match existing on the approaches and the side slopes will be graded at a 2:1 slope.

The bridge will be constructed during short term temporary rail line closures during non-train operation hours. The work will be accessed, staged and performed within the railroad right-of-way. Work will be performed in-the-dry inside of temporary cofferdams.

Superstructure Replacement and Substructure Strengthening of Bridge No. 76.23

Berkshire Line Bridge at Milepost 76.23 is a single 24'-0" span structure carrying the railroad over Columbia Mills in the town of Lee, MA. The bridge carries one railroad track and is subjected to freight traffic. The existing bridge superstructure consists of eight steel rolled I-beams supporting an open deck . The existing substructure consists of two stone masonry abutments and wingwalls. The centerlines of bridge bearings are at a 43.85 degrees skew angle.

The work to be completed in the Contract is to repoint stone masonry joints in abutments and wingwalls; demolish the existing bridge superstructure and stone masonry bridge seats, and replace with new precast reinforced concrete bridges seats and a ballasted deck supported by two steel through girders and floor beams, with a pedestrian walkway outside one of the through girders. Micropiles will be installed to support the new bridge seats. The proposed centerlines of bridge bearings are at an 30 degrees skew angle. Local regrading will be done at the approaches to the pedestrian walkway.

The proposed track work related to Bridge 76.23 includes removal and construction of approximately 160 linear feet of track. Work proposed includes: the removal of existing track within approximately 60 feet of the bridge abutments on both sides; removal and replacement of subballast and ballast in the construction areas, installation of ballast mat; removal and replacement of tie plates on existing ties, plugging and replating existing timber ties; and install new 136RE rails after the ties have been installed. The existing track outside of the reconstruction area will be surfaced and aligned to meet the existing track alignment. The elevation of the track will match existing profile on the approaches and the side slopes will be graded at a 2:1 slope, with ditching to be established north of the bridge.

The bridge will be constructed during short term temporary rail line closures during non-train operation hours. The Contractor shall coordinate with the Housatonic Railroad Company, Inc. ("HRRC" or "Railroad"), the Town of Lee and the owners of buildings adjacent to the railroad for construction schedule, access and stagging prior to construction.

Rehabilitation of Bridge No. 77.28

Berkshire Line Bridge at Milepost 77.28 is a single 23'-2" span structure carrying the railroad over Mt. Washington Brook in the town of Lee, MA. The bridge carries one railroad track and is subjected to freight traffic. The existing bridge superstructure consists of two built-up riveted plate girders supporting an open deck . The existing substructure consists of two stone masonry abutments and wingwalls.

The work to be completed in the Contract is to repoint stone masonry joints, fill in voids in south abutment stem and stabilize the existing south abutment and wingwalls with cast-in-place reinforced concrete breastwall and apron and tieback anchors; replace existing stone blocks on top of southeast wingwall with reinforced concrete; replace deteriorated girder pedestals under west girder at north and south abutments and east girder at south abutment and reset shifted and rotated

granite stones in backwalls. South end of bridge deck will be raised by 1 ½" when the bearing patdetals are reset. Track profile will be adjusted and surfaced at the south approach as required for a smooth transition.

The bridge work will be conducted during non-train operation hours. The work will be accessed, staged and performed within the railroad right-of-way. Work will be performed in-the-dry inside of temporary cofferdams.

Rehabilitation of Bridge No. 80.72

Berkshire Line Bridge at Milepost 80.72 is a single 11'-9" span structure carrying the railroad over unnamed stream in the town of Lenox, MA. The bridge carries one railroad track and is subjected to freight traffic. The existing bridge superstructure consists of six rolled steel beams supporting an open deck . The existing substructure consists of two stone masonry abutments and wingwalls.

The work to be completed in the Contract is to repoint stone masonry joints, fill in voids in abutments, backwalls and wingwalls, and reset shifted and rotated granite stones in backwalls.

The bridge work will be conducted during non-train operation hours. The work will be accessed, staged and performed within the railroad right-of-way. Work will be performed in-the-dry inside of temporary cofferdams.

Rehabilitation of Bridge No. 85.32

Berkshire Line Bridge at Milepost 85.32 is a 16'-0" long single span arch structure carrying the railroad over Shaker Brook in the City of Pittsfield, MA. The bridge carries one railroad track and is subjected to freight traffic. The bridge structure consists of a brick barrel arch with stone masonry voussoirs, masonry spandrel walls, masonry abutments and masonry wingwalls. There is a timber retaining wall on the west side of track on the bridge.

The work to be completed in the Contract is to replace the existing timber retaining wall with a precast modular retaining wall system as shown on the plans; repoint stone masonry joints, fill in voids in west spandrel wall and west wingwalls.

The proposed track work related to Bridge 85.32 includes removal and reconstruction of approximately 50 linear feet of track. Work proposed includes: the removal of existing track; removal of ballast, reinstallation of existing timber ties; replace deteriorated ties with new ties, and resetting the existing rails after the ties have been installed. The existing track outside of the replacement area will be surfaced and aligned to meet the proposed track. The elevation of the track will match the existing track.

The bridge work will be conducted during short term temporary rail line closures during non-train operation hours. The work will be accessed, staged and performed within the railroad right-of-way.

Rehabilitation of Bridge No. 85.52

Berkshire Line Bridge at Milepost 85.52 is a single span structure carrying the railroad over West Housatonic Street in the City of Pittsfield, MA. The bridge carries three tracks. Only the middle

track is currently active and is subjected to freight traffic. The rails for the originally east track were removed. The existing bridge superstructure has 3 bays and consists of four steel through girders, floor beams and stringers supporting open decks. The active track is on the center bay. The existing substructure consists of one stone masonry south abutment with wingwalls and a concrete north abutment with wingwalls. The through girder lengths vary from 51'-5" to 58'-9".

The work to be completed in the Contract is to repair bridge seats under the east through girder as shown on the plans; replace existing stringer bearing pedestals and repoint stone masonry joints in south abutment.

The Contractor shall coordinate with the Housatonic Railroad, the Town of Lee and the owners of buildings adjacent to the railroad for construction schedule, access and stagging prior to construction. The contractor is responsible for executing traffic management plans included in Document A00904. The contractor is responsible for coordinating with the utility owners for relocating wires and cables on south abutment.

Additional Civil Improvements

In addition to the above culvert and bridge improvements, the work in this Contract also includes surface and align up to 5,700 track feet as instructed by the Engineer, the contractor is expected to furnish 1,087 tons of ballast. In addition, establish up to 16,120 linear feet of spot ditching, stabilize up to 300 linear feet of track bed, install up to 856 linear feet of track underdrain and clean up to 400 linear feet of ballast. The Contractor is also required to perform miscellaneous work on the Berkshire Line as directed by the Engineer which will be paid under an allowance item. The required work is located between MP 72 and MP 86.6.

Currently the HRRC operates freight service during late afternoon and early evening Monday thru Friday. Anticipated work windows will be approximately 6am-4pm for Monday through Friday. There are currently no trains operating on Saturday and daylight trains run on Sunday. The Contractor shall coordinate with the Resident Engineer and the HRRC when performing their work to avoid impacts to freight rail service.

The proposed work will be accessed, staged, and performed within the railroad right-of-way except Br. 76.23. The right-of-way is owned by the Commonwealth of Massachusetts, Massachusetts Department of Transportation (MassDOT) and is operated by the HRRC.

SCOPE OF WORK

The project includes, but is not limited to, the following work items:

1. Replace and/or clean existing culverts. Replacement of existing culverts consists of removal and reinstallation of existing track, excavation for removal of existing culvert and headwalls, installation of new steel pipe culverts and reinforced cast-in-place concrete headwalls and backfilling. Cleaning of existing culverts consist of removal of bushes and debris as specified in the special provisions.

2. Replacement of Berkshire Line Bridge at Milepost 74.17, with associated approach work as described in the previous section. The existing single span structure carries the

Berkshire Line over Willow Brook in the town of Lee, MA. The proposed bridge is a precast concrete box structure with an 8'-6" clear span.

3. Superstructure Replacement and Substructure Strengthening of Bridge No. 76.23, with associated approach work as described in the previous section. The existing single structure carries the Berkshire Line over Columbia Mills in the town of Lee, MA. The proposed bridge is a single structure approximately 42' long.

4. Rehabilitation of Bridge No. 77.28, with associated approach work as described in the previous section. The existing single span structure carries the railroad over Mt. Washington Brook in the town of Lee, MA.

5. Rehabilitation of Bridge No. 80.72 as described in the previous section. The existing single span structure carries the railroad over unnamed stream in the town of Lenox, MA.

6. Rehabilitation of Bridge No. 85.32, with associated approach work as described in the previous section. The existing single span structure carries the railroad over Shaker Brook in the City of Pittsfield, MA.

7. Rehabilitation of Bridge No. 85.52 as described in the previous section. The existing single span structure carries the railroad over West Housatonic Street in the City of Pittsfield, MA.

8. Surface and align track in designated areas.

9. Furnish and install ballast for all work including surface and align.

10. Spot ditching in designated areas.

11. Track bed stabilization in designated areas.

12. Install track underdrain in designated areas.

13. Clean and replace ballast in designated areas.

14. Perform miscellaneous work as directed by the Engineer.

Track construction shall consist of all work necessary to complete the task, including but not limited to, subgrade preparation, spot ditching, installation of subballast and ballast, and track surfacing and aligning.

A full-time dedicated Safety Supervisor and a full-time dedicated Quality Supervisor are required to be on site during all work under this contract. See Special Provision Items for qualifications required of these personnel.

The Contractor shall also provide temporary protection of work and property during the Contract period. This includes existing mainlines, sidings, yard tracks, culverts, bridges, grade crossings, access paths, utility easements, and private crossings. Railroad equipment within the work area,

including existing ties, rails, switches, and OTM inside and outside the reconstruction limits shall also be protected. After the work is properly completed, Contractor shall be responsible for protecting work and for repairing, replacing, and cleaning of damaged work, so that all work is complete at the time of acceptance of the work. Contractor to remove all temporary protection and coverings at the completion of the Work.

The Contractor shall provide, maintain, and operate all required types and quantities of equipment required for the Work. A qualified mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

The work to be done under this Contract consists of furnishing all required labor, materials, tools, equipment, and services as indicated in accordance with the provisions of the Contract Documents. The HRRC is responsible for providing railroad services such as an Employee-in-Charge (EIC), flagging or signal support. These Specifications describe requirements for construction and for the procurement of materials to be used in the subject project.

The Contractor is responsible for completing all track work necessary to perform the work. MassDOT and HRRC will furnish certain materials and products as further described in the Special Provision Items.

All work done under this Contract shall be in conformance with the 2025 Massachusetts Department of Transportation Highway Division Standard Specifications for Highways and Bridges Division I: General Requirements and Covenants, as amended herein, certain subsections of Divisions II: Construction Details and III: Materials Specifications referenced herein, the Supplemental Specifications thereto (03/31/2025), Special Provisions contained in this book, the 2024 AREMA Manual for Railway Engineering, MassDOT's MW-1, HRRC procedures for the installation, adjustment, maintenance, and inspection of CWR, the Plans, and these Special Provisions. Each of the foregoing is incorporated by reference herein. In case of conflict among the foregoing documents, the most stringent provisions or standard will take precedence.

DESIGNER/PROJECT MANAGER

DESIGNER
June Wu, P.E.
HDR Inc.
99 High Street, Suite 2300
Boston, MA 02110
Tel No. (617) 357-7718
June.Wu@hdrinc.com

PROJECT MANAGER
MassDOT Rail and Transit Division
10 Park Plaza, Room 4160
Boston, MA 02110
Attn: Scott Conti
Tel No. (857) 368-8965
scott.conti@dot.state.ma.us

SUBSECTION 1.03 - DEFINED TERMS

- The definition of "Engineer" is deleted and replaced with the following definition: "Engineer/Chief Engineer: The MassDOT Rail & Transit Division, acting directly or through an authorized representative, such representative acting within the scope of the particular duties entrusted to them."
- The following definition of "Owner" is added: "Owner: The Massachusetts Department of Transportation ("MassDOT"), acting through its authorized representative, such

representative acting within the scope of the particular duties entrusted to them."

SUBSECTION 2.01 – PROPOSAL FORMS AND PLANS

Amend Subsection 2.01.A of the Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following:

A. PREQAULIFICATION TO BID.

All prospective Bidders who intend to bid on this project must provide the following required pre-qualification information to Scott Conti at the MassDOT Rail and Transit Division by email at Scott.Conti@dot.state.ma.us and June Wu at HDR June.Wu@hdrinc.com before 5:00 P. M. seven (7) days prior to the bid opening date.

1. Bidders must be pre-qualified under MBTA Class 1 – General Transit Construction, MBTA Class 4A- Steel Superstructures and Class 4B – Concrete Superstructure to bid on the project. In addition, if the bidders are not also prequalified in MBTA Class 3 – Trackage, then a subcontractor prequalified in MBTA Class 3 – Trackage must perform the track work.

   Go to the MBTA website below to find MBTA Prequalification Procedures.

   https://bc.mbta.com/uploadedfiles/Business_Center/Bidding_and_Solicitations/Design_and_Construction/Contractor%20Prequalification%20Application%202022.pdf

   Bidders must submit MBTA-issued certificates showing that they are prequalified in the required classes of work for the project.

2. MassDOT Rail & Transit Prequalification. Bidders must be prequalified in the following classes of work: General Rail Construction on or Around Active Rail Lines, Track Work and Bridge Construction.

   a) Bidders, as the prime contractors, must have satisfactorily performed in the field, managed and completed within the last five (5) years, as determined by MassDOT, three (3) projects, each with a project value of at least $10,000,000 with the following scope of work: track drainage and culvert improvement work.

   Bidders must submit the following:
   - Documentation describing the above-described required project experience.
   - Names of the skilled labor and supervisors that will perform the project track drainage and culvert improvement work.
   - Resumes of key project personnel.
   - Number of staff and crews employed by the bidder who will work on the project.
   - A reference for each project, which includes the following information: name, title and affiliation of the reference; address of the reference; phone number and email address of the reference.

b) Bidders, as the prime contractors, must have satisfactorily performed in the field, managed and completed with the last five (5) years, as determined by MassDOT, three (3) projects, each with a project value of at least $10,000,000 with the following scope of work: bridge rehabilitation and replacement work.

Bidders must submit the following:

- Documentation describing the above-described required project experience.
- Names of the skilled labor and supervisors that will perform the project bridge rehabilitation and replacement work.
- Resumes of key project personnel.
- Number of staff and crews employed by the bidder who will work on the project.
- A reference for each project, which includes the following information: name, title and affiliation of the reference; address of the reference; phone number and email address of the reference.

A-1. MASSDOT RAIL & TRANSIT DIVISION PREQUALIFICATION CLASSES OF WORK

General Rail Construction on or Around Active Rail Lines

Heavy rail line construction projects including the following work: site preparation, excavation backfill, support of excavation, grading, storm drainage, utilities, sewage and water systems, gravel base courses, bituminous and cement pavements, retaining walls, steel reinforced concrete structures, precast concrete structures, steel structures, timber structures, landscaping, access roadways, fencing, signing and incidental site work. This Class of work is intended to only include the contractor's ability to work on or around active facilities without causing disruption. In preparing the Contractor's bid proposal the contractor must exhibit, on previously completed projects that the scope of work for the project required the contractor to perform or manage work on or around active rapid transit, light rail, commuter rail and/or freight tracks without causing disruption to service.

Track Work

Projects consisting of the rehabilitation of, or new construction of trackwork for a railroad. Work includes the placement of track support structure, ballast, wood or concrete ties, direct fixation, rail fastening, switches and turnouts, rail welding placement, tamping, CWR installation, alignment, maintenance and testing, and track drainage and culvert work.

Bridge Construction

Construction of bridge structures consists of steel pile supported steel or concrete superstructures with a ballasted deck whether single or multiple span, that spans a body of water, depression, highway or railway, and affords passage for railroads, which is greater than 20 feet in length. Contractors bidding on this Class of Work must own or provide evidence of lease agreements for general construction equipment for excavating, grading, lifting and demolition such as loaders, bulldozers, backhoes and cranes.

SUBSECTION 2.01.B. ISSUANCE OF PROPOSAL FORMS AND PLANS

Subsection 2.01.B Issuance of Proposal Forms and Plans in the Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following:

"Modifications to any proposal documents will be made through the addendum process and posted on www.commbuys.com."

SUBSECTION 2.04 – PREPARATION OF PROPOSALS

Subsection 2.04 Preparation of Proposals in the Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following: Electronic proposals for the following project will be received through the internet using on www.commbuys.com ("COMMBUYS") until the date and time stated below. Bid documents will be posted on www.commbuys.com forthwith after the bid submission deadline. No paper copies of bids will be accepted.

All bidders must be registered with COMMBUYS in order to bid on this project. If Bidders are not currently registered with COMMBUYS, it is recommended that they register with COMMBUYS at least seven-days prior to the scheduled bid opening date. To register, go to www.commbuys.com and click on the "Register" link on the home or landing page.

A. At the designated time of the bid opening the MassDOT will accept, as the official bid, the set of proposal forms submitted by the bidder which includes the documents identified in Document B00420 PROPOSAL.

B. MassDOT will not be responsible for any communications or hardware breakdowns, transmission interruptions, delays, or any other problems that interfere with the receipt or withdrawal of proposals as required above either at the Bidder's transmitting location, at www.commbuys.com, or anywhere between these locations will not be considered grounds for a bid protest. MassDOT will not be held responsible if the bidder cannot complete and submit a bid due to failure or incomplete delivery of the files submitted via the Internet.

D. CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Project Designer by 1:00 P.M. on the Thursday of the 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 at june.wu@hdrinc.com. Please put the MassDOT project file number in the subject line.

E. PREBID CONFERENCE

A Prebid Conference will be held on project site see Section F.

F. PREBID SITEWALK

A Pre-Bid Meeting/Pre-Bid Site Walk will be held at 10:00 A.M. on Wednesday July 9, 2025 at the grade crossing at Utility Drive in Pittsfield, MA. Prospective bidders shall bring with them all personal protective equipment which must be worn to access the project site.

G. PROPOSAL REQUIREMENTS

1. To be approved for bidding, prospective bidders must submit the prequalification documents outlined in SUBSECTION 2.01 PROPOSAL FORMS AND PLANS
2. The completed and signed documents identified and inserted in Document B00420 PROPOSAL

must be included in the bid proposal submittal.

SUBSECTION 2.08: PUBLIC OPENING OF PROPOSALS.

Subsection 2.08 of the Massachusetts Department of Transportation Highway Division Standard Specifications for Highways and Bridges is deleted and replaced with the following:

The total price of each compliant proposal submitted by the deadline indicated in the Notice to Contractors will be posted on COMMBUYS forthwith after the bid submission deadline. Bids may be examined at MassDOT after the bid submission deadline and posting of the results on COMMBUYS.

SUBSECTION 2.09 – REJECTION OF PROPOSALS

Modify Subsection 2.09 as follows: In the third paragraph, the following text is deleted: "In accordance with 700 CMR 14."

SUBSECTION 3.02 - AWARD OF CONTRACT

Modify Subsection 3.02 as follows: In the fourth paragraph, the following text is deleted: ", and is otherwise in compliance with 700 CMR 14.00 *Prequalification of contractors and subcontractors*."

SUBSECTION 3.05 – EXECUTION OF CONTRACT

Modify Subsection 3.05 as follows: The first paragraph is deleted and replaced with the following paragraph: "Forms to be submitted by the successful bidder are in Contract Document B00421. The successful Bidder shall execute and deliver the contract and furnish the required forms and surety to the Department within **3 days** after the date of the notice of award."

SECTION 4.00: SCOPE OF WORK

SUBSECTION 4.10 – FINAL CLEANING UP

Amend Subsection 4.10 of the Standard Specifications by adding the following:

DISPOSAL OF EXCESS MATERIAL

Surplus materials obtained from any type of excavation, and all existing and other materials not required to be removed and stacked or stockpiled, or otherwise needed for use on the project, as identified in these Special Provisions or determined by the Engineer, shall become the property of the Contractor and disposed of subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

REMOVING AND STACKING OF MATERIALS

Contractor is responsible for obtaining their own yard for storage of all existing and other materials required to be removed and stacked. No separate payment will be made for this work, but all costs in connection there with shall be included in the prices bid for various Contract Items.

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.

SUBSECTION 5.02 – PLANS AND DETAIL DRAWINGS

Modify Subsection 5.02 as follows: Delete "The Engineer shall make all copies of approved shop drawings as indicated in Table 5.02-1" in Paragraph 8 and Table 5.02-1.

SUBSECTION 5.04 – ORDER OF PRECEDENCE

In the first paragraph of Subsection 5.04, the order of precedence of various contract documents is deleted and replaced with the following text:

1) Contract Amendments (e.g., Extra Work Orders and Time Extensions)
2) Contract (in the following order)
    - Addenda, including bid questions and responses
    - Special Provisions, Detail Sheets and Permits
    - Plans
    - Contract Documents
    - AREMA
    - Supplemental Specifications to the Highway Division Standard Specifications for Highways and Bridges
    - Highway Division Standard Specifications for Highways and Bridges

SUBSECTION 6.03 – DELIVERY AND STORAGE OF MATERIALS

Subsection 6.03 must be amended as follows:
The fourth paragraph is deleted and replaced with the following paragraph: "The Contractor may opt to obtain storage outside of the project limits if required. No areas shall be used for storage outside the project limits within the Right-Of-Way layout without written permission of the Engineer. No additional compensation shall be given for the design, construction, preparation, or restoration of the storage site(s) which may include but is not limited to a Traffic Management Plan (TMP), utilities, and lighting."

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Subsection 7.02: Pollution Prevention

Amend Subsection 7.02.II of the Standard Specifications by adding the following:

G. Erosion and Sediment Control

The Engineer has the authority to limit the surface areas of erodible earth material exposed by excavation, borrow and fill, or any such operations, and to direct the Contractor to provide immediate, permanent, or temporary control measures to prevent contamination of any adjacent bodies of water or drainage systems. Such measures will involve the installation of compost filter tubes, staked hay bales, sedimentation basins, silt fences or other control devices or methods as necessary to control erosion and sedimentation.

The erosion and sediment control features installed by the Contractor shall be satisfactorily maintained by the Contractor until acceptance of work under this Contract.
In the event of conflict between these Specifications and Laws, Rules, or Regulations of local agencies, the more restrictive requirements shall apply.

If temporary erosion and sediment control measures are required due to the Contractor's negligence or carelessness, the control measures shall be performed by the Contractor at his/her own expense. Construction of temporary erosion and sediment control measures, which are not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls, will be performed as shown on the Plans and/or as ordered by the Engineer.

Repeated failures by the Contractor to control erosion, pollution, and/or siltation, shall be cause for the Engineer to employ outside assistance or to use his/her own forces to provide the necessary corrective measures. The cost of such assistance plus project engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

Payment for temporary soil erosion and sedimentation control work will be included under the various items in this Contract.

SUBSECTION 7.04: MOTOR VEHICLES
Subsection 7.04 is supplemented with the following section:
TRUCK SAFETY DEVICES

All motor vehicles subject to Section 7 of Chapter 90 to be operated under this Contract shall be equipped with safety devices as provided therein and in 540 CMR 4.00.

By December 31, 2025, the Contractor shall certify to the Registry of Motor Vehicles, in a manner prescribed by the Registrar, that all applicable vehicles are equipped with Lateral Protective Devices, Convex Mirrors, Cross Over Mirror(s) and Back Up Cameras in accordance with the requirements of 540 CMR 4.00.

The Contractor shall provide evidence satisfactory to the Department to demonstrate compliance with the above certification requirement for all applicable vehicles operated under this Contract by the Contractor and its subcontractors and vendors in a manner set forth by the Department. Thereafter, the Contractor shall have an affirmative obligation to continue to provide such evidence of compliance on an ongoing basis and no later than 7 days after certification with the Registry of Motor Vehicles of any additional vehicles operated under this Contract by the Contractor and its subcontractors and vendors.

Non-compliance with respect to a vehicle that is subject to 540 CMR 4.00 may subject the Contractor to statutory fines as established in M.G.L. c. 90, § 7 and/or contractual remedies up to and including termination of the Contract.

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 the Housatonic Railroad Company, Inc. shall be the named insureds.

Paragraph 3

Railroad Protective Liability Insurance and Protective Property Damage Liability Insurance.

Due to the nature of the project, Railroad Protective Insurance will be required for this project with a limit of not less than five Million Dollars ($5,000,000) per occurrence. Such insurance shall also contain an aggregate of not less than ten Million Dollars ($10,000,000) for damages arising out of more than one occurrence.

MassDOT and the Housatonic Railroad Company, Inc. shall be the named insureds.

SUBSECTION 7.09 – PUBLIC SAFETY AND CONVENIENCE

Amend Subsection 7.09 of the Standard Specification by adding the following:

The Contractor shall protect all work areas from unauthorized access by methods acceptable to the Engineer.

The Contractor shall repair any damage to public or private property adjacent to the Project caused by the Contractor's operations and shall leave the property in a condition equal to or better than what it was in prior to commencement of the work.

SUBSECTION 7.14 – RESPONSIBILITY FOR DAMAGE CLAIMS

1. First paragraph: The first sentence must be edited by as follows: "The Contractor shall indemnify, defend, and save harmless the Commonwealth, the Department, **the Railroad (including Railroad's parent company, affiliates, and subsidiaries)**, the Municipality …."
2. Third paragraph: The first two sentences must be modified as follows - **"~~The Contractor's attention is directed to the provisions of General Laws, Chapter 30, Section 39H as amended. In accordance therewith,~~"**

SUBSECTION 7.16.B – CONSTRUCTION CLAIMS COMMITTEE DETERMINATION (STEP 2)

A modified Subsection is as follows:
Subsections 7.16.B: Determination by Administrator (Step 2)

Within 14 Days after the receipt date of the Department's written decision denying a claim, the Contractor may file a request with the Chief Engineer for a hearing before **the Deputy Administrator of the Rail & Transit Division.** The Contractor shall also provide any additional information, at the Department's request, that the **Division's Deputy Administrator** determines is necessary for evaluation of the claim. The Contractor's claim information must be enhanced to include sufficient description and information to enable understanding by a third party who has no knowledge of the dispute or familiarity with the Project and this documentation must also include a description of the efforts undertaken to resolve the dispute. The Contractor shall

present the claim to the **Deputy Administrator** at a meeting to be scheduled after the filing of the request. After the meeting, the Chief Engineer will provide to the Contractor a written determination of each claim made.

Subsection 7.16.C: Appeal to the Administrative Law Judge (Step 3)

The Subsection must be modified as follows:

1) Delete the first two paragraphs**.**
2) Modify the topic sentence of the third paragraph r. as follows: "At any time after the determination by the **Engineer**, the Contractor at its sole discretion may appeal the **Engineer's** determination to the Superior Court Department of the Commonwealth of Massachusetts in the County of Suffolk for further consideration."
3) Modify the last paragraph as follows: "The acceptance by the Contractor of the final payment made under the provisions of Subsection 9.05: Final Acceptance and Final Payment shall operate as and shall be a release to the Department and every member, agent and employee thereof, **as well as the Railroad,** from all claim and liability to the Contractor for anything done or furnished for, or relating to, the work, or for any act or neglect of the Department or of any person relating to or affecting the work, except the claim against the Department for the remainder, if any there be, of the amounts kept or retained as provided in Subsection 7.15: Claims Against Contractors for Payment of Labor, Materials and Other Purposes. For claims for extensions of time see Subsection 8.10: Determination and Extension of Contract Time for Completion (Time Extension).

SUBSECTION 7.20: NO WAIVER OF LEGAL RIGHTS

The third sentence must be modified as follows: "Neither the acceptance by the Department, or any representative of the Department, nor any payment for any acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the Department **or by the Railroad**, shall operate as a waiver of any portion of the Contract, or of any power herein reserved, or of any right to damages."

ACCESS MASSDOT INFORMATION ON WEBSITE

Access MassDOT information related to Construction, Design/Engineering, Contractor/Vendor Information, Approved Materials and Fabricators, Manuals, Publications and Forms at:

Massachusetts Department of Transportation | Mass.gov

PROTECTION OF UNDERGROUND FACILITIES

The Contractor's attention is directed to the necessity of making his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, etcetera, will occur.

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. Contact the Dig Safe Call Center by 811 or 1-888-344-7233 or online at www.digsafe.com.

ENVIRONMENTAL PERMITTING

The proposed work occurs in jurisdictional wetland resources subject to the MA Wetlands Protection Act, thus an Order of Conditions from Lee Conservation Commission was issued. Self-Verification Notification has been submitted to the US Army Corps. The Contractor is advised that all terms and conditions within said permits shall be strictly adhered to.

If Contractor erection, demolition, storage, or other procedures require work to occur in or otherwise impact water, wetland resource areas, buffer zones, etc., the Contractor is responsible for obtaining the environmental permits for the additional impacts and is advised that no associated work can occur until all required environmental permits have been obtained. The Contractor must notify the MassDOT Rail and Transit Division 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 through the MassDOT Rail and Transit Division 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 obtain the environmental permits.

As a supplement to Section 7.00 of the Standard Specifications, the Contractor is reminded that no debris of any type shall be allowed to enter water or wetland resource areas, either temporarily or permanently.

Precautions for Protection of the Environment

During the execution of work under this Contract, the Contractor shall exercise care in the placement and storage of equipment, materials and debris as some areas of the site are in environmentally sensitive areas. No equipment, materials or debris can be placed or stored in or near a resource or drainage area leading to a resource as required by the Engineer. The Contractor shall neither stockpile material or equipment nor perform maintenance or refueling of equipment in a wetland area, within 100 feet of a wetland, or within 200 feet of a river, stream, pond or drainage area leading to a resource or other similar open body of water.

Oil and Hazardous Material Spill Prevention

Measures must be taken by the Contractor to prevent spills and leaks of oils and other hazardous materials to the environment. Such measures include but are not limited to properly maintaining construction equipment, establishing fuel and hazardous material handling areas that are designed to prevent releases to the environment (include containment structures if needed), instructing personnel in proper waste handling procedures and strictly prohibiting disposal into drains, water ways or receptacles, such as dumpsters, designed for non-hazardous waste. Spills or leaks of oil or hazardous materials must be reported to the DEP in accordance with the reportable quantities and criteria for "spills" as designed by the DEP in 310 CMR 40.370. Notification to the Engineer and to DEP must be made as soon as possible, but not more than two (2) hours after a spill or leak occurs.
For various locations projects with work on or around existing steel or bearing areas.
Also for designed projects involving full demolition, superstructure demolition, or superstructure demolition with modifications to the substructures.

WORK SCHEDULE

Use every effort and every means possible to minimize noises caused by construction operations, which the Engineer may consider as objectionable. Provide working machinery and equipment designed to operate with the least possible noise, and when gearing is used, such gearing shall be of a type designed to reduce noise to a minimum. Equip compressors with silencers on intake lines. Equip gas or oil operated equipment with silencers or mufflers on intake and exhaust lines.
Wherever practicable, electricity shall be used for power to reduce noise. Dumping bins, hoppers, and trucks used for disposal of excavated materials shall be lined with wood or other sound deadening material if required. Where required by agencies having jurisdiction, certain noise producing work may have to be performed during specified periods only.

The Contractor shall make all reasonable effort to minimize community disruption that might result from construction, including safety and security problems; the creation of noise, vibration, truck traffic on residential streets, traffic diversions, dust, storage and removal of materials; the choice of location of construction staging, the movement of construction equipment; provision of site cleanup; and hours of operation. Construction activities that may cause community disruption must be agreed upon in consultation with the Engineer prior to the start of construction.

Contractor shall be aware of the codes from the municipalities of Lee, Lenox and Pittsfield and shall comply with the codes, regulation of construction hours, and construction noise levels.

Municipalities through which the HRRC operates have varying ordinances which control various activities such as work hours. While HRRC believes that the ICC Termination Act exempts railroad activities from local regulation, the HRRC has adopted a “Good Neighbor Policy” and one element of that policy limits, to the extent consistent with efficiency and safety, early morning and late-night operations. Accordingly, unless otherwise controlled or allowed by local ordinances, work will not start before 6:00AM and will end before 7:00PM daily.

Noise control is also part of the HRRC’s “Good Neighbor Policy”. Noise from construction operations shall be controlled to the extent possible, including the sounding of horns and warning devices on construction machinery. Nothing set forth in this Section shall relieve Contractors from full compliance with FRA and Commonwealth regulations regarding sounding of horns, whistles, and/or bells at crossings and approaching and passing through work zones.

The Contractor shall give notice to the Engineer at least 48 hours in advance of beginning any work affecting the maintenance of traffic and shall not proceed with surfacing operations without specific notice to, and the approval of, the Engineer.

The Contractor shall coordinate with the Engineer and the municipalities of Lee, Lenox and Pittsfield to provide access and accommodation for these events. Work on a holiday or on the day before or after a long weekend which involves a holiday requires prior approval by the Engineer. Times will need to be submitted in advance for approval.

TRAIN OPERATIONS

The HRRC is an active freight railroad. The railroad shall remain operational throughout the duration of the project. Currently the HRRC operates freight service during late afternoon and early evening Monday thru Friday. Anticipated work windows will be approximately 6am-4pm for Monday thru Friday. There are currently no trains operating on Saturday and daylight trains

run on Sunday. A total of fifteen extended weekend closures from mid-night Friday to noon of the following Monday will be provided for construction at locations for culvert replacement, Bridge 74.14, Bridge 76.23, Br. 77.28, Bridge 85.32 and Br, 85.52. The contractor shall coordinate with HRRC to schedule the weekend closures. The track must be restored for operation by the Contractor at the end of each work window. The train will be advanced to just south of the work area and hold until workers clear each day. However, this schedule is also subject to change due to factors outside HRRC control including customer demands, interchange partners, other construction projects and weather. The contractor shall provide their monthly construction schedule and daily work hours to HRRC two weeks in advance and with weekly updates. HRRC, to the best of its knowledge, will notify the Contractor of any changes in schedule one week in advance.

HRRC is engaged in the business of providing freight rail transportation services in Western Massachusetts. HRRC will endeavor to operate its train service to provide track occupancy periods as long as practicable to facilitate efficient construction of the work.

No work will be permitted by the contractor without the HRRC EIC (Employee in Charge) being present. Each workday will begin with the required Job Briefing which will be given by the HRRC EIC.

Frequent and ongoing communication between the Contractor, the Engineer, and HRRC representatives is highly encouraged to enable efficient coordination of work activities and train service.

The Railroad determination of work schedules will take precedence over all other planning and scheduling efforts. The protection of trains, overall safe operations, and the protection of workmen and railroad personnel are paramount objectives in prosecuting the Work.

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.

CONTRACTUAL MILESTONES AND DURATIONS:

Contractual Milestones:
This Contract contains the following Contractual Milestones that are to be included in the Contractor's Baseline Contract Progress Schedule submission. The Contractor shall identify the completion of the work pertaining to each Contractual Milestone through the inclusion of a Finish

Milestone and hammock activities in the accepted baseline Contract Progress Schedule using the stated description.

MS#01 – Contractor Field Completion: The Contractor shall achieve Contractor Field Completion within **540 calendar days from Notice to Proceed**. Contractor Field Completion is defined as the completion of all physical contract work including the completion of the punch-list work, and the Contractor has fully demobilized from the field operations.

SUBSECTION 8.03 PROSECUTION OF WORK

Amend Subsection 8.03 of the Standard Specifications by adding the following:

Prior to the start of any work, the Contractor shall submit the required Scheduling in accordance with Section 722 of these Special Provisions. In addition to Section 722, the Contractor shall comply with the following:

The Contractor shall meet with MassDOT to review their work plan on how they intend to approach the various work items including the number of crews they intend to utilize, and the level of railroad support that they anticipate will be needed.

The Contractor is responsible to restore areas used for site access to their previous condition, which costs shall be considered incidental to the various Contract pay items, unless specific restoration work items are shown on the Plans.

SCHEDULE OF OPERATIONS - SCHEDULE TYPE

The applicable schedule type for this project is Type B.

SUBSECTION 8.06 – LIMITATIONS OF OPERATIONS

Amend Subsection 8.06 of the Standard Specifications by adding the following:

The Contractor shall review the weekday and weekend work windows and confirm with HRRC, for agreement and approval of the work windows. Changes to these work windows will require approval of all railroad entities. Any cost associated with additional outages or time shall be borne by the Contractor. The Contractor shall comply with the limits of work windows and shall clear the tracks and return the site to The Railroad before the specified work windows expire. The site and the track shall conform to FRA standards for safe operation of trains at the end of the work windows. The HRRC Chief Engineer, or representative thereof, shall be the sole judge of the condition of the site and tracks.

The Contractor must clearly identify all aspects of this work in the preparation of the Construction Schedule and throughout the contract duration. The Contractor is reminded that, in bidding this work, the Contractor is obligated to meet the Contract Milestones and Durations (Time) and is obligated to plan the successful completion of Work, prior to submitting the bid.

In submitting a bid price for this contract, the Contractor acknowledges that a detailed plan, has been developed to meet the Contract Time for all aspects of the Contact; including shift work;

extended work hour requirements/restrictions; as well as the planning of all subcontractor and supplier operations.

TRAFFIC CONTROL

Contractor to coordinate all requests for traffic control with MassDOT contact.

For any work that may impact traffic, the Contractor shall be responsible for the scheduling and coordination of the work with the HRRC, municipality, any affected abutters, and MassDOT. All traffic management arrangements shall be the responsibility of the Contractor including all advance notification that may be required and all signage, traffic barricades and police details that may be necessary. Streets and driveways adjacent to the work area shall remain open at all times.

The Contractor may be required to access project locations through adjacent properties. The Contractor shall coordinate with the property owners and provide a minimum advanced notice of 2 weeks prior to the start of work at these locations.

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of publicly or privately owned utilities of the Contractor's intention to commence operations affecting such utilities at least one (1) week in advance of the commencement of such operations in accordance with Chapter 82, Section 40 of the General Laws, as amended, and the Contractor shall at that time file a copy of such notice with the Engineer.

The Plans indicate the approximate location of known utilities in the vicinity of the work. The accuracy and completeness of the information is not guaranteed.

Any damage to these utilities caused by negligence of the Contractor shall be repaired by the Contractor at their own expense and to the satisfaction of the Engineer.

It is the intent of these Special Provisions that the Contractor having been given due notice hereof will safeguard the utilities during construction and shall assume liability for damage, relieving the Department from any liability.

A list of public and private utilities can be found on the MassDOT – Highway website at:
https://www.mass.gov/info-details/utility-contacts-by-district-and-municipality

Select District 1
Select Town of LEE
Locate the utility contact

The Contractor shall inform the following officials in each area that he assigned to work:

Superintendent, Department of Public Works or Town Engineer,
Superintendent, Water Department,
Superintendent, Sewer

Department, Police and
Fire Department,
Electric Department

Town officials are shown at website https://www.mass.gov/lists/cities-and-town.
Select "Choose Lee" from the "pull down" menu.
Press "Go" and locate the official Municipality Home Page.

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

GAS:
Emergency: 1-800-233-5325
New Service: 1- 877-696-4743
Customer Support: 1-800-732-3400

ELECTRIC:
Outage/ Emergency: 1-800-465-1212
New Service: 1-800-375-4730
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

ELECTRIC:
Outage/ Emergency: 800-592-2000 or 844-726-7562
New Service: 1-888-633-3797 (1-888-need pwr)
Customer Support: 1-800-340-9822

BERKSHIRE GAS EMERGENCY TELEPHONE NUMBERS

GAS:
Outage/Emergency: 1-800-292-5012 or 413-499-1680
New Service: 1- 800-297-7144
Customer Support: 1-800-292-5012

HOLIDAY & WEATHER WORK RESTRICTIONS
(Supplementing Subsection 7.09)

The Engineer may authorize work to continue during these specified time periods if it is determined by the Engineer that the work will not negatively impact the traveling public or the quality of the work.

Below are the holiday work restrictions:

1. New Years Day (Federal Holiday)
2. Martin Luther King's Birthday (Federal Holiday)

3. President's Day (Federal Holiday)
4. Patriot's Day (State Holiday)
5. Memorial Day (Federal Holiday)
6. Juneteenth (Federal Holiday)
7. Independence Day (Federal Holiday)
8. Labor Day (Federal Holiday)
9. Columbus Day (Federal Holiday)
10. Veterans' Day (Federal Holiday)
11. Thanksgiving Day (Federal Holiday)
12. Christmas Day (Federal Holiday)

Tie replacement in CWR track is restricted between November 15 and March 15.

ROADRWAY WORKER PROTECTION FOR RAILROAD CONTRACTORS

HRRC strictly adheres to the practice of operating a safe railroad and mandates that all Contractors and their Subcontractors, their Officers, employees, agents and all personnel employed or engaged by them in the performance of the Work or activity while on or adjacent to Railroad property operate and perform all activities in a safe manner and in strict accordance with HRRC On-Track Safety Manual and all Provisions of 49 CFR Parts 214, 219 and 243, as promulgated by the Federal Railroad Administration (FRA). See ITEM 180.1 HEALTH AND SAFETY PLAN for additional information on 49 CFR Parts 219 and 243.

All employees, agents and any personnel employed by and or engaged by the Contractor or his Subcontractors shall attend Roadway Worker Protection (RWP) training conducted by the HRRC, prior to entry upon Railroad property. RWP training provided online by the HRRC shall be completed prior to initiation of work activities and at other times to accommodate the project schedules. The training will be conducted in English. If the Contractor has employees who may not be able to adequately understand the content of the training in English, then the Contractor will be responsible to provide the appropriate translation to ensure that their employees are in compliance with FRA requirements.

Personal Protective Equipment (PPE) requirements are specified in the FRA Regulations and the Housatonic Railroad On-Track Safety Manual. The manual is included in the bid documents. Wearing and use of PPE shall be mandatory and strictly enforced. Failure to adhere to the PPE requirements may be grounds for removal of an individual from Railroad property and prohibition from work. Continual disregard for safety and failure to obey and adhere to safety directives of the Railroad shall be cause for termination of the Contract.

ROADWAY WORKER PROTECTION AND CWR TRAINING AND QUALIFICATION

1. HRRC RWP training is provided online through the RailPros website. All employees, agents and personnel employed by and or engaged by the Contractor or his Subcontractors working on the Project are required to successfully complete RWP training and to have their training and qualification card on their person while on site. All costs for training are the responsibility of the Contractor.

2. Housatonic CWR – Installation, Adjustment, Maintenance and Inspection of Continuous Welded Rail is provided online through the RailPros website. See ITEM 492.12.1

CROSSTIE REPLACEMENT for training requirements. All costs for training are the responsibility of the Contractor.

3. RWP and CWR training and qualification is required on an annual basis.

RAILROAD PROVIDED SUPPORT SERVICES

Contractors will be provided the following required Railroad Support Services by HRRC personnel:

1. Daily onsite worker safety inspections by HRRC.
2. One full-time EIC person and additional personnel as required supplied by HRRC for the duration of the Contractor and/or Subcontractor's presence on site. The EIC person will provide the following services to the Contractor and/or Subcontractor:
   a. Daily Job Briefings at the beginning of each workday and anytime work conditions change.
   b. Coordination of on-track safety protection for the Contractor and/or Subcontractor's personnel and equipment.
   c. Flagging of all train movements through Contractor and/or Subcontractor's work location.

RAILROAD WORK TRAINS

See ITEM 850.42 WORK TRAINS

PROJECT OVERSIGHT

MassDOT and MassDOT representatives will be present on site at times throughout the project for the purpose of representing the Owner's interests with regard to this project and will provide:

1. Oversight and Construction Inspection Services.
2. Act as a liaison between HRRC and Contractor.

SUBMITTALS

Prior to beginning any work, the Contractor shall submit to the Engineer for its review and approval proposed work plans, schedules and materials to be used in the Work as required in the specifications and special provisions. Contractor shall not commence any work requiring an approved submittal, including but not limited to schedules, work plans, materials and change orders without having first received approval by the Engineer.

Contractor shall also be required to submit, as part of their proposal, evidence of Dig Safe notification at project site.

CONDITIONS OF ACCEPTANCE

Materials that do not fully meet the requirements of these Specifications shall be rejected, removed from MassDOT property (if rejected following shipment) and replaced at no additional costs to MassDOT. It is the responsibility of the Contractor to meet the Specifications and in no case is rejection of materials a cause for a change in the contract completion date.

WARRANTY OF WORK

1. Neither final acceptance, final payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the premises by MassDOT or the HRRC shall

constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability with respect to any express warranties or responsibility for faulty materials or workmanship.

2. Except where longer periods of warranty are specified for certain items, the Contractor warrants all work done under the Contract to be free from faulty materials and workmanship for a period of one year from date of Final Acceptance.
3. Upon receiving notification from MassDOT, the Contractor shall immediately make the required repairs or replacements to any work found defective. If repairs or replacements are not started within 10 days from the date of notification and prosecuted to completion, the MassDOT reserves the right to employ others to complete the work. The Contractor agrees, upon demand, to pay MassDOT all amounts which it expends for such repairs or replacements.
4. All remedied work shall carry the same warranty as the original work starting with the date of accepted replacement or repair.

SUBSECTION 8.11 FAILURE TO COMPLETE WORK ON TIME.
Remove Table 8.11-1 and amend Subsection 8.11 of the Standard Specifications by adding the following:

If the Contractor fails to comply with the schedule for occupancy which results in HRRC being unable to operate trains or other on-track equipment within the project territory, said Contractor shall pay to the following liquidated damages:

The Liquidated Damages for the Contract is $2,500 per day.

Contractor and MassDOT agree that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that Owner will sustain by reason of delayed completion. These liquidated damages are intended as compensation for losses that are difficult to estimate. The Contractor and MassDOT agree that this $2,500 per day liquidated damages amount would compensate MassDOT only for construction engineering inspection costs incurred by MassDOT due to the Contractor's failure to complete a portion(s) of the Contract Work by the time(s) stipulated in the schedule proposed by the Contractor and approved by the HRRC and MassDOT, as required by the Contract, or the Contractor's failure to complete the whole of the Contract Work by the time stipulated by the Contract. In addition, in the event that the Contractor fails to complete a portion(s) or the whole of the Contract Work by the above-stated times, the Contractor recognizes that MassDOT may incur other expenses which are not covered by the payment of the Liquidated Damages referenced above, including, but not limited to, costs to defend and/or pay third party claims brought against MassDOT for damages.

As a consequence and in addition to the payment of the above referenced Liquidated Damages, the Contractor agrees that it will defend, indemnify and hold MassDOT Harmless from all claims, damages and expenses, other than the construction engineering inspection costs referenced above, which arise, in whole or in part, out of the Contractor's failure to complete a portion(s) or the whole of the Contract Work by the above-stated times.

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.

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 Contactor 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.

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.

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.

SECTION 9.00: MEASUREMENT AND PAYMENT

SUBSECTION 9.03 – PAYMENT FOR EXTRA WORK

Amend Subsection 9.03 of the Standard Specifications with the following:

No extra work shall be started without written authorization by MassDOT. Any extra work involving time and materials shall have a MassDOT representative on site while work is being performed.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL

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".

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 30µg/m3.

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.

PROVISIONS FOR TRAVEL AND PROSECUTION OF WORK

The Contractor shall coordinate their work with the work done by Utility Companies/Utility Owners who will be performing relocations and other work within the project limits, and they shall so schedule their operations as to cause the least interruption to the normal flow of traffic on the existing road.

Following provisions shall apply, unless otherwise required by the Engineer:

Prior to commencing work, the Contractor shall place protective shielding/work platforms/containment under the demolition locations so as not to allow debris to fall to the waterway or ground below.

The Contractor shall not start any operation until all materials required for the operation are at the site or until the Engineer is satisfied that the materials will be delivered in such order that there will be no interruption to continuous and efficient progress.

Under no circumstance should a Contractor close a travel lane or in any way affect traffic outside the specified work hours. All travel lanes of the roadway must be fully open to traffic prior to the start and after the end of the approved work schedule. In no case will operations commence prior to the specified work hours. This includes traffic set-ups that restrict the flow of traffic.

The Contractor’s schedule of operations shall be of sufficient detail to show all work elements and stages and shall account for all facets of the job, including but not limited to: traffic management control deployment and subsequent restoration, and anticipated restrictions due to weather.

The Contractor shall notify the Engineer in writing two (2) weeks in advance of any proposed temporary roadway closures required to complete the work. Before starting any work under this Contract, the Contractor shall submit a Schedule of Operations. Work on the roadway shall proceed only on such sections and widths thereof as will be approved by the Engineer.

The Contractor shall serve written notice to all abutters one week in advance of any reconstruction work adjacent to their property, and during such time that construction is in progress, provide

safe access to the abutting properties.

Signs having messages that are irrelevant to normal traffic conditions will be removed or properly covered at the end of each work period. Signs are to be kept clean at all times, and legends shall be distinctive and unmarred.

The Contractor may opt to obtain storage outside of the project limits if required. No areas shall be used for storage outside the project limits within the Right-Of-Way layout without written permission of the Engineer.

TRAFFIC MANAGEMENT PLANS

Phased or staged construction is proposed to complete Rehabilitation of Bridge No. 85.52 utilizing two travel lanes without shoulders to serve both directions of travel on West Housatonic Street by means of a temporary traffic barriers, cones and signs.

These time periods include the "set-up" and "breakdown" that may be required for the traffic pattern employed. No operations, personnel, or equipment will be allowed on the roadways except during working hours. The work hour restrictions do not apply to emergency conditions, as determined by the Engineer.

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 as defined by the schedule type set forth below. These requirements are in addition to any requirements imposed in other sections.

This section establishes the requirement for scheduling submissions. There are four schedule types identified as types A, B, C and D. The schedule type applicable to this project is established in the project special provisions.

All schedules shall be prepared and submitted in accordance with this specification and 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.

Type A –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type B –

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded & Resource Loaded CPM
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software and computer

Type C –

- 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 and computer

SECTION 722 (Continued)

Type D -

- Bar chart schedule updated monthly or at the request of the Engineer
- Short-term Construction Schedule
- Monthly Projected Spending Report (PSR)

EQUIPMENT, PERSONNEL

722.40 General

A. **Software Requirements**

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. The computer and software shall be maintained and serviced at no additional cost to the Department.

B. Scheduler Requirements

The Scheduler shall be approved 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.

SCHEDULING METHODS

722.60 General

A. **Schedule Planning Session**

The Contractor shall conduct a schedule planning session 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;

a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;

SECTION 722 (Continued)

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 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**

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. Rejected Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.
2. Contract Progress Schedule / Monthly Update Reviews / Recovery Schedules
   The Engineer will respond to each submittal within twenty-one (21) Calendar Days. Rejected schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

The Engineer's review comments shall not be construed as direction to change the Contractor's means and methods. The review and acceptance of the CPM schedule does not relieve the Contractor of the responsibility for accomplishing the work within the contract required completion dates. Omissions and errors in the accepted CPM schedule shall not excuse performance less than that required by the Contract.

722.61 Schedule Content and Preparation Requirements

All schedules 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
and the following:

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.

SECTION 722 (Continued)

B. **ACTIVITIES**

The schedule shall clearly define the progression of the Work from the Notice to Proceed (NTP) to Contractor Field Completion (CFC) by using separate activities, or including attributes within appropriate activities, to address each of the following:

1. Notice to Proceed
2. Work Breakdown Structure
3. The Critical Path is clearly defined and organized.
4. Float shall be clearly identified.
5. Detailed activities to satisfy permit requirements.
6. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
7. 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.
8. 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.
9. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
10. Each component of the Work defined by specific activities.
11. Right-of-Way (ROW) takings that have been identified in the Contract.
12. Early Utility Relocation (by others) that has been identified in the Contract.
13. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
14. 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
15. 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
16. Limitations of Work – time of year restrictions and any other limitations identified in the contract
17. Traffic work zone set-up and removal, night work and phasing
18. Material Certifications
19. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
20. For Type A and B Contracts only: All items to be paid for, 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.

SECTION 722 (Continued)

21. Contractor's request for validation of FBU (ready to open to traffic)
22. Full Beneficial Use (FBU) Contract Milestone per the following requirements: The majority of contract Work has been completed and the asset(s) has been opened for full multi-modal transportation use, except for limited contract work items that do not materially impair or hinder the intended public use of the transportation facility. All anticipated lane takings have been completed, except for minor, short term work items and as defined in Subsection 8.03 - Prosecution of Work
23. The Department's confirmation of completed work to allow for FBU.
24. Contractor's request for validation of Substantial Completion
25. Department generated punch list of twenty-one (21) Calendar Days
26. Substantial Completion Contract Milestone as defined in the standard specifications.
27. Punch list 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
28. Contractor confirmation that all punchlist work and documentation has been completed.
29. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
30. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
31. Contractor Field Completion Contract Milestone (which can also be considered the completion date) per the following requirements: All physical contract Work is complete including punchlist. The Contractor has fully de-mobilized from field operations and as defined in Subsection 5.11

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.

D. **DURATIONS**

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration of 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

SECTION 722 (Continued)

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

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.

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT Highway Division Contractor Construction Schedule Toolkit.

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. All calendars shall extend two years beyond the current project completion date.

Project Special Provisions identify specific calendar restrictions some 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.
- Planting seasons for trees, shrubs and grasses and wetlands mitigation work.

SECTION 722 (Continued)

- 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. 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.
- 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.
- Night-time paving and striping operations, traffic, and temperature 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.
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.

SECTION 722 (Continued)

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.
6. Leads such as leads, lags, SS, SF, & FF relationships without the expressed permission of the Department.

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.

Each Submission shall, at a minimum, include the following:

a. Narrative
b. Schedule submittals shall be signed by the Scheduler
c. Schedule Printout - All Activities
d. Schedule Printout - Critical Path Layout
e. Schedule Printout - Remaining Work
f. Schedule Printout - Top 3 Float Path
g. Work Breakdown Structure (WBS) Summary
h. Project Spending Report (PSR) in Portable Document Format (.PDF)
i. Project Spending Report (PSR) in Microsoft Excel spreadsheet (.XLS)
j. Oracle Primavera P6 Schedule File (.XER)

All digital file submittals will be labeled with the following information.

- Contract Number
- Project Number
- Project locations (i.e., town(s))
- Brief description
- Submittal description (i.e., UP07)
- Data Date (MM-DD-YY)
- File Description (i.e., Critical Path)

Example: C110464 (P606309) - Orange Route 2 over 202 – UP23 (07-15-22) - Critical Path

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.

SECTION 722 (Continued)

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.
13. include and describe any notifications, communications and coordination meetings with third-parties such as utility companies that occurred from the last update including personnel names, job titles and contact information, date of meeting(s)/correspondence(s), topics discussed, and reasons the third party provided for deviations from the PUC form.

SECTION 722 (Continued)

B. **CPM Bar Charts**

One (1) timescaled 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 timescaled 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.

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.

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.
4. 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

A Projected Spending Report (PSR) shall be prepared and submitted monthly. 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. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF.

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

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 two months (approximately 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 asbuilt sequencing and asbuilt dates for completed and inprogress activities. Asbuilt 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 fragnet 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.

Contract Progress Schedules that extend performance beyond the Contract Time or beyond any Contract Milestone shall not be approved by the Engineer. The Contractor shall submit a Recovery Schedule, or a Time Entitlement Analysis, if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

SECTION 722 (Continued)

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 spreadsheet 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. 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.

722.64 Impacted Schedule Requirements

A. Notice of Delay

The Contractor shall notify the Engineer in writing, with copies to the Rail and Transit Division Project Manager, within fifteen (15) 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 a 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 fifteen (15) 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 demonstrate the schedule impacts most efficiently 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 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. 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 or Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Contract Progress Schedules that predict performance extended beyond the Contract Time or beyond any Contract Milestone shall not be approved as the schedule of record. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

The Contractor shall submit a Recovery Schedule within fifteen (15) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates unless a recovery schedule is waived by the Department. Waiving the recovery schedule does not relieve the contractor of the responsibility for the delay. The Department may revoke the waiver of a Recovery Schedule, at which time a Recovery Schedule shall be submitted within fifteen (15) Calendar Days of the Contractor being notified.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

SECTION 722 (Continued)

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 or 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 acceleration including 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. Proposal Schedules that contain a cost element shall be submitted with a separate Cost Proposal.

Changes represented in the 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.

E. Disputes

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. The Contractor may dispute a decision by the Engineer by filing a claim notice within seven (7) days after the Contractor's request for additional time has been denied or if the Contractor does not accept the number of days granted in a time extension. The Contractor's claim notice shall include a revised time entitlement analysis that sufficiently explains the basis of the time-related claim. Failure to submit the required time entitlement analysis with the claim notice shall result in denial of the Contractor's claim. A determination on the Contractor’s claim shall be in accordance with Subsection 7.16 Claims of Contractor for Compensation. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

SECTION 722 (Continued)

722.65 Schedule Type D Requirements

This section is to detail the requirements for Type D Schedules and is separate from the requirements listed above. These schedules are intended for a project in which a more formal schedule would not be practical.

Schedules for Type D projects shall be submitted for each work assignment. The Schedule Type D shall be submitted electronically in .XLS and .PDF format and meet the following requirements.

The schedule requirements for work assignments that are anticipated to last three weeks or less shall conform to the requirements for Short-term Construction Schedules below.

Work assignments that are anticipated to last longer than three weeks shall submit a bar chart baseline and provided update schedules upon request of the engineer as required under Bar Chart Schedule below in addition to meeting the Short-term Construction schedule requirements.

A. **Bar Chart Schedule**

A Bar Chart that shall include the following:

- Work Assignment start date.
- Activities to identify.
  - Major work operations broken down to be no longer than 14 days.
  - Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before procuring and fabricating.
  - 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.
  - The review and return of shop drawings, procedures, and other required submittals, approved or with comments, the duration of which shall be shown as thirty (30) Calendar Days,
  - Detailed activities to satisfy permit requirements.
  - Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
  - Project Close out activities including a 21-calendar day creation of a punchlist activity and 30 calendar day minimum completion of punchlist activity.
- Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract.
- Access Restraints – restrictions on access to areas of the Work
- Traffic work zone set-up and removal, night work and phasing
- Contract Milestones including Full beneficial Use, Substantial Completion and Contractor Field Completion

The Bar Chart Schedule shall be provided at the beginning of the project and updated with each work order created for the project.

SECTION 722 (Continued)

B. **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 spreadsheet 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. See schedule toolkit for suggested format.

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 on the assignment for the two week period prior and all planned work for the following three 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.

C. **Project Spending Report (PSR)**

A Projected Spending Report (PSR) shall be prepared and submitted monthly. The PSR shall be for all active work assignments, broken down by work assignment. 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. The Projected Spending Report (PSR) shall be depicted in a tabular format and provided in both an .XLS and .PDF

SECTION 722 (Continued)

COMPENSATION

722.80 Method of Measurement

Schedule of Operations (Type A, B and C)

The project bid documents specify the fixed-price amounts to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this fixed price bid item amounts in their bid. Failure to do so may be grounds for the rejection of the bid.

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.

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.

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:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of the Item Cost.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

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.

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. The monthly payment will be the basis for this Equitable Adjustment.

Schedule of Operations (Type D)

For projects assigned with Type D schedule requirements, all scheduling work shall be considered incidental to the project with no separate payment under this section.

SECTION 722 (Continued)

722.81 Basis of Payment

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.

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 (including monthly progress schedules, short-term schedules, project spending reports, TEAs, recovery schedules or impacted schedules) shall be included in this work.

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. The late submission of Impacted schedules, including TEAs, recovery schedules and proposal schedules will result in the forfeiture of the monthly payment for the month in which they were due and subsequent months until the submission is made. Late submission of missed submittals 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 Engineer withholding of full or partial payments of all work performed.

722.82 Payment Items

722.2 SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE $77,500 LUMP SUM

ITEM 102. SELECTIVE CLEARING AND THINNING N/A

The work under these items shall conform to the relevant provisions of Section 8.08, Section 101 of the Standard Specifications, as shown on the plans and the following:

Trees less than six inches in diameter may be removed as necessary for construction. Any tree greater than or equal to six inches in diameter shall be retained and protected; however, if any trees conflict with construction operations, these trees may be removed as required by direction of the Engineer.

The Contractor shall perform selective clearing and thinning in areas within 10 feet of the centerline of culverts and 20 feet by 20 feet beyond each end of the culverts to be replaced or cleaned. Roots of brush and trees within 6' to ends of culverts and the headwalls shall be removed and restore the areas with loam and seed.

The Contractor shall perform selective clearing and thinning areas at bridge approaches for bridges to be replaced and rehabilitated in this contract. The areas shall be within minimum 25 feet from the centerline of track and 20 feet behind each bridge abutment unless otherwise indicated on the plans. Roots of brush and trees within 6' to abutments and wingwalls shall be removed and restore the areas with loam and seed.

The Contractor shall trim low hanging tree limbs in areas adjacent to both sides of the bridges which may conflict with construction operations by direction of the Engineer.

For Bridge 76.23, removal of trees (> 9" in diameter) adjacent to the bridge for construction stagging and access shall be included in the work plan and be approved by the engineer. The locations of the removed trees should be replanted with new trees of the same species with the Engineer's approval.

Prior to selective clearing and thinning and tree trimming operations, the Contractor shall identify all trees to be removed. The Contractor shall review all proposed work with the Engineer and no work shall begin without approval of the Engineer.

The method of disposal of all materials shall be the responsibility of the Contractor and shall be submitted to the Engineer for approval. All methods of disposal shall be accomplished in accordance with all applicable federal, state and local ordinances.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102. Selective Clearing and Thinning is incidental to Items 231.1 thru 231.6 for Cleaning Existing Culverts and Items 233.1, thru 233.9 for culvert replacement, and Items 995.1 thru 995.6 for bridge replacement and rehabilitations. No payment will be made under this Item.

ITEM 114.1 DEMOLITION OF BRIDGE 74.17 LUMP SUM
ITEM 114.2 PARTIAL DEMOLITION OF BRIDGE 76.23 LUMP SUM
ITEM 114.3 DEMOLITION OF TIMBER RETAINING WALL ON BR 85.32 LUMP SUM

GENERAL

The work under this section shall conform to the relevant provisions of Section 112 and the following:

Work under Item 114.1 shall include the complete demolition, removal, and satisfactory disposal of the selected bridge elements to the limits shown on the Bridge Plans and as directed by the Engineer for Br. 74.17. This item shall include, but not be limited to, demolition of timber bridge superstructure, stone masonry abutments and portions of retaining walls/wingwalls.

Work under Item 114.2 shall include the partial demolition, removal, and satisfactory disposal of the selected bridge elements to the limits shown on the plans and as directed by the Engineer for Bridge 76.23. This item shall include, but not be limited to, demolition of the existing superstructure, bridge timber ties, portion of backwalls and bridge beam seats.

Work under Item 114.3 shall include the complete demolition, removal, and satisfactory disposal of the existing timber retaining wall to the limits shown on the plans and as directed by the Engineer for Bridge 85.32.

All materials removed under this section shall become the property of the Contractor and be properly disposed of in accordance with the Standard Specifications, these Special Provisions, and state and federal regulations.

The Contractor shall take all measures necessary to protect pedestrian and vehicular traffic from his construction operations. Materials shall be removed carefully so as to avoid damage to adjacent structures and utilities. During the prosecution of this work, the Engineer may reject the use of any method or equipment, which causes undue vibration or possible damage to the remaining structure or any part thereof. No explosives shall be used.

The Contractor shall locate and protect from damage all existing utilities. The Contractor shall contact utility companies to verify existing utilities and locations and coordinate proposed utility locations prior to demolition and construction.

The Contractor shall obtain all necessary permits, coordinate with the utility owners the relocation of all utilities, and make all required submittals under this item prior to beginning any demolition work.

The Contractor shall be responsible for the disposal of wood as part work of this section. Disposal shall be accomplished through incineration of wood material at an approved facility. The processing and disposal facilities shall be fully licensed and permitted for handling, processing, storage and incineration of treated wood waste. Bottom ash, fly ash, and other by- product residues from the combustion process shall be disposed of at a fully licensed landfill. Identified combustion

facilities must be approved by MassDOT prior to the commencement of burning of disposed wood material.

The Contractor shall comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction and shall comply with ANSI A10.6 and NFPA 241.

The Contractor shall be responsible for reviewing the latest bridge inspection report and verifying that the existing bridge has the capacity necessary for any construction equipment that will be used on the existing bridge during construction. The Owner assumes no responsibility for structure to be demolished.

The Contractor shall schedule a Predemolition Conference to at Project site to review methods and procedures related to bridge demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing bridge.
3. Review and finalize demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.

The Contractor shall provide and maintain shoring, bracing, or structural support to perserve stability and prevent movement or collapse of construction being demolished.

Hazardous Materials: Hazardous materials may be present in structures to be demolished. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified or required by a licensed professional and/or agency having jurisdiction.

No demolition work shall be started until the various federal, state and local agencies and utility companies involved have been notified (not less than 7 days prior to the start of demolition) and the Contractor has received approval from the Engineer as to the equipment, procedures and schedule of operations during the demolition period.

Arrange demolition schedule so as not to interfere with Railroad’s operations.

On-site storage or sale of removed items or materials is not permitted.

Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas. Do not burn demolished materials.

Clean adjacent structures and improvements of dust, dirt, and debris caused by bridge demolition operations. Return adjacent areas to condition existing before bridge construction operations began.

SUBMITTALS

The Contractor shall submit his proposed method of demolition for each structure, including crane capacity and location, demolition sequence, traffic management plan, schedule of operations, lift loads, equipment, tools, procedures, temporary supports, etc., to the Engineer for review. The submittal shall specify that the requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61D, Steel Erection of the Standard Specifications for Highways and Bridges. The demolition procedure and any necessary calculations (loads, selection of crane equipment, and lifting hardware) and drawings shall all be stamped by a Professional Structural Engineer registered in the Commonwealth of Massachusetts certifying that all existing structural members are suitably braced and supported throughout the demolition process. Work under this item may not commence until the Engineer has given written approval of the method of demolition.

MEASUREMENT AND PAYMENT

The work described for Br. 74.17 under this section shall be paid under Item 114.1 and shall be paid for at the Contract lump sum price for the respective items and shall include all labor, tools, equipment, materials, testing, loading, transportation, approvals, permits, and incidental work necessary for the completion of the work including any hazardous material costs.

The work described for Br. 76.23 under this section shall be paid under Item 114.2 and shall be paid for at the Contract lump sum price for the respective items and shall include all labor, tools, equipment, materials, testing, loading, transportation, approvals, permits, and incidental work necessary for the completion of the work including any hazardous material costs.

The work described for Br. 85.32 under this section shall be paid under Item 114.3 and shall be paid for at the Contract lump sum price for the respective items and shall include all labor, tools, equipment, materials, testing, loading, transportation, approvals, permits, and incidental work necessary for the completion of the work including any hazardous material costs.

ITEM 140.0 BRIDGE EXCAVATION N/A

The work to be done under these items shall conform to the relevant provisions of Section 140 of the Standard Specifications and shall consist of the excavation required for demolition of the existing Br. 74.17 and installation of the proposed Br.74.17; for partial demolition of Br. 76.23 and installation of proposed bridge seats and backwalls and concrete aprons of the proposed Br. 76.23; and for removal of existing timber retaining wall on Br. 85.32 and for installation of the proposed precast concrete modular retaining wall.

The excavated material will be transported and spread out within the railroad right-of-way by the Contractor. Approved areas for excavated materials will be determined by HRRC. The Contractor is responsible for disposal of the excavated concrete and stone masonry.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under this section for Br. 74.17 shall be paid under Item 995.1.
The work described under this section for Br. 76.23 shall be paid under Item 995.2.
The work described under this section for Br. 85.32 shall be paid under Item 995.3.

ITEM 180.1 HEALTH AND SAFETY PLAN LUMP SUM

It is the Contractor's ultimate responsibility to ensure the health and safety of all the Contractor's employees and subcontracting personnel, the Engineer and his/her representatives, and the public from any on-site chemical contamination.

GENERAL

The HASP shall include the components required by OSHA 29 CFR 1910.120(b); be designed to identify, evaluate, and control health and safety hazards and provide for emergency response if needed; and 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.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions (e.g. OSHA, RCRA, CERCLA). In addition, guidelines of NIOSH, OSHA, USCG, EPA, etcetera, shall be followed. Equipment used for the purpose of health and safety shall be approved and meet pertinent standards and specifications of the appropriate regulatory agencies.

The HASP shall be submitted to the Engineer for acceptance at least four weeks prior to commencement of work. The review and acceptance of the HASP by MassDOT does not relieve the Contractor of the responsibility for attaining the required degree of protection and training, or to comply with all laws, rules, regulations, standards or guidelines in effect during the execution of the contract.

A copy of the Health and Safety Plan 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 MassDOT, Contractor and sub-Contractors. The employee's signature on the Health and Safety Plan shall be deemed prima facie evidence that the employee has read and understands the plan. A copy of the plan with signatures shall be submitted to the Engineer at the conclusion of the contract, or at the Engineer's request. Signature sheets shall be submitted monthly, or at the request of the Engineer.

49 CFR PART 219 & 243 COMPLIANCE

FRA's rule requires the Contractors and Subcontractors working on a railroad right-of-way be subject all 49 CFR Part 219 testing and 49 CFR Part 243 training. MassDOT requires certification that the Contractor and Subcontractors are in compliance with the requirements of 49 CFR Parts 219 and 243. The Contractor and subcontractors must submit Compliance Plan to FRA for each Part. The FRA will send a letter acknowledging receipt (not approval) of each plan. Once received, a copy of each FRA acknowledgement letter is to be immediately forward to MassDOT, along with certification from the contractor and subcontractors that their plan complies with the requirements of 49 CFR Part 219 or 49 CFR Part 243. The FRA acknowledgement letters and contractor certifications will be part of the compliance records.

The Contractor and Subcontractors will be prohibited from performing work until they are in compliance with 49 CFR Parts 219 and 243. Any delays related to failure to comply with these requirements will be considered a non-excused delay under the contract.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Health and safety plan shall be measured by the lump sum, in accordance with the Plans, as specified herein and as directed by the Engineer.

Health and safety plan shall be paid for at the contract unit price per lump sum which shall be full compensation for all labor, and incidentals necessary for the development and preparation of the HASP and as directed by the Engineer.

ITEM 180.2 HAZARDOUS MATERIALS HEALTH AND SAFETY N/A

For all construction activities that require handling or exposure to regulated soils, the Health and Safety Plan (HASP) shall specify an on-site Health and Safety Officer. The on-site Health and Safety Officer duties shall include but are not limited to: implementation of the site Health and Safety Plan, training, evaluating risks, safety oversight, determining levels of personnel protection required, and performing any required monitoring at the site. A Daily Log shall be kept by the on-site Safety Officer and provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personnel protection being employed, monitoring data and any other information relevant to on-site safety conditions. The on-site Health and Safety officer shall sign and date the Daily Log.

The level of protection, relative to respiratory and dermal hazards, required to ensure the health and safety of on-site personnel will be stipulated in the Health and Safety Plan and will be subject to modification by the on-site Safety Officer based on changing site and weather conditions and the following factors: type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and equipment, and type of equipment to be utilized.

The Contractor shall be required to provide appropriate personnel protective equipment for anyone who is working in an area either containing or suspected of containing a hazardous environment. This work will include both individuals physically working in these areas and those directing the work of same. Contingencies for upgrading the level of protection for on-site workers will be identified in the Health and Safety Plan and the Contractor shall have the necessary materials/equipment on hand to implement the level of protection upgrade in a timely manner. Payment for this level of upgraded protection shall be paid for under Item 180.3.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 180.2 HAZARDOUS MATERIAL HEALTH AND SAFETY shall be considered incidental to the Work.

ITEM 180.3 FULL TIME SAFETY SUPERVISORS N/A

The Contractor shall have full-time (all working hours/one each shift) on-site experienced Safety Supervisors, whose sole responsibility is on-site safety management. Work may not proceed without a Safety Supervisor present on-site.

Safety Supervisors shall successfully complete HRRC RWP training and qualification.

The Contractor shall within thirty (30) days after receipt of the award of the contract submit the resume of the qualifications and work experience of the designated Safety Supervisors proposed for assignment to the Project and evidence of their successful completion of Roadway Worker Protection training and qualification. No construction work shall begin until project Safety Supervisors have been approved by MassDOT.

Safety Supervisors shall have a minimum of 5 years of experience as a construction safety supervisor, three of which include full-time on-site construction safety experience. Qualifications shall include:

- Thorough knowledge of construction safety and OSHA regulations
- Successful completion of OSHA 30-hour Construction Safety and Health training course
- Specialized safety training relevant to the project
- Demonstrated ability in creating a safe work environment
- Working knowledge of safety regulations and hazard control measures
- Demonstrated ability to conduct safety training
- Working knowledge of safety specific contract hazardous work procedures
- Physically able to perform the job
- Thorough knowledge of Title 49 Part 213 Track Safety Standards, Subparts A to F
- Thorough knowledge of Title 49 Parts 219 and 243.
- Thorough knowledge of Housatonic Railroad On-Track Safety Manual
- Thorough knowledge of applicable Provisions of Title 49 CFR Part 214 Railroad Workplace Safety, as promulgated by the FRA, in particular:
    - Subpart B-Bridge Worker Safety Standards
    - Subpart C-Roadway Worker Protection
    - Subpart D-Track Roadway Maintenance machines and Hi-Rail Vehicles

The duties of the Safety Supervisors shall include maintenance of the Contractor's safety program, enforcement of safe practices, and the use of safety equipment and personal protective equipment, and other such activities as may be required by OSHA and MassDOT to maintain job safety and accident prevention. Safety Supervisors shall not be replaced, terminated, nor reassigned without the written approval of MassDOT. MassDOT shall be informed immediately of all safety representative resignations and replacements. A minimum transition period of two weeks shall occur to orient newly appointed safety supervisors. Vacancies in these positions must be filled within two weeks of the vacancy occurring. Safety Supervisors shall be assigned full-time to the contract and shall not be utilized concurrently on any other MassDOT contract or any other projects outside this MassDOT contract.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 180.3 FULL TIME SAFETY SUPERVISORS shall be considered incidental to the Work.

ITEM 180.4 FULL TIME QUALITY CONTROL SUPERVISORS N/A

The Contractor shall have full-time (all working hours/one each shift) on-site experienced Quality Supervisors, whose sole responsibility is on-site quality management, including management of the Contractor's Quality Program. Work may not proceed without a Quality Supervisor present on-site.

Quality Control supervisors must possess thorough knowledge of Title 49 Part 213 Track Safety Standards, Subparts A to F and maintain an active HRRC CWR Plan qualification prior to any work commencing in the field and lasting for the duration of the project.

The Contractor is responsible for controlling the quality of Work including work of its Subcontractors and suppliers and for assuring that the specified quality is achieved. The Contractor, Subcontractors and suppliers shall establish, maintain, and implement a written Quality Assurance Program (QAP). The Contractor shall ensure their Quality Assurance Program includes a responsibility to audit themselves plus all subcontracts, fabricators, and suppliers. The Contractor shall note that MassDOT reserves its right to also perform audits. The Program shall be tailored to the scope and complexity of the Work and shall include implementing procedures and inspection forms equal to or more detailed than those included at the end of this Section and throughout the Special Provisions.

The Contractor shall within thirty (30) days after receipt of the award of the contract submit their QAP, the resumes of the qualifications and work experience of the designated Quality Supervisors proposed for assignment to the Project and evidence of their successful completion of Roadway Worker Protection training and qualification. No construction work shall begin until the QAP and project Quality Supervisors have been approved by MassDOT. The Quality Supervisors shall have at least five (5) years of experience in implementing a quality control program on construction projects of similar size, scope and complexity. The Quality Supervisors shall be technical competent with the freedom and authority to make decisions without pressure or bias and shall have sufficient authority to ensure that quality requirements are consistently maintained.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 180.4 FULL TIME QUALITY CONTROL SUPERVISORS shall be considered incidental to the Work.

Daily Quality Field Report
Contractor
Berkshire Line Track Improvement - Phase III
Contract Number: 117189

Prepared By:		Date Prepared:	
Weather:		Daily Report Date:	

Quality Activities Observed: Provide a Brief Description of Quality Activities Performed

Permanent Material Installed & Products Used			
Material	Purpose	Location	Submittal #

Quality Checks/Inspections/3rd Party Inspections	
Material	Purpose

Quality Manager:	Signature:	Date:

ITEM 231.1	**CLEANING EXISTING CULVERT MP 72.84**	**LUMP SUM**
ITEM 231.2	**CLEANING EXISTING CULVERT MP 76.10**	**LUMP SUM**
ITEM 231.3	**CLEANING EXISTING CULVERT MP 78.60**	**LUMP SUM**
ITEM 231.4	**CLEANING EXISTING CULVERT MP 78.65**	**LUMP SUM**
ITEM 231.5	**CLEANING EXISTING CULVERT MP 82.69**	**LUMP SUM**
ITEM 231.6	**CLEANING EXISTING CULVERT MP 84.40**	**LUMP SUM**

This Item shall govern for the removal of all extraneous material from existing culvert barrels and/or culvert pipes to restore proper drainage at locations shown on the plans and in accordance with this Item.

The work may be performed by hand or mechanical methods or a combination of methods in order to completely expose all inside surfaces of the specified culverts.

The Contractor shall remove and dispose of material from the culvert barrel. When the debris blockage has been removed from the culvert barrel, the entire culvert, including the culvert inverts and beyond 20’-0” from inverts, shall be free of debris, allowing a normal flow of water. Debris is defined as beaver dams, wood, vegetative material, household items and other non-granular materials.

Selective Clearing and Thinning should be performed in accordance with requirements under Items 102.

Stone masonry joints in culvert headwalls shall be repointed in accordance with Item 909.2 as directed by the Engineer.

Dumped riprap (approcimately10’-0” by 10’0” by 3’-0” deep) shall be placed at the outlet of Culvert 78.60 and shall conform to the relevant provisions in Subsection 983 of the MassDOT Standard Specifications.

The work shall be performed in a manner which will not move the culvert out of position nor damage any portion thereof. Any movement or damage done shall be corrected by repairing or replacing the damaged or moved portion of the culvert as directed by the Engineer, at the Contractor's expense.

Material removed from the culvert shall be removed and disposed of in accordance with the requirements of ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS.

The Contractor shall schedule cleaning of the structure to provide proper drainage during construction. The culvert barrel and/or culvert ends shall be free of debris and silt, rock or granular material, allowing a normal flow of water as determined by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work performed under Items 231.1 thru 231.6 shall be measured by the lump sum for each culvert, in accordance with plans, as specified herein and as directed by the Engineer.

The work shall be paid for at the contract unit price per lump sum which shall be full compensation for all excavation, disposal of excavated material, Selective Clearing and Thinning, for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

Repointing of stone masonry joints in culvert headwalls will be paid under Item 909.2.

Installation of dumped riprap at the outlet of Culvert 78.60 shall be incidental to Item 231.3.

ITEM 233.1	**CULVERTS MP 73.23 AND MP 73.24 REPLACEMENT**	**LUMP SUM**
ITEM 233.2	**CULVERT MP 74.30 REPLACEMENT**	**LUMP SUM**
ITEM 233.3	**CULVERT MP 76.05 REPLACEMENT**	**LUMP SUM**
ITEM 233.4	**CULVERT MP 77.90 REPLACEMENT**	**LUMP SUM**
ITEM 233.5	**CULVERT MP 78.10 REPLACEMENT**	**LUMP SUM**
ITEM 233.6	**CULVERT MP 78.17 REPLACEMENT**	**LUMP SUM**
ITEM 233.7	**CULVERT MP 78.21 REPLACEMENT**	**LUMP SUM**
ITEM 233.8	**CULVERT MP 78.50 REPLACEMENT**	**LUMP SUM**
ITEM 233.9	**CULVERT MP 80.90 REPLACEMENT**	**LUMP SUM**

GENERAL

The work specified under this section shall conform to the applicable provisions of Section 230 of the MassDOT Standard Specifications for Highways and Bridges, the Supplemental Specifications, and the specific requirements stipulated below for the component parts of these items. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under Items 233.2 thru 233.9 shall include all materials, equipment and labor needed to replace each of the existing culverts and headwalls with a new steel pipe culvert and reinforced concrete headwalls as shown on the plans. The work also includes selective clearing and thinning, removal and reinstall existing track, excavation, removal and disposal of existing culverts, backfilling and placement of riprap at ends of culverts.

Work under Item 233.1 shall include all materials, equipment and labor needed to grout the existing cast iron pipe Culvert MP 73.23 with Controlled Low-Strength Material; replace existing stone masonry box Culvert MP 73.24 with a twin-steel-pipe culvert. The two pipes are spaced at 5’-0” on center and jointed by steel reinforced concrete headwalls at ends as shown on the plans. The work also includes selective clearing and thinning at ends of the existing and proposed culverts, removal and reinstall existing track, excavation, removal and disposal of existing Culvert MP 73.24, backfilling, grade the inlet area between the existing Culvert MP 73.23 and the proposed Culvert MP 73.24 to direct water away from the grouted existing culvert to the new twin pipe culvert and placement of riprap at ends of the new culvert.

Contractor is responsible for providing an independent material testing company for concrete. No separate payment will be made for testing. Testing shall be considered incidental to the work.

Contractor is responsible for removal and disposal of excavated soil at a location within railroad right-of-way as directed by Housatonic Railroad. Any slope restoration for disposal shall be included in the price of pay items for Culvert Replacements.

The water level is subject to change; therefore, the contractor is responsible for determining the water levels that will exist during construction and take appropriate measures. Dewatering shall be considered incidental to the work.

Cost for temporary removal and reinstalling ballast and track for construction phasing at each culvert is incidental to the Item for the culvert replacement.

Payment for materials shown on the Plans as being part of these culvert replacement or which may be incidental to their construction and are not specifically included for payment under another item shall be considered incidental to the work performed under these items and shall be included in the unit price of the component of which they are a part.

SELECTIVE CLEARING AND THINNING

A. The work under this heading shall be performed in accordance with the relevant provisions of Section 8.08, Section 101 of the MassDOT Standard Specifications, and the requirements under Item 120. Selective Clearing and Thinning in special provisions. The work is incidental to the culvert replacement.

CONTROL OF WATER

GENERAL

The work to be performed under this item shall include all pumping, sandbagging and other measures, required for maintaining for sufficient water control for replacement of culverts.

The Contractor shall provide proper drainage during construction.

SUBMITTALS

Plans for all sandbagging and other water control measures shall be developed by the Contractor. These plans shall be submitted for the approval of the Engineer prior to the start of construction.

CONSTRUCTION METHODS

The Contractor shall use such equipment and shall perform his operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. The Contractor shall keep the work area dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway.

The pumping discharge shall not be allowed to enter directly into the waterways. The water from the work areas shall be pumped to a settling tank/basin. The tank shall be constructed so as to allow for the pumped water to pass through the tank with sediments settling out before letting the water out to an area enclosed by hay bales. The tank can be constructed of concrete, fiberglass, or any other material that will meet the following:

Approximately 70 percent sedimentation trapping efficiency shall be achieved with a typical tank to ensure that the tanks are adequately sized to prevent overtopping from dewatering and to provide the required filtering.

The outlet from the settling tank/basin shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the tank/basin.

The settling tank/basin shall be maintained as follows:

1) Inspect at least twice daily during dewatering operations.
2) Repair any damage immediately.
3) Clean tank/basin outlet daily. Remove any debris immediately.
4) Remove sediments when deposits reach 9" below the outlet invert.
5) Dispose sediments outside of wetland areas at a location approved by the Engineer.

The Contractor shall inspect hay bales that surround the outlet daily and shall immediately replace any that are damaged.

Pumping shall be conducted in a manner that will not adversely affect the freshly placed concrete within the excavation.

The Contractor shall provide and maintain ample pumps, pipes and other devices to promptly and continually remove and dispose of water from the excavation areas. The size and configuration of pumps and pipes shall be selected by the Contractor.

BACKFILL EXISTING CULVERT MP 73.23 WITH CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

GENERAL

The work performed under this section shall conform to the relevant provisions of Section 140 of MassDOT Standard Specifications for Drainage Structure Abandoned and the following.

MATERIAL

Controlled Low-Strength Material (CLSM): CLSM Structural Non-Excavatable as specified in Section M4.08.0 of MassDOT Standard Specifications for Highways and Bridges. The CLSM shall be a non-segregating, free-flowing, self-leveling and self-consolidating material that will result a hardened, dense backfill

SUBMITTALS

1. At least 30-days before starting placement of CLSM, the Contractor shall submit a mix design to the Engineer. The mix design shall include, but not be limited to the following information:
    a. The source of supply of each of the materials shall be approved by the Engineer before delivery or use. The Contractor shall submit the manufacturers and suppliers certification of compliance for all materials covered by referenced Specifications.
    b. Certification of compliance of the design mix relative to the mix design requirements of this specification and referenced specifications.
    c. Certification of compliance of component materials used in the mix design to this specification and referenced specifications.

d. Representative gradations for aggregate from the designated aggregate source and proposed gradation limits for aggregates to be used in the CLSM.
e. Plastic characteristics of the design mix including temperature, slump, air entrainment, wet unit weight, yield, and cement factor.
f. Performance characteristics of the hardened flowable fill to include compressive strength of all specimens and the corresponding average compressive strength. Compressive strength tests shall be reported for ages of 7 days, 28 days and 90 days. The test results shall be certified and be from a qualified, independent, and commercial testing laboratory.
g. Unit weight of all compressive strength specimens at the time of testing and the corresponding average unit weight.
h. The moisture density relationship for the combined cement, fly ash, mineral filler (if used), as determined in accordance with ASTM D 558.

2. Provide fill placement equipment and procedures for the Engineer review and approval prior to the backfill. Selected equipment and proposed procedure shall be able to fully fill the pipe but avoid damage to existing track, underground utilities and structures. The proposed pressure for running equipment shall not distort or imperial portion of work, new or existing. The equipment used shall be capable of continuous delivery at planned placement rate.
3. Two monitor holes shall be installed on the top of the pipe at a minimum of 6’ from each end of culvert. The purpose of the monitoring holes is to ensure that the pipe is fully filled. The Contractor shall provide plan and details for the monitoring hole locations and details to the Engineer for review and approval.
4. Pressure grout method shall be used to remediate placement of CLSM which does not fill voids in pipe or where voids developed due to excessive shrinkage or bleeding of fill. The grout material and procedure shall be provided to the Engineer for review and approval. It shall be at the Contractor’s expense to fill the voids.

CONSTRUCTION METHODS

A. Clean pipes and manholes of debris and remove sludge and other substance that may degrade performance of fill.
B. Remove free water prior to starting fill placement.
C. Batching, mixing and delivery shall conform to the requirements of either ASTM C 94 or C 685. CLSM shall be placed when the weather conditions are favorable and when the ambient temperature is above 40 degrees F, or above 34 degrees F and rising. CLSM placement shall stop when the ambient temperature is below 36 degrees F and falling. At the time of placement, CLSM shall have a temperature of at least 50 degrees F. CLSM shall be cured at a minimum temperature of 40 degrees F for at least 24 hours after placement.
D. The CLSM shall be sampled and tested in the field in conformance with either ASTM C 94 or C 685 and in conformance with these Specifications. Samples for tests shall be taken for every 75 cubic yards of material, or fraction thereof, for each day’s placement. Tests shall include temperature and five compressive strength cylinders. Compressive strength sampling and testing shall conform to ASTM D4832 with one specimen tested at 7 days, two at 28 days, one at 90 days and one held for each batch of five specimens. The sampling and testing shall be performed by a qualified, independent commercial testing laboratory employed by the Contractor with results submitted to the Engineer within 48 hours of completion of testing. The Engineer may perform his own testing of the CLSM using any or all of the above test methods. The Contractor shall cooperate with the Engineer in the testing of the CLSM.
E. Continuously place CLSM for the pipe with no intermediate pour points. Pump CLSM through bulkheads constructed for placement of two 2-inch PVC pipes or use other suitable construction methods to contain CLSM in pipe to be abandoned. These PVC pipes will act

as injection points or vents for placement of CLSM. Place CLSM under pressure flow conditions into properly vented open system until CLSM emerges from vent pipes. Pump CLSM with sufficient pressure to overcome friction and to fill pipes from downstream end, to discharge at upstream end. The filling operation shall be continued until the CLSM is observed exiting from the monitoring holes. The volume of CLSM required for filling each segment of pipes shall be estimated prior to the operation. During the operation, the Engineer shall be notified immediately if an excessive volume of CLSM has been placed in the pipe but no CLSM is observed at the top of monitoring holes.

F. Filling operation shall be performed by experienced crews with equipment to monitor density of fill and to control pressure. During placement of fill, ensure no voids remain unfilled.
G. After completing the work, both ends of the abandoned culvert pipe should be sealed in a neat, workmanlike manner that is acceptable to the Engineer.
H. The areas excavated to access the monitoring holes and to remediate the voids shall be backfilled with gravel borrow in accordance with the requirements in Section 140 Excavation.
I. After completing the work, the Contractor shall remove from the project site any excess CLSM that resulted from spillage, et cetera, and restore the project site to a condition that is acceptable to the Engineer. If excavation is required to reach the abandoned pipe, the contractor shall restore the area to its original condition as directed by the Engineer.

EXCAVATION

A. The excavation work performed under these items for culvert replacements shall conform to the relevant provisions of Section 140 of MassDOT Standard Specifications.

B. The excavation shall include the removal and satisfactory disposal of materials including the existing culvert structure and headwall at their entireties.

C. Contractor shall remove and dispose of excavated soil in accordance with the requirements of ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS

GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

A. The work under this item shall conform to the relevant provisions of Section 150 of the MassDOT Standard Specifications. Material for Gravel Borrow for backfilling structures shall be in accordance with the requirements in Section M1.03.0, Type b of the Standard Specification

CRUSHED STONE

A. The work under this item shall conform to the relevant provisions of Section 150 of the MassDOT Standard Specifications.

RIPRAP

A. The work under this item shall conform to the relevant provisions of Section 983 of the MassDOT Standard Specifications.

GEOTEXTILE FILTER FABRIC

A. The work under this item shall consist of placing geotextile fabric under crushed stone. The geotextile fabrics shall conform to M9.50.0: Geotextile Fabrics for stabilization of MassDOT Standard Specifications.

CEMENT CONCRETE

A. The work under this heading shall conform to the relevant provisions of Section 901 of the MassDOT Standard Specifications.

B. Concrete for bridge beam seats shall be high early strength concrete. Concrete compressive strength shall be a minimum of 4,000 PSI at 24 hours. The concrete mix shall be approved by MassDOT and used in pervious MassDOT projects.

STRUCTURAL STEEL

A. The work under this heading shall conform to the applicable provisions of the AREMA Manual of Railway Engineering, Chapter 15, Section 960 of the MassDOT Standard Specifications and the following:
   1. All welding and the preparation and assembly of material for welding shall conform to the current editions of the Standard Specifications,) and the AASHTO/AWS Bridge Welding Code (ANSI/AASHTO/AWS D1.5).
   2. Material for steel pipe shall be as specified on the plan.
   3. All structural steel shall conform to ASTM A709, Grade 50 unless otherwise noted.

TRACK WORK

A. Track work consists of removal and reinstallation of exiting rails and cross ties and placement of new ballast. The work shall be performed in accordance with the contract drawings, ITEM 492.11.1 TRACK RECONSTRUCTION, with relevant requirements under MassDOT MW-1, and Items 458.6.1 FURNISH BALLAST & 492.8.1 SURFACE AND ALIGN BALLASTED TRACK. The existing top rail elevations and track alignment should be maintained after culvert replacement. The track work is incidental to culvert replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work performed under Items 233.1 thru 233.9 shall be measured by the lump sum for each culvert, in accordance with plans, as specified herein and as directed by the Engineer.

The work shall be paid for at the contract unit price per lump sum which shall be full compensation for all labor, materials, tools, equipment and incidentals necessary to complete the work.

ITEM 458.6.1 FURNISH BALLAST TON

GENERAL

These Specifications describe requirements for the furnishing, testing, and procurement of ballast to be used in track construction and for aligning and surfacing track. Ballast shall meet, in every respect, specifications of the American Railway Engineering and Maintenance-of-Way Association (AREMA) contained in the Manual for Railway Engineering, Volume 1, Chapter 1, Part 2 – Ballast, Sections 2.2 through 2.6 standards. Ballast shall be installed at locations per the Contract Drawings and at the direction of the Engineer.

SUBMITTALS

1. Prior to shipment of ballast, submit the name of the ballast supplier, processing facility and testing laboratory that will sample and test the ballast as in AREMA, Chapter 1, Tables 1.2.1 and 1.2.2 to the Engineer for review and approval.
2. Prior to shipment of ballast, submit inspection reports certifying that all required tests and inspections as specified herein have been made and that the ballast being shipped is in full compliance with AREMA specifications and as specified herein to the Engineer for review and approval.
3. Prior to shipment of ballast, submit a certification that field samples were secured in accordance with the current ASTM Methods of Sampling Designation D75, and that test samples were reduced from field samples by the means of ASTM C702 to the Engineer for review and approval.
4. Required testing includes, but is not limited to:
    a. Sieve Analysis: ASTM Method of Test Designation C136
    b. Material Finer than No. 200 Sieve: ASTM Method of Test Designation C117
    c. Bulk Specific Gravity: ASTM Method of Test Designation C127
    d. Absorption: ASTM Method of Test Designation C127
    e. Percentage of Clay Lumps and Friable Particles: ASTM Method of Test Designation C142
    f. Resistance to Degradation: ATSM Method of Test
    g. Designation C535 - Material gradations with particles retained on 1” sieve
    h. Designation C131 - Material gradations with 100% passing the 1” sieve
    i. Sodium Sulfate Soundness: ASTM Method of Test Designation C88
    j. Unit Weight: ASTM Method of Test Designation C29
    k. Percent of Flat and/or Elongated Particles: ASTM Method of Test Designation D4791
5. For each ballast sample obtained, test results shall be entered in the **Field Inspection Summary Report** included in this specification and submitted to the Engineer for review and approval prior to the shipment of ballast.
6. Sampling and testing of ballast as specified herein shall not be billed separately, but are included in the cost per ton of ballast supplied to MassDOT.

Submit the following for review and approval by the Engineer before ballast work is started:

1. List of proposed equipment for use in construction. The list shall be submitted to the Engineer twenty-one (21) days prior to the start of work and shall include the name of the manufacturer, dimensions and weights of the equipment and the intended use of each of piece of equipment.
2. Proposed construction and installation procedures for ballast installation, and track surface and alignment.
3. Manufacturer's certificate of compliance to the Engineer for all materials that are incorporated into the work.

QUALITY ASSURANCE

1. Provide certified test results of ballast quality and grading as conducted by the approved testing laboratory.
2. In addition, provide tests for gradation (sieve analysis) for every 1,000 tons of ballast delivered to the job site.
3. Testing, as defined by this specification, shall be performed at least two (2) times a year or as directed by the Engineer, to ensure the quality of the material being produced. If the supplier changes the location of the source or encounters changes within the supply source, laboratory testing shall be performed on the new material to ensure compliance with specifications.
4. Field samples shall be secured in accordance with the current ASTM Methods of Sampling, Designation D75. Test samples shall be reduced from field samples by the means of ASTM C702.
5. If the source of ballast changes during ballast installation, additional certified test results (in accordance with the requirements included under Submittals and Quality Assurance) shall be provided to the Engineer for review and approval prior to the shipment of the ballast from the new source.
6. Supplier shall certify with billing that the ballast delivered is typical of the ballast which has been tested and that has been approved by the Engineer.
7. Perform sampling and tests of the ballast material to determine compliance with specified requirements. Samples shall be initially taken from the supplier's source (quarry). Additional samples may be taken from the site at the direction of the Engineer.

PRODUCTS

PRODUCTS AND MATERIALS TO BE PROVIDED BY HRRC OR MASSDOT

1. None

PRODUCTS AND MATERIALS TO BE PROVIDED BY THE CONTRACTOR

1. All Ballast

MATERIALS

1. Ballast shall conform to AREMA Number 4 Gradation.

2. Ballast shall be crushed, quarried, and washed Granite or Traprock composed of hard, strong, angular, and durable particles, free from frozen lumps, foreign materials, and injurious amounts of substances and conforming to all of the requirements of these specifications.
3. Ballast shall conform to the following Limiting Values:

No.	Property	Ballast Material	
		Granite	**Traprock**
1.	Sieve Analysis	AREMA No. 4	AREMA No. 4
2.	Percent Material Passing No. 200 Sieve	1.0%	1.0%
3.	Bulk Specific Gravity See Note 1 below	2.60	2.60
4.	Absorption Percent	1.0	1.0
5.	Percent Clay Lumps and Friable Particles	0.5%	0.5%
6.	Degradation Percent	35%	25%
7.	Soundness (Sodium Sulfate) 5 Cycles (Percent Material Loss)	5.0%	5.0%
8.	Unit Weight (lb/ft^3)	By Engineer	By Engineer
9.	Percent Flat and/or Elongated Particles	5.0%	5.0%
	Note 1: Use ASTM Test Designation most representative of ballast material gradation as specified above. Note 2: The limit for bulk specific gravity is a minimum value. Limits for the remainder of the tests are maximum values.		

EXECUTION

DELIVERY OF BALLAST

1. Contractor is responsible for coordinating delivery of ballast, including the delivery schedule. Contractor shall coordinate delivery windows and track access required for ballast delivery with HRRC.
2. Contractor shall provide HRRC written notice a minimum of two weeks prior to the date ballast will be delivered to the site.
3. The Contractor is responsible for all ballast delivered by rail or truck.
4. See ITEM 850.42 WORK TRAINS for locomotive support available from HRRC for moving ballast cars within the project corridor.
5. Contractor is responsible for all scheduling and coordination for ballast delivery. MassDOT is not responsible for delays or any additional costs associated with delivery of ballast, all costs shall be the responsibility of the Contractor.

PRODUCTION AND HANDLING

1. The ballast production facility shall be of such a design to permit production and or blending without excessive working of the materials. The capacity of the production facility shall be adequate to efficiently produce the anticipated daily loadings providing sufficient stockpiles to facilitate loadings without any delays.
2. Blending, stockpiling and other production and handling operations shall be managed by the producer to keep ballast clean and minimize segregation of the finished product. Stockpiling operations shall minimize the breakage or excessive fall in stockpiling operations. The movement of wheeled or tracked machines over stockpiled materials shall be limited.

3. Processed ballast shall be washed and/or rescreened as necessary to remove fine particle contamination as defined by the specification prior to stockpiling in operations using stockpiles or immediately prior to loading operations.

LOADING

1. Processed ballast shall be loaded only into rail cars or trucks which are in good order, tight enough to prevent leakage and waste of material, and clean and free from rubbish or any substance which would foul the ballast.

INSPECTION

1. MassDOT, or its representatives, reserve the right to make unscheduled visits to the supplier's facility during normal business hours for the following purposes:
    a. Observe sampling and testing procedures to assure compliance with the requirements of these specifications.
    b. Obtain representative samples of the prepared material being produced and shipped.
    c. Review plant inspection, methods, quality control procedures, and equipment and review test results of both current and previous tests.
2. The supplier shall provide MassDOT or its representative with such assistance, materials, and laboratory testing equipment as necessary to perform so called "on site production tests" consisting of site gradation and percent passing No. 200 sieve.
3. Performance of these tests at the time of an unscheduled inspection visit is the right, but not the duty, of the inspector.

CONSTRUCTION QUALITY CONTROL AND ASSURANCE

ACCEPTANCE/REJECTION

1. To be accepted, ballast offered shall conform to this specification in all respects. Ballast is also subject to inspection at delivery and is at the supplier's risk until acceptance. Ballast rejected for non-compliance with this specification will be picked up, loaded, and transported off-site at the Contractor's expense. Ballast installed prior to acceptance and subsequently rejected for non-compliance with this specification shall be removed and replaced at the Contractor's expense. MassDOT is not responsible for any costs associated with rejection of ballast.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment, and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Work under ITEM 458.6.1 FURNISH BALLAST shall be measured and paid at the contract unit price per TON under ITEM 458.6.1 FURNISH BALLAST. Contractor shall submit weight tickets to the Engineer for all ballast furnished. No payment will be made without weight tickets being submitted to the Engineer.

MassDOT Rail Division
FIELD INSPECTION SUMMARY REPORT
To Be Submitted by Supplier

Ballast Supplier:	**Sample Location:**
Quarry Location:	**Sample No./Type:**
Date Sampled:	**Testing Company:**

Field samples were secured in accordance with the current ASTM Methods of Sampling Designation D75. Test samples were reduced from field samples by the means of ASTM C702.

Supplier's Authorized Signature

TEST	ASTM STANDARD		ALLOWABLE RESULT/RANGE		TEST RESULT	PASS/ FAIL	COMMENTS
1. Sieve analysis AREMA No. 4	C136		UL %	LL %			
Ballast Material ❑ Granite (G) ❑ Traprock (T)	% Passing	2"	-	100%			
		1 ½"	100%	90%			
		1"	55%	20%			
		¾"	15%	0			
		½"	N/A	N/A		N/A	
		⅜"	5%	0			

TEST	ASTM STANDARD	LIMITING VALUE	TEST VALUE	PASS/ FAIL	COMMENTS
2. Percent Material Passing No. 200 Sieve	C117	1.0%			
3. Bulk Specific Gravity	C127	2.60			
4. Absorption Percent	C127	1.0			
5. Percent Clay Lumps and Friable Particles	C142	0.5%			
6. Degradation Percent	❑C131/❑C535	G-35% /T-25%			
7. Soundness (Sodium Sulfate) 5 Cycles (Percent Material Loss)	C88	5.0%			
8. Unit Weight (lb/ft^3)	C29	By Engineer			
9. Percent Flat and/or Elongated Particles	D4791	5.0%			

ITEM 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS **TON**

DISPOSAL REGULATIONS

Wood materials are to be disposed in accordance with local, State and Federal regulations. The Contractor shall notify MassDOT which facility will be used to dispose of crossties and wood materials. A copy of the Mass DEP certification showing that it is an approved disposal facility along with all weight slips for crossties/timbers sent to an approved facility shall be provided to MassDOT.

1. REMOVALS/DEMOLITION

   The Contractor shall remove and dispose of materials to the limits indicated in the Contract Drawings and these Special Provisions.

   a. Non-contaminated and contaminated materials shall be disposed of at a certified disposal facility. The Contractor shall provide the weight slips and other documentation as required for the disposal of all materials.
   b. Disposal of all ties/timber removed from track during general tie/timber replacement and track rehabilitation at a certified and registered facility. Pieces of ties may have to be picked up by hand and/or raked up to be loaded out for disposal.

DISPOSAL OF OLD CROSSTIES

The Contractor is responsible for the cleanup of all crossties on the right-of-way including those from previous crosstie installation projects. All old crossties and timbers are to be picked up and disposed of at a Mass DEP approved disposal site as specified in the Special Provisions. Wood pickup is to be done concurrently with installation of crossties.

1. Disposal of Materials

   a. Dispose of scrap ties and timber.
   b. Disposal of all ties/timber removed from track during general tie replacement and track reconstruction at a certified and registered facility.
   c. The Contractor to obtain:

      i. Weight tickets from certified facility giving tie tonnage, trucker, truck number and date brought to the plant.
      ii. Corresponding truck tickets used by haulers to remove ties from project and transferred to certified facility.
      iii. Tickets from (a) and (b) must match and will be used to determine actual payment to the Contractor.

   d. Small pieces of removed ties will not be allowed to remain on the right-of-way. Pieces of ties may have to be picked up by hand and/or raked up to be loaded out for disposal.

PRODUCTION RATES

Scrap crossties and other wood products shall be removed from the right of way within five (5) working days of their removal from the track.

Piles of scrap crossties and other wood products are permitted at locations agreed upon between the Contractor and the HRRC. Such staging piles must be removed within thirty (30) days of completion of the crosstie installation phase of this Contract.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Cleanup And Disposal of Defective Crossties and Wood Material will be measured by the TON and the quantity paid shall be the number of tons of disposed crossties and wood material as determined by the actual amount of defective crossties and wood material disposed from the tickets produced by a MassDOT/Mass DEP certified facility.

Work under this item shall be paid at the contract unit price per TON. No additional payment in excess of the contract price will be made without prior approval from MassDOT.

All other labor and material required to complete work within the ITEM 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES AND WOOD MATERIAL, including but not necessarily limited to, pickup of materials, disposal of materials, and maintaining the Work Area in a neat and orderly fashion, meeting all of the requirements of the ITEM 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES AND WOOD MATERIAL, shall be considered incidental to ITEM 492.3 CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES AND WOOD MATERIAL.

ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK TRACK FOOT

GENERAL

This Section specifies the requirements for placing track ballast stone and for surfacing and aligning the track. Work includes general procedures for curve modifications in existing track, including track raises, changes in track superelevation where existing conditions have been modified by contract work, as well as final surfacing and alignment in areas where complete track reconstruction will be performed. Work includes:

1. Initial and final surfacing and aligning of tracks
2. Track ballast compaction
3. Track Raises
4. Curve and superelevation modification
5. Resurfacing and aligning of track

Related work specified elsewhere includes:

1. ITEM 458.6.1 – FURNISH BALLAST
2. ITEM 492.11.1 – TRACK RECONSTRUCTION
3. ITEM 492.11.2 – TRACK CONSTRUCTION – BRIDGE AREA

REFERENCE STANDARDS

1. Current American Railway Engineering and Maintenance of Way Association (AREMA), Manual for Railway Engineering, Chapter 1.

SUBMITTALS

1. Submittals will be reviewed for general conformance with the intent of the Contract Documents. This review will not relieve the Contractor of final responsibility for the means, methods, procedures, and sequences to be used.
2. The following submittals shall be made to the Engineer for review and approval prior to procuring any material or performing any work required under this Section:
    a. A detailed description of the methods and procedures to distribute, tamp, regulate, compact and dress ballast for track work.
    b. Submit type and specifications for equipment to be used in the placing, compacting, and tamping of track ballast and for aligning of track.
    c. Submit charts and reports from tamper/liner for all curves adjusted as part of the Work.

MECHANIC

1. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic

shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

QUALITY CONTROL

1. Testing of ballast at the production facility and on the job-site shall be performed in accordance with ITEM 458.6.1 FURNISH BALLAST.

2. Tolerances
    a. Track construction tolerances shown below shall not be exceeded.

3. Document and provide existing track geometry data prior to commencing surface and align work and upon completion of all surface and align work. Data may be collected by geometry car or other suitable equipment capable of measuring and documenting line and surface data required to confirm construction is within required tolerances. All data shall be submitted to MassDOT for record.

PRODUCTS

PRODUCTS AND MATERIALS TO BE PROVIDED BY MASSDOT

1. None.

PRODUCTS AND MATERIALS TO BE PROVIDED BY THE CONTRACTOR

1. Ballast furnished by ITEM 458.6.1 FURNISH BALLAST.

EXECUTION

LINE AND GRADE

1. Final track line and grade shall conform to the existing track line and grade to the extent possible except as indicated otherwise in the Contract Drawings.
2. The final profile shall be raised in additional areas as indicated in the Contract Drawings.

CONSTRUCTION TOLERANCES

1. Final surface, aligning and gauge of track shall be within the following tolerances:

Track Surface and Alignment

Construction Tolerance	(Inches)
Deviation from uniform profile on either rail at the midordinate of a 62 ft. chord shall not exceed	± ¼"
Deviation from zero cross level at any two points less than 62 ft. apart on tangents or specified elevation on curves shall not exceed	± ⅛"
The difference in cross level between any two points less than 62 ft. apart on tangents or curves shall not exceed	± ¼"
Deviation from uniform alignment between any two points less than 62 ft. apart on tangent and curved track shall not exceed	± ¼"

2. There is no reverse elevation allowed in curves. Curves shall be elevated as follows:
    a. Elevation shall be run out in spirals as indicated on the Contract Documents.
    b. The actual elevation in a curve shall be within +⅛" and -0" of the design value.
3. Gauge of track shall be as follows:
    a. CWR: 56½" (± 1/8").
    b. Jointed Rail: 56½" (+ 1/4", -1/8").
4. Required superelevation in curves is as indicated in the Contract Drawings.
5. The Contractor, at no cost to the Project, shall correct any deviations from the above specified tolerances.

RUNOFF – VERTICAL ALIGNMENT

1. The runoff at the end of a raise into a hold point in track, such as at the project limits location, shall not exceed 1-1/2 inch in 31 feet of track unless otherwise approved by the Engineer.

MONITORING CURVE MOVEMENT FOLLOWING TRACK SURFACING AND ALIGNING

1. Stake and monitor curves for movement in accordance with requirements of MassDOT MW-1, Appendix A Continuous Welded Rail (CWR) procedures.

SURFACING AND ALIGNING FOR TRACK RECONSTRUCTION AND CURVE MODIFICATIONS

1. Check grade lines and cross section prior to placing ballast. Bring ballast to proper elevation as shown in the Contract Drawings.
2. Clean trackbed area of debris and standing water prior to placing ballast.
3. Distribute and compact four inch layers (maximum) of ballast uniformly and as required to achieve required ballast depth prior to tie distribution.
4. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work, maintaining a proper interval of operations, and at such times as to permit proper inspection by the Engineer.
5. To extent practicable, unload ballast in position for use with a minimum of redistribution and

dressing.

6. Self-spreading vehicles may be used as approved by the Engineer. When stone is initially spread by self-spreading vehicle a power grader may be used to assist spreading operations.
7. Shape ballast to a true section conforming to the ballast section shown on Standard Plans and Contract Drawings.
8. Thoroughly compact each ballast layer until stones are firmly interlocked and surface is true and unyielding. Compact each lift with not less than four passes of a roller or a vibratory compactor subject to the following requirements:

    a. Compact by rolling using either a self-propelled, three-wheel, or two axle roller of such weight that will provide compression under the rear wheels of not less than 350 pounds per linear inch of tread; or using a two or three-wheel tandem roller having a weight per inch of drive roll of not less than 350 pounds, and every part of the surface receiving compression from the drive wheels.
    b. Compact by vibration using vibratory compactors of either the roller or pad type. Dynamic force for either type shall not be less than 20,000 pounds and the frequency range shall be 1100 to 1500 vpm. Use machines equipped with a governor which can be set and locked to control rate of impulse. Provide a tachometer or other suitable device for accurately checking the frequency of vibration during the compacting operation.

9. Top surface of initial layers of ballast shall be smooth, flat and uniformly compacted prior to distributing ties. Surface shall be free of ruts.

    a. Unload ballast in quantities which will fill tie cribs and provide an adequate amount of ballast for the initial track raise with sufficient surplus to continue to hold track after initial raise.
    b. Prior to dumping ballast in track, ties shall be properly spaced as specified and shall be square with rails.
    c. Contractor shall re-space and straighten ties as required before stone is distributed.
    d. The Contractor shall use a ballast regulator machine to distribute the stone ballast in sufficient quantity for tamping the track and for restoring the ballast section.
    e. The Contractor shall avoid pulling sod, vegetation, and other foreign material onto the track structure or shoulders for purpose of tamping or dressing the ballast section. Any sod, vegetation or foreign matter inadvertently pulled in shall be removed by the Contractor prior to tamping.
    f. Clean the track way area of all debris and standing water prior to placing of ballast. Do not place ballast on frozen subgrade or subballast.
    g. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work.
    h. To the extent practicable, unload ballast in position for use with a minimum of redistribution and dressing.

10. Tamping

    a. Tamp ballast with 16 tool, squeeze-vibratory type, power tamping equipment. Control of power tamper shall ensure maximum compaction of ballast uniformly along track. The Engineer will determine tamping variables, including rate of advance, number of passes, number of insertions per tie (if more than two are required), length and number of blades, and frequency of vibration. Tamping tools shall be replaced when the working

surface is worn more than 30 percent of its original surface area. Procedures and equipment shall be as approved. To allow for proper insertion depth below bottom of crossties, the tamping tools shall be adjusted to compensate for concrete/timber crosstie size difference.

b. Tamp ballast thoroughly under both sides of tie from a point 15 inches inside rails to ends of tie.
c. For each tie, tamp simultaneously inside and outside both running rails on both sides of tie. Minimum tamping insertions shall be two.
d. The Contractor shall remove 5 ties per mile, at locations selected by the Engineer, in order that the Engineer may inspect ballast compaction beneath ties. If compaction does not meet requirements of these Specifications, additional ties shall be pulled at the Engineer's direction to discover limits of inadequate tamping. Areas of inadequate tamping shall be retamped at no additional cost to MassDOT.
e. Tamping on snow covered or frozen ballast will not be permitted.

11. Surfacing and Aligning

a. Surface and align track by methods which will prevent undue bending of rail, straining of joints, or damaging of rail fastening assemblies.
b. Surface and align track only after cribs are filled with ballast.
c. Restore ties pulled loose during surfacing to full bearing against rail and properly secure them.
d. Remove and replace any ties or fasteners damaged during surfacing operations with new ties and fasteners at no additional expense to MassDOT.
e. Surface and align track to meet Class 3 specifications per FRA Track Safety Standards Part 213 and the Contract Documents.
f. Surfacing and aligning shall be performed to comply with surface and superelevation tolerances specified and shall consist of a lift of one inch maximum, unless otherwise directed by the Engineer, and shall not endanger horizontal and vertical stability of tracks.
g. Track liner employed shall be a fully automatic model capable of determining existing curve data, computing new values for optimum curve value, and lining track to the new values without disturbing track surface.
h. Machine shall be capable of producing a tape or graph showing existing and proposed values and this tape shall be reviewed and approved by the Engineer prior to final lining. Tape shall become the property of MassDOT.

12. Ballast Compaction and Ballast Dressing

a. Concurrent with surfacing and aligning of all tracks and turnouts, consolidate cribs and shoulders and dress ballast to conform to ballast section shown in the Contract Drawings and as directed by the Engineer.
b. After surfacing and alignment of track is completed, consolidate cribs and shoulders and dress ballast to conform to ballast section shown in the Contract Drawings. Top of ballast shall be one inch below base of rail. Ballast shoulders shall be 12” minimum on tangents and 16” minimum on curves. The 16” minimum shoulder width on curves may be reduced at the direction of the Engineer, shoulder width on curves shall not be

reduced without prior approval of the Engineer.

c. Subbase outside toe of slope of ballast that has been fouled or disturbed by Contractor's operations shall be properly sloped as shown in the Contract Drawings or as directed by the Engineer.
d. Upon completion of surfacing and aligning produce as-built chart from tamper or liner and submit to the Engineer.
e. Reconsolidate cribs, shoulders and redress ballast if disturbed during removal of existing rail.

FINAL TRACK INSPECTIONS

1. Final horizontal and vertical alignment, gauge, superelevation and cross level shall be within the tolerances specified. In order to determine the acceptability of finished track, the Contractor together with MassDOT, and at the Contractor's expense, shall conduct a final inspection to establish that track construction is within tolerances specified in ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK.
2. Track deviations disclosed by inspection, which exceed tolerances specified herein, shall be corrected by the Contractor at no additional cost to MassDOT. Reinspections shall be made by the Contractor and MassDOT to ensure that corrections have been made.
3. Final inspection shall include testing by geometry car equipment with test parameters set for FRA Class 5 track, to evaluate gauge, cross level, left and right rail profiles, track alignment, twist, warp and superelevation. Equipment shall be capable of measuring the parameters specified above with sufficient accuracy to establish that the track construction is within the specified tolerances. Contractor shall submit for approval the proposed equipment to be used and who will be conducting the testing, prior to the start of the work. Records of all testing and results shall be submitted to the Engineer.
4. Notify the Engineer one month in advance regarding the request for the scheduling of final track inspections.
5. The Contractor shall correct track deviations, as disclosed by final inspection, at no additional cost to MassDOT.
6. The Contractor shall participate in any retesting, required as a result of corrections to work, at no additional cost to MassDOT. Cost of MassDOT approved equipment required for retesting shall be the sole responsibility of the Contractor.

MEASUREMENT AND PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

TRACK FOOT measurement for ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK shall be based on the physical distance between the stationing limits show in the Contract Drawings. The TRACK FOOT unit price shall include all passes required to surface and align the track within those limits.

Work under ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK shall be measured and paid at the contract unit price per TRACK FOOT under ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK.

ITEM 492.10 SPOT DITCHING OF RAILROAD RIGHT-OF-WAY LINEAR FOOT

GENERAL

This work will consist of creating and/or re-establishing the railroad ditching along the Railroad right-of-way at various locations on the line as shown in the Contract Drawings and/or as directed by MassDOT or the MassDOT (Owner's) Authorized Representative.

EXECUTION

LIMITS OF RIGHT OF WAY DITCHING

1. Contractor is responsible for Right-of-Way ditching at locations shown in the Contract Drawings and/or as directed by the Engineer.

DITCHING REQUIREMENTS

1. Contractor shall create/re-establish Right-of-Way ditches using appropriate hi-rail equipment approved by the Engineer and Operating Railroad. All ditching must conform to the requirements outlined in the Contract Drawings. Any relief from these requirements must be formally requested by the Contractor and approved by the Engineer.
2. Material removed during spot ditching shall be removed and disposed of in accordance with the requirements of ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS.
3. Contractor shall establish outlets from re-established Right-of-Way ditches at the direction of the Owner or Owner's Authorized Representative. Contractor shall ensure positive drainage of the ditch with a minimum slope of 2% within the Railroad Right-of-Way.

MECHANIC

1. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Work under ITEM 492.10 SPOT DITCHING OF RAILROAD RIGHT-OF-WAY shall be measured and paid at the contract unit price per LINEAR FOOT under ITEM 492.10 SPOT DITCHING OF RAILROAD RIGHT-OF-WAY.

HANDLING AND DISPOSAL OF EXCAVATION SPOILS shall not be measured or paid separately. All costs shall be considered incidental to this item.

ITEM 492.10.1 BALLAST CLEANING LINEAR FOOT

GENERAL

This work will consist of cleaning fouled ballast along the Railroad right-of-way at various locations on the line as shown in the Contract Drawings and/or as directed by MassDOT or the MassDOT (Owner's) Authorized Representative.

EXECUTION

LIMITS OF BALLAST CLEANING

2. Contractor is responsible for ballast cleaning at locations shown in the Contract Drawings and/or as directed by Owner's Authorized Representative.

BALLAST CLEANING REQUIREMENTS

1. Contractor shall remove fouled ballast from tie cribs to a depth of 4-inches below the bottom of tie.
2. Removal of fouled ballast shall be made via an excavator-mounted ballast cribbing bucket assembly or by another method subject to approval of the Engineer.
3. Contractor shall remove and dispose of fouled ballast in accordance with ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATED SPOILS.
4. Contractor shall place clean ballast in accordance with ITEM 458.6.1 FURNISH BALLAST.
5. Contractor shall surface and align track in accordance with ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK.

MECHANIC

2. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Work under ITEM 492.10.1 BALLAST CLEANING shall be measured and paid at the contract unit price per LINEAR FOOT under ITEM 492.10.1 BALLAST CLEANING.

Neither FURNISH BALLAST, nor SURFACE AND ALIGN BALLASTED TRACK shall be measured or paid separately. All costs shall be considered incidental to this item.

ITEM 492.11.1 TRACK RECONSTRUCTION N/A
ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA TRACK FOOT

GENERAL

This section specifies demolition of track, ballast and subballast; preparing subgrade; furnishing and installation of subballast, installation of ballast, ties, tie plates and associated new trackwork.

SUBMITTALS

All submittals shall be approved before any work may proceed. Contractor shall submit the following for review and approval:

1. Proposed Protection Measures: Submit informational report in accordance with OSHA Part 1926 procedures, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
2. Indicate the following:
    a. Adjacent trackwork and systems equipment: Detail special measures proposed to protect adjacent trackwork and systems equipment to remain.
    b. Detailed sequence of demolition work, with starting and ending dates for each activity.
3. Contractor shall submit for approval the facility to be used for the disposal of crossties.
4. A detailed construction work plan describing of the methods and procedures to be used in the execution of TRACK RECONSTRUCTION and TRACK CONSTRUCTION – BRIDGE AREA as specified herein, including:
    a. Proposed construction and installation procedures for ballasted track construction, ballasted track panel removal and installation, tie installation, tie plate removals and replacements, and track surface and alignment.
    b. Proposed methods to distribute, tamp, regulate and compact ballast for track construction, reconstruction and track surface and alignment.
5. Proposed methods to distribute, tamp, regulate, and compact ballast for track surface and alignment.
    a. This submittal shall specify which equipment, and methods will be used for track work.
    b. The Contractor shall furnish for review and approval by the Engineer the type of tamping, aligning, and compacting equipment to be used for surfacing and aligning ballasted track.
        i. In general, the Contractor shall provide a 16 tool vibratory tamper that is capable of tamping and aligning both the ballasted trackwork and ballasted special trackwork.
        ii. The Contractor shall provide one or more ballast regulators with brooms, plows, and wings.
6. Prior to bringing equipment to the job site, submit list of equipment proposed for use in construction, including tie and timber installation equipment for removing and installing timber ties and wood bridge timbers. The list shall be submitted to the Engineer fifteen (15) days prior to the start of work and shall include the name of the manufacturer,

dimensions, type, age, present condition, and weights of the equipment and the intended use of each piece of equipment.
7. The Contractor shall furnish resumes for the Superintendent and Foremen who are to be employed in the Work to the Engineer for review and approval prior to the start of Work.
8. Additional submittals listed under PRODUCTS and MATERIALS sections.

QUALITY CONTROL

GENERAL

1. The Contractor shall perform all measures necessary to assure the quality of the Work. This shall include quality control and field quality control requirements specified in these Special Provisions.
2. Prepare a quality control plan for the Work to be performed for review and approval by the Engineer prior to start of work.
3. Contractor shall implement a comprehensive quality assurance program to assure that the Work is performed as specified in the Contract Documents.
4. Contractor's Quality Assurance program shall be supervised by supervisors in accordance with ITEM 180.4 FULL TIME QUALITY CONTROL SUPERVISORS qualified to supervise the installation, restoration, and renewal of tracks.
5. Track construction tolerances shall be in compliance with ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK
6. Except as modified by these Special Provisions or the Contract Drawings, trackwork construction and materials shall conform to the current AREMA Manual for Railway Engineering and AREMA Portfolio of Trackwork Plans.
7. Submit for approval product specifications for ballast mat, the manufacturer's installation requirements, and the Contractor's plan for the complete installation.

REQUIRED CONTRACTOR SUPERVISION

1. One (1) Qualified Supervisor shall be on site during track reconstruction, track construction in bridge areas and quality control operations overseeing, instructing. and assuring quality workmanship. If multiple site are under construction at the same time, Contractor shall provide additional Supervisors as necessary, one (1) per site.

2. One (1) Qualified Foreman is to be on site during operations. If multiple sites are under construction at the same time, Contractor shall provide additional Foremen, one (1) per site. Qualified Foreman will work to ensure that quality deficiencies are addressed prior to the next step in the production sequence. Foremen are to be on the ground directly supervising the production process. Performing tasks that do not support this purpose shall not be permitted.

REQUIRED AMOUNT OF PERSONNEL

1. The Contractor shall have on site at all times a sufficient number of qualified Machine Operators to ensure safe operation and quality workmanship.
2. The Contractor shall ensure there is a sufficient number of Laborers to perform all tasks as needed for crosstie, bridge timber, and QC operations.

MECHANIC

1. A Qualified Mechanic shall be on site at all times during construction operations. The mechanic shall be equipped with a truck that contains sufficient tools, replacement parts, and fluids for the equipment being used.

FINAL TRACK INSPECTIONS

1. The final surface, alignment, gauge, cross level, and superelevation shall be within the tolerances as specified in these Special Provisions.
2. In order to determine the acceptability of finished track, the Contractor and Engineer shall make a final inspection to establish that track construction is within the tolerances specified herein and obtain approval of the Engineer.
3. Track deviations, as disclosed by the inspection described above, which exceed tolerances specified herein shall be corrected by the Contractor at no additional cost to MassDOT.
4. The Contractor shall make necessary re-inspections to confirm that corrections have been made.
5. The Contractor shall notify the Engineer one week in advance before requesting any track inspection.

PRODUCTS

PRODUCTS AND MATERIALS TO BE PROVIDED BY MASSDOT

1. TRACK RECONSTRUCTION
    a. Crossties
    b. Replacement tie plates and joint bars that are not suitable for reuse as determined by the Engineer.
    c. Any existing track components damaged during construction shall be replaced by the Contractor at no additional cost to MassDOT.
    d. Contractor is responsible for all loading, transporting, distribution, and installation of plates, fasteners, and screw spikes.

2. TRACK CONSTRUCTION – BRIDGE AREA
    a. Crossties
    b. Rail
        i. 136lb RE rail for the Work.
        ii. 115lb RE step down rail where required.
        iii. Contractor is responsible for all loading, transporting, distribution, and installation of rail.
        iv. Contractor shall install rail as shown in the Contract Drawings and as directed by the Engineer and HRRC.
    c. Resilient fasteners
    d. Resilient fastener tie plates
    e. Screw Spikes
    f. Contractor shall replace MassDOT provided materials damaged during construction at the Contractor’s expense.

g. Contractor is responsible for all loading, transporting, distribution, and installation of plates, fasteners, and screw spikes.

PROCUCTS AND MATERIALS TO BE PROVIDED BY HOUSATONIC RAILROAD COMPANY

1. 107# relay plug rail as required.

MATERIALS FURNISHED BY THE CONTRACTOR

1. Subballast/Gravel Borrow
2. Ballast by ITEM 458.6.1 FURNISH BALLAST.
3. Track spikes by ITEM 492.2 FURNISH TRACK SPIKES
4. Nuts, bolts, and washers in conformance with AREMA.
5. Liquid plugging compound
6. Ballast mat and geotextile protection layer.
7. All additional materials not specifically cited as being provided by MassDOT or Housatonic Railroad Company shall be provided by the Contractor and considered incidental to the work described in this section.

MATERIALS

SUBBALLAST/GRAVEL BORROW

1. Submittals:
    a. Prior to shipment of subballast, submit the name of the subballast supplier, processing facility and testing laboratory that will sample and test the subballast and submit to the Engineer for review and approval.
    b. Submit test results for the following required testing, which includes but is not limited to:
        i. Particle Size Analysis: ASTM Method of Test Designation D422
        ii. Material Finer than No. 200 Sieve: ASTM Method of Test Designation C117
        iii. Absorption: ASTM Method of Test Designation C127
        iv. Percentage of Clay Lumps and Friable Particles: ASTM Method of Test Designation C142
        v. Resistance to Degradation: ATSM Method of Test Designation C131 - Material gradations with 100% passing the 1” sieve
        vi. Unit Weight: ASTM Method of Test Designation C29
        vii. Sampling and testing of subballast as specified herein shall not be billed separately, but are included in the cost per ton of subballast supplied.
2. Quality Assurance:
    a. Provide certified test results of subballast quality and grading as conducted by the approved testing laboratory.
    b. Testing, as defined by this specification, shall be performed at least two times a year or as directed by the Engineer, to ensure the quality of the material being produced. If the supplier changes the location of the source or encounters changes within the supply source, laboratory testing shall be performed on the new

material to ensure compliance with specifications.

c. Field samples shall be secured in accordance with the current ASTM Methods of Sampling, Designation D75. Test samples shall be reduced from field samples by the means of ASTM C702.
d. Contractor shall use the attached Field Inspection Summary Report
e. If the source of subballast changes during subballast installation, additional certified test results (in accordance with the requirements included under Submittals and Quality Assurance) shall be provided to the Engineer for review and approval prior to the shipment of the subballast from the new source.
f. Supplier shall certify with billing that the subballast delivered is typical of the subballast which has been tested and approved by the Engineer.
g. Perform sampling and tests of the subballast material to determine compliance with specified requirements. Samples shall be initially taken from the supplier's source (quarry). Additional samples may be taken from the site at the direction of the Engineer.

3. Subballast shall conform to the following gradation:

Subballast	
Sieve Size	Percent Passing by Weight
1 Inch	100
3/8 Inch	50 to 85
No. 4	35 to 65
No. 10	25 to 50
No.40	15 to 25
No.200	4 to 10

Subballast shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials.

Sand subballast shall conform to the current MassDOT Highway Division Material Specification M1.04.0 Type b. Sand Borrow (Maximum particle size 3/8 inch). Sand subballast shall consist of clean inert, hard durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials. Subballast shall conform to the following Limiting Values:

No.	**Property**	**Limiting Value**
1.	Particle Size Analysis	Per this Specification
2.	Percent Material Passing No. 200 Sieve	10.0%
3.	Absorption Percent	0.5 %
4.	Percent Clay Lumps and Friable Particles	0.5%
5.	Degradation Percent	20%
6.	Unit Weight (lb/ft^3)	By Engineer

4. Production and Handling:
    a. The subballast production facility shall be of such a design to permit production and/or blending without excessive working of the materials. The capacity of the production facility shall be adequate to efficiently produce the anticipated daily loadings providing sufficient stockpiles to facilitate loadings without any delays.
    b. Blending, stockpiling and other production and handling operations shall be managed by the producer to keep subballast clean and minimize segregation of the finished product. Stockpiling operations shall minimize the breakage or excessive fall in stockpiling operations. The movement of wheeled or tracked machines over stockpiled materials shall be limited.
5. Loading:
    a. Processed subballast shall be loaded only into rail cars or trucks which are in good order, tight enough to prevent leakage and waste of material, and clean and free from rubbish and other deleterious materials.
6. Inspection:
    a. MassDOT, or its representatives, reserve the right to make unscheduled visits the supplier's facility during normal business hours for the following purposes:
        i. Observe sampling and testing procedures to assure compliance with the requirements of these specifications.
        ii. Obtain representative samples of the prepared material being produced and shipped.
        iii. Review plant inspection, methods, quality control procedures, equipment and review test results of both current and previous tests.
    b. The supplier shall provide MassDOT or its representative with such assistance, materials, and laboratory testing equipment as necessary to perform so called "on site production tests" consisting of site gradation and percent passing No. 200 sieve. Performance of these tests at the time of an unscheduled inspection visit is the right, but not the duty, of the inspector.
7. Acceptance/Rejection:
    a. To be accepted, subballast offered shall conform to this specification in all respects.
    b. Subballast is also subject to inspection at delivery and is at the supplier's risk until acceptance. Subballast rejected for non-compliance with this specification will be picked up, loaded and transported off-site at the supplier's expense.

BALLAST MAT

1. Ballast Mat: Pandrol Under Ballast Mat UBM-H80-S or approved equal (one layer mat).
2. Non-Woven Geotextile Protection Layer for Ballast Mat: In accordance with requirements of ITEM 492.14 GEOTEXTILE MATERIALS.

EXECUTION

GENERAL

1. Except as otherwise indicated in the Construction Documents, trackwork shall be completed and restored within the service outage times coordinated with the

Housatonic Railroad as specified previously.

2. Trackwork shall be constructed to match existing line and existing profile except as indicated otherwise in the Contract Drawings and in these Special Provisions.
3. Contractor shall install track in accordance with current American Railway Engineering and Maintenance of Way Association, Manual for Railway Engineering and Portfolio of Trackwork Plans, MassDOT MW-1 including all Appendices, and these special provisions.

DEMOLITION

1. Contractor shall verify that utilities have been disconnected and capped before starting demolition operations.
2. Contractor shall protect any existing utilities, culverts, signal system equipment, mile posts, fences, and any other items not part of the demolition along the ROW. Should demolition activities damage any existing item, it shall be repaired or replaced immediately at no cost to MassDOT.
3. Contractor shall protect any adjacent tracks and walkways not part of demolition during demolition operations. Contractor shall take care to not undermine or structurally impact any adjacent tracks and will be responsible for any damage that occurs to adjacent tracks during demolition operations. Contractor shall repair any damage at no cost to MassDOT.
4. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from MassDOT and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction. Provide no less than 72 hours' notice of activities that may impact these facilities.
5. Remove rail and OTM and save for use in reconstructing track in areas designated for Track Reconstruction as shown in the Contract Drawings. Demolish remaining existing track components.
6. Remove existing ballast to the depth required to provide for installation of new subballast, ballast mat and ballast as indicated in the Contract Drawings.
7. Use methods required to complete the Work within limitations of governing regulations and as follows:
    a. In the event torch cutting is approved by the Engineer, do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
    b. In the event torch cutting is approved by the Engineer, maintain fire watch during and for at least four hours after flame cutting operations.
    c. In the event torch cutting is approved by the Engineer, maintain adequate ventilation when using cutting torches.
8. Use of explosives is not permitted.
9. Do not burn demolished materials on site.
10. Use water mist and/or other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
11. On-site storage or sale of removed items or materials is not permitted.
12. With the exception of ferrous materials, all demolition waste and materials removed as

part of this demolition shall become the property of the Contractor and shall be disposed of properly according to applicable local, State and Federal regulations, unless otherwise specified herein or by the Engineer.

13. All ferrous materials shall be salvaged and shall remain the property of the Housatonic Railroad. All rail, joint bars, spikes, tie plates, and other OTM and ferrous materials removed as part of demolition shall be organized, transported to, and stockpiled at locations to be determined by the Operating Railroad. Joint bars shall be sorted separately from the remainder of the OTM.
14. Salvaged items, Contractor shall comply with the following:
    a. Clean salvaged items of dirt and demolition debris.
    b. Pack or crate items after cleaning. Identify contents of containers.
    c. Store items in a secure area until delivery to HRRC.
    d. Transport items to storage area designated by HRRC.
    e. Protect items from damage during transport and storage.
    f. Contractor shall follow HRRC's instructions for stockpiling, stacking and organizing salvaged materials to maintain proper organization and neatness.
15. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to the Operating Railroad or MassDOT that may be uncovered during demolition shall remain the property of MassDOT.
16. All timber ties, bridge timbers and wood materials being removed as part of this ITEM shall be removed from the property and disposed of under ITEM 114.1 DEMOLITION OF BRIDGE 74.17 and in ITEM 114.2 PARTIAL DEMOLITION OF BRIDGE 76.23.
    a. All existing crossties removed shall become the property of the Contractor, removed from the ROW and disposed of at an approved facility.
    b. The Contractor shall provide the Engineer with a copy of a certified weight slip for each quantity shipped, unloaded, and properly disposed of at the licensed facility.
17. Remove demolition waste materials (excluding excess soil and ballast spoils) from the Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
    a. Do not allow demolished materials to accumulate on-site.
    b. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
18. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.
19. Excess soil and ballast excavation spoils shall be transported and disposed of in accordance with ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS

REMOVAL OF EXISTING RAIL

1. Limits of rail removal shall be as indicated in the Contract Drawings.
2. Carefully remove the rail and OTM and transport to a storage area approved by the Engineer without damage. Materials damaged by the Contractor shall be replaced at no cost to MassDOT.
3. Protect rail and OTM from damage during the Work.

REMOVAL OF EXISTING CROSSTIES

1. The Engineer will mark existing ties to be salvaged.
2. Ties to be salvaged shall have spike holes plugged and be bundled at no extra cost to MassDOT using two straps to prevent movement and stored in such a way as to avoid damage. Any damage to these ties rendering them unusable will be the sole responsibility of the Contractor. The Contractor shall replace ties damaged at no cost to MassDOT.
3. Salvaged ties shall be moved to a location within the right of way as directed by the Engineer.
4. Contractor shall remove existing tie plates and spikes from all existing timber cross ties and bridge timbers being removed.
5. Removed tie plates are to be collected by the Contractor and returned to a location designated by HRRC.
6. Removed spikes are to be collected by the Contractor and returned to a location designated by HRRC.

PREPARATION OF SUBGRADE

1. Prior to placement of subballast or ballast, all trash and debris shall be removed from subgrade. Subgrade shall be clear and void of tire ruts, large stone or other deleterious objects before placement of subballast or ballast.
2. Subgrade shall be freely drained and compacted to the required density before placement of subballast or ballast conforming to the requirements of the AREMA for Railway Engineering, Volume 1, Chapter 1, Part 3 – Construction, Section 7.5.3 standards.
3. Before placement of subballast or ballast, subgrade shall be proof-rolled using heavily loaded pneumatic-tired equipment or, by vibratory roller on granular subgrades.
4. Where soft places are located they shall be undercut to a suitable depth, no less than 6 inches, and backfilled with compacted granular aggregate as directed by the Engineer.

PLACEMENT OF SUBBALLAST

1. Apply subballast course over the prepared subgrade and compact.
2. Deliver aggregate for subballast as uniform mixture and spread in layers without segregation.
3. Place subballast material with sufficient moisture to allow compaction to specified maximum density.
4. Compaction shall be accomplished with one or more of the following:
    a. Pneumatic-Tire Roller. Pneumatic-tire rollers shall be of the self-propelled type consisting of two axles equipped with pneumatic tires mounted so as to completely cover the area to be compacted in a single pass. The wheels on at least one axle shall oscillate vertically, either singly or in pairs. The roller shall have a width of not less than 5 feet. Wobble-wheel rollers will not be permitted. The wheels shall be equipped with smooth, wide-tread compactor tires of equal size and diameter, capable of producing a uniform, ground-contact pressure on a level, unyielding surface through a range of 60 to 95 pounds per square inch on all wheels. Operating tire contact pressure shall be maintained by the use of ballast,

and tire inflation pressure combinations shall not exceed the recommendations of the Tire and Rim Association Incorporated for the applicable tire size and ply rating.

b. All tires shall be uniformly inflated so that their respective tire pressures do not vary more than 5 pounds. Charts and tabulations shall be furnished showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the tires used.
c. Dynamic Compactor. The compactor shall be a vibratory roller or vibratory pad-type compactor capable of operating at the optimum frequency of vibration required for the size and type of compactor used and for the type of material being compacted. Vibratory pad-type compactors shall be used only when access with a vibratory roller is not practical. Vibratory rollers shall be equipped with a readily visible instruction plate containing the manufacturer's recommended operating frequency, amplitude and roller speed. A calibrated vibrating reed tachometer shall be provided with each roller to permit a mechanical check of the roller vibration control system.

5. Subballast course shall be minimum uniform thickness, after compaction, of dimensions indicated in the Contract Drawings. Where not indicated, compacted thickness shall be a minimum of 4 inches.
6. Compaction of each layer shall continue until the material meets 95% dry density compaction. The in-place dry density of each compacted layer will be determined in accordance with AASHTO T 191.
7. Thickness of finished subballast course shall not vary more than 1 inch from the indicated thickness at any point. Reshape or rework, water, and recompact subballast to achieve compliance with specified requirements which do not conform to this requirement.
8. The surface of the finished subballast course at any point shall not vary more than +1” above or 0” below the indicated grade.
9. The Contractor shall obtain a test lab approved by the Engineer to perform tests in accordance with AASHTO T 191 and ASTM D2922 to determine compliance with specified requirements for density and compaction of subballast, and with ASTM D3017 to determine moisture content of the installed subballast.

PLACEMENT OF BALLAST MAT

1. Ballast mat shall be installed within the area of installation as show in the Contract Drawings.
2. Existing ballast shall be removed to a minimum depth of 10” below the proposed bottom of tie elevation.
3. Where soft places are located, they shall be undercut to a suitable depth, no less than 6 inches, and backfilled with granular aggregate as directed by the Engineer.
4. Prior to placement of ballast mat all trash and debris shall be removed from subgrade. Subgrade shall be clear and void of tire ruts, large stone or other deleterious objects before placement of ballast mat. Subgrade shall be freely drained and compacted to the required density before placement of ballast mat.
5. Approach Ballast Mat shall be installed in accordance with the manufacturer’s instructions and requirements. Approach Ballast mat shall be installed within the

areas shown in the Contract Drawings.

6. Geotextile protection layer shall be installed on top of the ballast mat in accordance with the manufacturer's requirements.
7. Ballast mat and geotextile shall not be driven over prior to placement of ballast.

PLACING INITIAL LAYERS OF BALLAST

1. Check grade lines and cross section prior to placing ballast. Bring ballast to proper elevation as shown in the Contract Drawings.
2. Clean trackbed area of debris and standing water prior to placing ballast.
3. Distribute and compact four-inch layers (maximum) of ballast uniformly and as required to achieve required ballast depth prior to tie distribution.
4. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work, maintaining a proper interval of operations, and at such times as to permit proper inspection by the Engineer.
5. To extent practicable, unload ballast in position for use with a limited redistribution and dressing.
6. Self-spreading vehicles may be used as approved by the Engineer. When stone is initially spread by self-spreading vehicle a power grader may be used to assist spreading operations.
7. Shape ballast to a true section conforming to the ballast section shown in Standard Plans and Contract Drawings.
8. Thoroughly compact each ballast layer until stones are firmly interlocked and surface is true and unyielding. Compact each lift with not less than four passes of a roller or a vibratory compactor subject to the following requirements:
    a. Compact by rolling using either a self-propelled, three-wheel, or two axle roller of such weight that will provide compression under the rear wheels of not less than 350 pounds per linear inch of tread; or using a two or three-wheel tandem roller having a weight per inch of drive roll of not less than 350 pounds, and every part of the surface receiving compression from the drive wheels.
    b. Compact by vibration using vibratory compactors of either the roller or pad type. Dynamic force for either type shall not be less than 20,000 pounds and the frequency range shall be 1100 to 1500 vpm. Use machines equipped with a governor which can be set and locked to control rate of impulse. Provide a tachometer or other suitable device for accurately checking the frequency of vibration during the compacting operation.
9. Top surface of initial layers of ballast shall be smooth, flat and uniformly compacted prior to distributing ties. Surface shall be free of ruts.

DISTRIBUTING AND SPACING TIES

1. Carefully distribute and properly space all ties on initial layer of ballast. Space ties center to center as follows:
    a. Mainline Track Reconstruction: 19 ½ inches, unless otherwise noted on plans.
2. Place timber ties so that heartwood is down. Place all ties so that the bottom surface of the tie shall have full bearing against the initial layer of ballast.
3. Handle treated timber ties in a manner to avoid breaking and bruising. Do not throw ties from cars or trucks onto rails or rocks.

4. Place all ties normal to center line of track unless shown otherwise in the Contract Drawings.
5. Properly space and align all ties prior to rail installation.
6. In placing or spacing treated ties, handle only with tongs or suitable devices. Do not use bars, chisels, forks, mauls, picks, punches, shovels, or sledges for moving ties or placing them in position beneath rails.
7. Avoid unnecessary handling, redistribution, and reloading of all ties. To extent practical, distribute ties in proper position for use without further handling.
8. Remove any tie damaged as result of improper handling by the Contractor and rejected by the Engineer and replace with undamaged ties at no additional cost to MassDOT.

TRACK RECONSTRUCTION CROSSTIE INSTALLATION

1. PLUGGING EXISTING TIES

    a. The Contractor shall use a MassDOT approved chemical formulation for plugging crossties not designated for replacement. Such compound shall have the equivalent or greater characteristics of the Willamette Valley Company SPIKEFAST® ES-50 RM formula.

    b. Plugging compound shall be applied in a manner that is consistent with the chemical manufacturer's instructions. Spike holes shall be filled in completely with the approved plugging compound. Furnishing and installing liquid plugging compound for all work in this Contract shall be incidental to installation of the rail.

2. REMOVE AND REUSE TIE PLATES ON EXISTING CROSSTIES & TIMBERS

    a. Tie plates to be installed on crossties will be provided by MassDOT.
    b. Contractor shall remove existing tie plates and spikes from crossties and timbers being replaced.
    c. Removed tie plates are to be reused on newly installed crossties.
    d. Removed spikes are to be collected by the Contractor and returned to a location designated by HRRC.

3. TIE PLATES

    a. Crossties and timbers shall have tie plates installed under each rail.
    b. Prior to installation of tie plates, clean contact surfaces to allow proper bearing of the tie plate on the tie.
    c. Install tie plates so crosstie is centered under the track.
    d. Locate tie plates on 8 foot 6 inch crossties so that the line side of crosstie and timber is 18 1/2 inches from outer edge of base of rail. Tie plate shall be centered on the crosstie and timber under rail.
    e. Locate tie plates on longitudinal centerline of each crosstie and timber and place square to centerline of rail so that field side of plate bears fully against rail base. Place plate with the downward cant toward center of track.
    f. Secure rail on line end of crossties and timbers to tie-in proper relation to crosstie and timber end, before securing opposite rail.

g. Use line rail as reference in securing opposite rail to proper gauge.

4. SPIKING

a. All spikes shall be driven with the head pointed toward the rail, except that spikes driven against the sides of insulated joints shall be driven with the head pointing away from the rail and not be in contact with the joint bars.
b. Start and install spikes vertically and square with rail. Install spikes straight/plumb. Spikes should be driven in accordance with the AREMA Manual, Chapter 5, leaving 1/8" clearance between the spike head and the base of the rail. Do not overdrive spikes.
c. Straightening spikes will not be permitted.
d. Avoid removal of spikes once driven. When necessary, pull spikes and plug hole using approved liquid plugging compound.
e. Under no circumstances shall gauge be adjusted by striking spikes or plate edge after it is fixed to tie.
f. Seat rail properly between tie plate shoulders on debris free plate with field side base of rail tight against field side plate shoulder.
g. Each newly installed crosstie shall be spiked in accordance with HRRC's Spiking Pattern A contained in the Appendix of HRRC's CWR plan. The Contractor shall ensure that four (4) spikes are installed on all crossties.
h. Each newly installed timber shall be spiked to match existing spiking pattern or as directed by the Engineer.

TRACK CONSTRUCTION – BRIDGE AREA CROSSTIE INSTALLATION

1. REMOVE TIE PLATES ON EXISTING CROSSTIES & TIMBERS
   a. Tie plates to be installed on new crossties will be provided by MassDOT.
   b. Contractor shall remove existing tie plates, resilient fasteners, and spikes from crossties and timbers being replaced.
   c. Removed tie plates are to be collected by the Contractor and returned to a location designated by HRRC.
   d. Removed spikes are to be collected by the Contractor and returned to a location designated by HRRC.

2. TIE PLATES – RESILIENT

a. Crossties and timbers shall have resilient fastener tie plates installed under each rail.
b. Prior to installation of tie plates, clean contact surfaces to allow proper bearing of the tie plate on the tie.
c. Install tie plates so crosstie is centered under the track.
d. Locate tie plates on 8 foot 6 inch crossties so that the line side of crosstie and timber is 18 1/2 inches from outer edge of base of rail. Tie plate shall be centered on the crosstie and timber under rail.

e. Locate tie plates on longitudinal centerline of each crosstie and timber and place square to centerline of rail so that field side of plate bears fully against rail base. Place plate with the downward cant toward center of track.
f. Secure rail on line end of crossties and timbers to tie-in proper relation to crosstie and timber end, before securing opposite rail.
g. Use line rail as reference in securing opposite rail to proper gauge.
h. Crosstie and Timber Boring
    i. Field bore crossties and timbers before fastening tie plates.
    ii. Holes in crossties and timbers shall be drilled with a 11/16 inch diameter drill bit, 6 inches deep, for 15/16 inch screw spikes.
    iii. Location and number of holes shall conform to location and number of screw spikes. Boring of holes in excess of number required is not permitted.
    iv. Do not bore holes entirely through crosstie or timber.
    v. After drilling, brush drill chips from top surface of crosstie or timber.
    vi. Prior to locating position of holes to be bored for subsequent rail(s) to be placed on any crosstie or timber, position crosstie or timber laterally so that field side base of first rail is in contact with shoulder of plate. Any tolerance between rail base width and plate seat width shall be on gauge side of rail. Position other plate(s) similarly to ensure retention of gauge established.

3. SPIKING

a. Each newly installed crosstie shall be spiked in accordance with HRRC's Spiking Patterns contained in the Appendix of HRRC's CWR plan. The Contractor shall ensure that the minimum specified number of spikes are installed on all crossties in curves and throughout the entire project.
b. Each newly installed timber shall be spiked to match existing spiking pattern or as directed by the Engineer.
c. Start and install screw spikes vertically and square with rail. Install spikes straight/plumb.
d. Screw spikes shall be set and driven in accordance with manufacturer's recommendations and specifications. Straightening screw spikes will not be permitted.
e. Number of screw spikes used per crosstie shall conform to Contract Drawings and the HRRC's CWR plan.
f. Avoid removal of screw spikes once driven. When necessary, pull spikes and plug holes using approved liquid plugging compound.
g. Under no circumstances shall gauge be adjusted by striking lags, spikes, or plate edge after it is fixed to tie.
h. Seat rail properly between tie plate shoulders. With field side base of rail tight against field side plate shoulder.

INSTALLATION OF RAIL

1. Rail shall be installed in accordance with MassDOT MW-1 requirements for jointed rail.
2. The distance between jointed rail ends shall be adjusted according to the temperature at which the rails are laid as per MassDOT MW-1.
3. Expansion shims shall be used to set rail end openings. The opening between the ends of rails for different rail temperatures shall be as follows:

TRACK RECONSTRUCTION:

Jointed Rail Expansion Table	
Rail Temperature (F)	Rail End Opening (39’ Rails)
Below 6°	5/16”
6° to 25°	1/4”
26° to 45°	3/16”
46° to 65°	1/8”
66° to 85°	1/16”
Over 85°	None

TRACK CONSTRUCTION – BRIDGE AREA:

Jointed Rail Expansion Table	
Rail Temperature (F)	Rail End Opening (78’ or 80’ Rails)
Below 30°	5/16”
31° to 45°	1/4”
46° to 60°	3/16”
61° to 72°	1/8”
73° to 85°	1/16”
Over 85°	None

4. A standard rail thermometer shall be used to determine the rail temperature. The thermometer shall be laid close to the web on the side of the rail base, which is shaded from the sun’s rays in advance of the laying operation and left there long enough to accurately record the temperature.
5. The supervisory employee in charge shall see that rail temperature is checked frequently and that proper rail expansion shims are used.
6. The Contractor shall provide a record of all rail temperatures and the required expansion shims used for review and approval by the Engineer.
7. In general, rails laid out-of-face in track panel rehabilitation and at rail replacement locations shall be placed so that the joints of one line of rails shall be opposite third point of rails in the other line.
8. Short rails less than 33’ long shall not be used in track unless approved by the Engineer and shall be shown on the Contractor’s steel plan.
9. Every effort shall be made by the Contractor to utilize existing joint location.

10. Rails with unequal wear and different sections must be brought to an even surface at joints on the tread and gage side of the rail by welding/grinding. Excessive rail-end mismatch will not be permitted .When shimming is required to run off the difference in height of rails, the requirements of §129.0(M) must be met.
11. Rail shall be anchored in accordance with MassDOT MW-1 and the following:
12. A minimum of 16 anchors for a 39’ rail and be boxed on 8 ties.
13. A minimum of 10 anchors per 33’ rail and be boxed on 5 ties.

TRACK GAUGE

1. Track gauge by ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK

LIQUID PLUGGING COMPOUND

1. The Contractor shall use a MassDOT approved chemical formulation for plugging crossties designated for salvage. Such compound shall have the equivalent or greater characteristics of the Willamette Valley Company SPIKEFAST® ES-50 RM formula.
2. Plugging compound shall be applied in a manner that is consistent with the chemical manufacturer’s instructions. Spike holes shall be filled in completely with the approved plugging compound. Furnishing and installing liquid plugging compound for all work in this contact shall be incidental to installation of the rail.

HANDLING AND STORAGE

1. Contractor shall be responsible for loading and transporting all Owner and Railroad supplied products and materials from delivery and storage locations to the installation sites.

TAMPING AND DRESSING OF BALLAST

1. Tamping and dressing of ballast by ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK

FINISHED TRACK CONDITION (FOR FINAL INSPECTION AND PAYMENT)

1. The Contractor shall provide a continuous On-Site Supervisor and Gang Foreman to provide continuous quality control as the ties/timber are installed.
2. The following items must be accomplished by the Contractor so payments can be made for the work:
    a. Crossties and timbers installed complete with ballast in cribs, tamped, regulated and dressed to either side to within 1” of the base of rail.
    b. Track gauge is within required tolerances.
    c. A minimum ballast shoulder of 12” on tangent track and 16” (or as otherwise previously directed and approved by the Engineer) on curved track on each side of the track with a slope of 2:1 or conforming to existing shoulder, as directed by the Engineer.
    d. Ballast dressed with ballast regulator and by hand as required in accordance with

AREMA Specifications.

e. All stone removed from the top of crosstie, base of the rail, and track plates following installation of crossties.
f. Each installed crosstie/timber carefully, mechanically tamped (multiple squeezes may be required) as part of the installation process.
g. Line and Surface conforms to the requirements specified in ITEM 492.8.1 SURFACE AND ALIGN BALLASTED TRACK where required and the Contract Documents.
h. Any damage to existing track as a result of this surfacing was repaired by the Contractor at no cost to the project.
i. Base of the rail rests firmly on tie plates.
j. Field shoulder of the tie plate is tight up against field side of running rail.
k. Tie plates are centered longitudinally on the crossties and timbers.
l. No tie plates overhang the edge of the crossties and timbers.
m. No ballast between base of rail and tie plate.
n. No ballast between the tie plate and top of crossties and timbers.
o. All of the above items are considered to be incidental to the installation of crossties and timbers.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Separate Measurement and Payment will not be made for the work of ITEM 492.11.1 complete in place. All costs for TRACK RECONSTRUCTION shall be considered incidental to the item or items of work to which they pertain.

Work under ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA shall be measured and paid at the contract unit price per TRACK FOOT under ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA

ITEM 492.11.3 HANDLING AND DISPOSAL OF EXCAVATION SPOILS N/A

GENERAL

This section specifies handling and disposal of excavation spoils.

EXECUTION

HANDLING AND DISPOSAL OF EXCAVATION SPOILS

1. Excess soil and ballast excavation spoils shall be transported and disposed of entirely within the railroad right of way in a manner to be approved by the Engineer and HRRC at specific locations as directed by HRRC and as may be shown on the Contract Documents. Disposal areas may be located up to 10 miles from the excavation areas.
2. Contractor shall load excavation spoils directly into air side dump cars, high rail swivel dumps or equivalent as approved by the Engineer. Stockpiling of excavation spoils is not allowed.
3. Contractor is responsible for providing, maintaining, and operating all rail mounted equipment.
4. See ITEM 850.42 WORK TRAINS for locomotive support available from HRRC for moving excavation spoils within the project corridor.
5. Contactor is responsible for unloading spoils at the disposal areas and for dispersing and evenly spreading the materials at the disposal sites as directed by the Engineer.
6. Contractor is responsible for all scheduling and coordination with HRRC for transportation of spoils to the disposal areas. MassDOT is not responsible for delays or any additional costs associated with transportation of spoils, all costs shall be the responsibility of the Contractor.

Separate Measurement and Payment will not be made for the work of this Special Provision complete in place. All costs for HANDLING AND DISPOSAL OF EXCAVATION SPOILS shall be considered incidental to the item or items of work to which they pertain.

ITEM 492.12 TRACK UNDERDRAIN LINEAR FOOT

GENERAL

This section specifies furnishing and installing track underdrains as shown in the Contract Drawings.

SUBMITTALS

1. Submit a prepared construction sequence for installation of underdrains.

2. Submit the name and contact information for the pipe material supplier and the manufacturer's catalog cuts, material specifications and installation recommendations.

PRODUCTS

PERFORATED HIGH DENSITY POLYETHYLENE (HDPE) PIPE

1. Perforated high density polyethylene pipe and fittings for use as underdrain pipe shall be corrugated profile-wall pipe with a smooth interior wall. HDPE underdrain pipe shall meet the requirements of AASHTO M294 and ASTM F2306. Virgin material for pipe and fitting production shall be high-density polyethylene conforming with the minimum requirements of ASTM D3350, except that carbon black content should not exceed 4%.

2. Pipe joints shall comply with the requirements of AASHTO M294 and soil tight requirements of ASTM F2306. Pipe joints shall be watertight meeting the requirements of ASTM D3212. The joint gaskets shall comply with ASTM F477.

3. Fitting connections shall be with a bell and spigot connection utilizing a welded bell and valley gasket. The joint shall meet the watertight requirements of ASTM D3212, and gaskets shall meet the requirements of ASTM F477.

4. Perforations shall be Class 2 type, circular.

NON-WOVEN GEOTEXTILE FOR RAILROAD DRAINAGE APPLICATIONS

1. Provide non-woven geotextile for railroad drainage applications in accordance with ITEM 492.14 GEOTEXTILE MATERIALS.

UNDERDRAIN STONE

1. Underdrain stone shall be narrowly graded mixture of washed crushed stone; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

EXECUTION

1. Underdrain trench shall conform to the dimensions shown in the Contract Drawings.
2. Place drainage geotextile around perimeter of underdrain trench. Place underdrain stone on drainage geotextile to support the underdrain pipe.

3. Install underdrain pipe in accordance with the manufacturer's recommendations.
4. Encase underdrain pipe in stone as indicated in the Contract Drawings. Place stone in maximum 6 inch lifts and compact. Stone shall be thoroughly compacted to provide support for the pipe and to prevent settlement of the track surface above the trench.
5. Overlap subsurface drainage geotextile a minimum of 12" on top of the underdrain trench and a minimum of 12" at all other locations where the drainage geotextile overlaps.
6. Slope underdrains as indicated in the Contract Drawings. Contractor shall ensure positive drainage of the ditch with a minimum slope of 2% within the Railroad Right-of-Way.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Work under ITEM 492.12 TRACK UNDERDRAIN shall be measured and paid at the contract unit price per LINEAR FOOT under ITEM 492.12 TRACK UNDERDRAIN.

ITEM 492.14 GEOTEXTILE MATERIALS N/A

GENERAL

This section specifies the furnishing and installing of approved geotextile materials at all proposed underdrain and track stabilization locations shown in the Contract Drawings.

SUBMITTALS

1. Submit a prepared construction sequence for all geotextile materials installation.

2. Submit the name and contact information for the material supplier and the manufacturer's catalog cuts and material specifications.

PRODUCTS

NON WOVEN GEOTEXTILE FOR RAILROAD TRACK BED STABILIZATION

5. Geotextile shall meet the requirements of AREMA Chapter 1, Section 10.1 "Geotextile and Geocomposite Specifications for Railroad Separation/Stabilization Applications".

6. Fibers used in the manufacture of the geotextile, and the thread used in joining the geotextile by sewing, shall consist of long-chain synthetic polymers, composed of at least 95 percent by weight of polyolefins or polyesters. Geotextile shall be a nonwoven fabric formed into a stable network such that the filaments or fibers retain their dimensional strength relative to each other.

7. The geotextile shall be inert to commonly encountered chemicals, hydrocarbons, and mildew. The geotextile shall be resistant to ultraviolet light, insects, and rodents. The geotextile shall be tinted or otherwise treated to prevent the occurrence of snow blindness of handling personnel.

8. The geotextile shall meet the property values for Heavy Weight 12-16 Oz/SY stipulated in AREMA Table1-10-2, Chapter 1, Section 10.1.

NON WOVEN GEOTEXTILE FOR RAILROAD DRAINAGE APPLICATIONS

1. Geotextile shall meet the requirements of AREMA Chapter 1, Section 10.2 "Geotextile Specifications for Railroad Drainage Applications".

2. Fibers used in the manufacture of the geotextile, and the thread used in joining geotextile by sewing, shall consist of long-chain synthetic polymers, composed of at least 95 percent by weight of polyolefins or polyesters. The geotextile shall be a nonwoven fabric formed into a stable network such that the filaments or fibers retain their dimensional strength relative to each other.

3. The geotextile shall be inert to commonly encountered chemicals, hydrocarbons, and mildew. The geotextile shall be resistant to ultraviolet light, rot, insects, or rodents.

4. The geotextile shall conform to the properties for Class A geotextile found in Table1-10-7, "Geotextile Survivability Properties for Drainage Geotextiles", and Table1-10-8,

"Geotextile Filtration Properties for Drainage Applications" found in AREMA Chapter 1, Section 10.2 "Geotextile Specifications for Railroad Drainage Applications".

EXECUTION

1. The geotextile materials shall be installed as shown in the Contract Drawings and as described in this Special Provision.

2. Drainage Application geotextile shall be laid to encapsulate all underdrain trenches as shown in the Contract Drawings. The geotextile shall be installed as shown in the Contract Drawings with a minimum 6" overlap at the top closing joints of the filter fabric.

3. Trackbed Stabilization geotextile shall be laid within the entire limits of special trackwork installation areas. Geotextile shall be laid on compacted subgrade below the new ballast installation.

4. All geotextile shall be installed in accordance with the manufacturers requirements and recommendations.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Separate Measurement and Payment will not be made for the work of this Special Provision complete in place. All costs for GEOTEXTILE MATERIALS shall be considered incidental to the item or items of work to which they pertain.

ITEM 492.15 TRACKBED STABILIZATION LINEAR FOOT

GENERAL

This section specifies furnishing and installing geocell materials for reinforcement within the subballast or subgrade of the trackbed at proposed track stabilization locations indicated on the Drawings and/or as directed by MassDOT.

SUBMITTALS

1. Name and contact information for the material manufacturer and supplier and the manufacturer's catalog cuts and material specifications.
2. Qualifications of crew installing geogrid material.
3. Manufacturer's certificate attesting to the shipped material's compliance with minimum values for material properties.
4. A construction sequence for geocell installation consistent with manufacturer's instructions.

PRODUCTS

GEOCELL FOR RAILROAD TRACK BED STABILIZATION

1. Geocell shall meet the requirements of AREMA Chapter 1, Section 10.5 "Geocell System Guidelines for Railroad Use", Section 10.5.2 "Material Requirements".
2. In particular, geocell cellular confinement sections shall have the minimum chemical and physical property values as stipulated in AREMA Table 1-10-13, Chapter 1, Section 10.5.2.1 "Geocell Sections".

INFILL

1. Infill material shall be in compliance with AREMA Chapter 1, Section 10.5 "Geocell System Guidelines for Railroad Use", Section 10.5.2.2 "Infill Material".

EXECUTION

1. Installation of geocell materials shall be in compliance with AREMA Chapter 1, Section 10.5 "Geocell System Guidelines for Railroad Use", Section 10.5.5.5 "Construction Details and Methods" and in accordance with manufacturer's instructions.
2. Install the geotextile separation layer in accordance with the requirements of ITEM 492.14 GEOTEXTILE MATERIALS.
3. The work shall be performed in accordance with the contract drawings, ITEM 492.11.1 TRACK RECONSTRUCTION, with relevant requirements under MassDOT MW-1, and Items 458.6.1 FURNISH BALLAST & 492.8.1 SURFACE AND ALIGN BALLASTED TRACK. The existing top rail elevations and track alignment should be maintained after trackbed stabilization installation. The track work is incidental to trackbed stabilization replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The Contractor shall provide all necessary labor, equipment and materials to be incorporated into the work as indicated in the Contract Drawings and in these Special Provisions.

Work under ITEM 492.15 TRACKBED STABILIZATION shall be measured and paid at the contract unit price per LINEAR FOOT under ITEM 492.15 TRACKBED STABILIZATION.

ITEM 493.1 MISCELLANEOUS WORK AS DIRECTED BY THE ENGINEER ALLOWANCE

GENERAL

This section specifies miscellaneous work to be performed as directed by the Engineer. No work shall be performed that is not within the scope of this Project unless explicitly directed by the Engineer.

SUBMITTALS

Prior to commencement of any directed work, Contractor shall submit a cost proposal for all required labor, equipment, and materials to complete the work. Subsequent technical submittals may be required for proposed methodology, equipment, and materials to be used.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment under this item will be made at the contract unit price per ALLOWANCE under ITEM 493.1 MISCELLANEOUS WORK AS DIRECTED BY THE ENGINEER. No additional payment over the Contract Allowance amount will be made for any work that does not meet the requirements of this section.

ITEM 698.4 **GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL** **N/A**

The work under this Item shall consist of furnishing and installing geotextile fabric for foundations as shown on the Plans or as required by the Engineer.

The geotextile fabric shall conform to the requirements of M9.50.0, and AASHTO M 288 for the intended application and must be on the MassDOT QCML. Construction and installation shall be in accordance with the following. Atmospheric exposure of the geotextile fabric to the elements following lay down shall be a maximum of 14 days.

For seams that are sewn in the field, the Contractor shall provide at least a six-foot length of sample sewn seam for the approval of the Engineer before the geotextile fabric is installed. The seams sewn for sampling shall be sewn using the same type of equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, samples of seams for both directions shall be provided. The seam assembly description shall be submitted by the Contractor along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density.

Geotextile shall be placed in intimate contact with soils without wrinkles or folds, and shall be anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement of the overlaying materials will not excessively stretch or tear it. Adjacent geotextile sheets shall be joined by either sewing or overlapping. At roll ends, overlapped seams shall overlap a minimum of 12 inches, except when placed under water, where they shall overlap a minimum of 3 feet. Adjacent rolls shall overlap a minimum of 12 inches.

Care shall be taken during installation to avoid damage to the geotextile as a result of the installation process. Should the geotextile be damaged, a geotextile patch shall be placed over the damaged area extending a minimum of 3 feet beyond the limits of the damage.

The Riprap placement shall begin at the toe of slope and proceed up the slope. Placement shall take place so as to avoid stretching and subsequent tearing of the geotextile. Stones shall not be dropped from a height exceeding 3 feet.

Field monitoring shall be performed to verify that the riprap placement does not damage the geotextile. Any geotextile damaged during backfill placement shall be replaced as required by the Engineer, at the Contractor’s expense.

METHOD OF MEASUREMENT

No payment will be made under this Item.

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:

- 12-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.

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.

See DEP approval and requirements for use of Compost Filter Tube in Document A00841.

Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales 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.

Sedimentation Fence

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

MAINTENANCE

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact (despite fabric decay) and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

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.

Barriers that have been driven over or otherwise damage by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

ITEM 850.41 RAILROAD SERVICES ALLOWANCE

DESCRIPTION

Work under this item shall be performed by signal system personnel and railroad flaggers provided by the HRRC.

No work will be permitted by the Contractor without the HRRC flagger being present. Each workday will begin with the required Job Briefing which will be given by the HRRC flagger.

HRRC will provide signal system support and coordination.

The Contractor shall be responsible for scheduling and coordinating their work with HRRC and retain the flagger service from HRRC. MassDOT is not responsible for delays or any additional costs associated with scheduling and coordination of flagger or signal system personnel or for the availability of HRRC personnel to perform the work, all such costs shall be the responsibility of the Contractor and will not be paid under this ITEM.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment under this item will be an ALLOWANCE made based on paid invoice to HRRC for the service provided by the HRRC flagger and system personnel with no markup. No payment shall be made beyond the amount on the invoices. No other payment for other items beyond the scope of this item shall be included.

The ALLOWANCE amount under this item is not to be exceeded without authorization of MassDOT. Any costs in excess of the ALLOWANCE amount are the responsibility of the Contractor and will not be paid by MassDOT unless authorized in advance.

ITEM 850.42 WORK TRAINS ALLOWANCE

DESCRIPTION

Upon the Contractor's request, subject to equipment and personnel availability, the Housatonic Railroad Company (HRRC) will, on a limited basis, provide and operate locomotives to move ballast cars and/or air side dump cars within the project corridor for ballast distribution and transport of excess soil and ballast excavation spoils as described in these special provisions.

The Contractor shall be responsible for scheduling and coordinating their work with HRRC. MassDOT is not responsible for delays or any additional costs associated with scheduling and coordination of locomotive power or for the availability of HRRC personnel to perform the work, all such costs shall be the responsibility of the Contractor and will not be paid under this ITEM.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Maximum reimbursement under this ALLOWANCE is capped at the ALLOWANCE amount stated in the bid form. Any costs in excess of the ALLOWANCE amount are the responsibility of the Contractor and will not be paid by MassDOT.

Before permitting work to begin under this ITEM, the Contractor shall request an itemized, written estimate from HRRC indicating the cost for the work to be performed. The Contractor shall submit these written estimates to the Engineer for review and approval prior to engagement of HRRC's services. No payments will be made for any services provided under this ITEM without prior review and approval by the Engineer. No payments exceeding the approved estimate amounts will be made by MassDOT.

Payment under this item will be an ALLOWANCE made based on the paid invoice to HRRC for the service provided by the HRRC with no markup. No payment shall be made beyond the amount on the invoices. No other payment for other items beyond the scope of this item shall be included.

ITEM 909.1 REPAIRING STONE MASONRY SQUARE YARD
ITEM 909.2 REPOINTING MASONRY JOINT LINEAR FOOT

DESCRIPTION OF WORK

Work under this item shall conform to the relevant Provisions of Section 901 of the Standard Specifications and the following:

This section specifies the repairing stone masonry and repointing of stone masonry joints in the existing abutments and wingwalls and culvert headwalls as shown on the plans and as directed by the Engineer.

Work under this item also include cleaning vegetation in stone masonry joints at abutments and wingwalls and culvert headwalls.

The Contractor is responsible for providing an independent material testing company for material testing that is specified under this Item. No separate payment for testing and shall be considered incidental to the work.

SUBMITTALS

1. Product Data: For each type of product indicated.

2. Samples for Verification: Match the existing for each type and color of the following:

    a. Mortar color.
    b. Sand grain size.

3. Qualification Data: For testing agency.

4. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

    a. Cementitious materials. Include brand, type, and name of manufacturer.
    b. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
    c. Grout mixes. Include description of type and proportions of ingredients.

5. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

    a. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
    b. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.

6. Tests Results: For each type of test including mortar, grout and prism tests, for approval by the Engineer.

7. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

QUALITY ASSURANCE

1. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

2. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

3. Preconstruction Testing Service: The Contractor will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by the Contractor. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

    a. Prism Test: For each type of construction required, per ASTM C 1314; strength as specified.

DELIVERY, STORAGE, AND HANDLING

1. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

2. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

3. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

PROJECT CONDITIONS

1. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost.

2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

MORTAR AND GROUT MATERIALS

1. Material shall be compatible with existing mortar.

2. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

3. Hydrated Lime: ASTM C 207, Type S.

4. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

    a. Available Products:

        i. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
        ii. Davis Colors; True Tone Mortar Colors.
        iii. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

5. Aggregate for Mortar: ASTM C 144. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

6. Aggregate for Grout: ASTM C 404.

7. Water: Potable.

MORTAR AND GROUT MIXES

1. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

    a. Do not use calcium chloride in mortar or grout.
    b. Limit cementitious materials in mortar to Portland cement [mortar cement] and lime.

2. Mortar for repointing granite masonry joints shall comply with ASTM C 270, and shall be Type M, minimum strength 2,500 psi.

3. Pigmented Mortar: Use colored cement product. Pigments shall not exceed 10 percent of Portland cement by weight.

STONE FOR MASONRY

1. Stone for masonry shall be quarry stone, field stone, or rock fragments approximately rectangular in shape and of a hard, sound, and durable quality acceptable to the Engineer. The stone shall be free from structural defects or imperfections that would tend to compromise its resistance to the weather.

2. Materials used for rebuilding or repairing stone masonry shall be approved by the Engineer prior to use. New stone, as required, shall match as closely as practical the existing stone masonry color, texture, and size. If required to match the existing stone masonry, chemical treatment processes to aid in providing stone of similar color shall be investigated by the Contractor.

MIXING OF MORTAR

1. The fine aggregate and cement shall be mixed in a clean, tight container until a mixture of uniform color is produced, after which clean water shall be added in such quantity as to form a mortar with the consistency of stiff paste. If desired, the Contractor will be permitted to use a batch mixer of an approved size and type. Mortar which has been mixed for more than 45 minutes shall not be used, and re-tempering of mortar will not be permitted.

REPAIRING STONE MASONRY

1. General:

   a. Earth, minor vegetation, and other foreign matter shall be removed and cavities in the stone substructure and wingwalls filled as indicated and specified in the Contract and as directed by the Engineer.

   b. The bed shall be clean and well moistened just prior to the placement of the stone. The stone shall be thoroughly saturated with water, well bedded into the mortar, and carefully settled in place before the mortar has set. No spalls will be permitted in the bed. Joints and beds shall not average over 1 inch in thickness.

2. Examination: The Contractor and Engineer shall jointly examine the abutments and wingwalls to field verify the extent of the work. All work shall be performed by stonemasons with a minimum of three years of experience with similar work

3. Repair: gaps between horizontal faces of existing stones less than 1 inch shall not be repaired. The size of these gaps shall equal the approximate diameter of a 7/8- inch steel dowel. Gaps between horizontal faces of existing stones between 1 inch and 6 inches shall have small stone blocks added, with the depth of the blocks as large as possible for good bearing. The minimum width of said blocks shall be 4 inches. Gaps between horizontal faces of existing stones greater than 6 inches shall have crushed gravel and stone blocks added. The crushed gravel shall be placed at the back of the stone and compacted in place up to 12 inches of the exposed wall face. The crushed gravel shall be compacted by tamping rods or other methods acceptable to the Engineer. Stone blocks shall then be added to achieve a tight fit. New stone blocks shall not extend beyond the face of the stone wall.

REPOINTING MASONRY JOINTS

1. Remove all deteriorated and loose mortar to a depth required to reach sound mortar.

2. Clean mortar joints using hand tools such as a trowel, hand chisel, and hammer or a small pneumatic chisel; the use of power saws and grinders is not recommended because of the potential to damage the surrounding stone. Remove mortar cleanly, leaving square cuts at the rear of the joint, if possible.

3. Rake out loose material using a natural bristle or nylon brush or low-pressure compressed air (40-60 psi). Low pressure water (maximum pressure 400 psi) may also be used, although care should be taken not to scour additional bedding mortar out of the joints.

4. Any loose stones encountered should be carefully removed, cleaned, and reset in their original positions.

5. Repoint only when the ambient temperature is between 41 and 86 degrees F, and is expected to remain above 41 degrees for several days following repointing; the stone should be free of frost.

6. Repoint using a mortar that is compatible with the historic mortar and which matches the historic mortar in color, texture, and, finish.

7. Measure and mix mortar components carefully to assure uniformity of visual and physical characteristics. Measure dry ingredients by volume and thoroughly mix them before adding water.

8. After dry mixing, add half the needed water and mix for approximately five minutes. Then add the remaining water in small portions until the desired consistency is reached.

9. Before placing the repointing mortar, dampen masonry surfaces and joints with a spray bottle to control suction and evaporation. Joints should be damp, but with no standing water present.

10. All joints shall be filled with mortar, well driven in. Place new mortar to within 1½ inches of the face of the stone. Apply the mortar into the joints in layers, starting with the deepest areas. Each layer should be no thicker than 3/8". Thoroughly compact each layer of mortar using a pointing tool or a trowel, ensuring it is firmly packed into the joint. Mortar should be compacted in successive layers, with each layer permitted to reach thumb-print hardness before the next layer is applied.

11. Hand pointing is the preferred method; a pressure gun may be used by experienced operators.

12. Finish point the remaining 1½ inches.

13. Finish pointing should be done by hand, using a pointing tool. For the outer ¾ inches, install mortar in ¼ in lifts, compacting each layer. Permit each layer to reach thumbprint hardness before the next layer is applied.

14. Upon completion, the new pointing should match the historic finish and tooling; the finish should match the stone face or be slightly concave, to channel water out of the wall and to avoid water pooling.

15. The repointed mortar joints should match the width of the historic mortar joints.

16. Immediately after repointing, clean excess mortar from adjacent masonry, taking care not to damage newly pointed joints. Use only natural bristle or nylon brushes and wood or plastic tools to remove excess mortar.

17. After mortar has begun hardening (about 12 hours), tamp back with a stiff brush to further compact the material.

18. Protect the finished work from direct sun and rain until the face has cured and hardened, approximately 48 hours.

19. After mortar has been allowed to cure for 7 to 14 days, clean exposed masonry surfaces using stiff nylon or natural bristle brushes.

MEASUREMENT AND PAYMENT

Work under Item 909.1 Repairing Stone Masonry will be paid for at the Contract unit price per square yard. Payment will be full compensation for removing material specified from the face of stone masonry; filling cavities; furnishing, transporting, handling, and placing the materials specified; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work

Work under Item 909.2 shall be measured and paid at the contract unit price per joint linear foot under Item 909.2 Repointing Masonry Joints. Work for cleaning vegetation in stone masonry joints at abutments and wingwalls and culvert headwalls is incidental to this item. Payment will be full compensation for furnishing, transporting, handling, and placing the material specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

ITEM 909.3 RESET ROTATED GRANITE STONE IN BACKWALL EA

A. GENERAL

Provide all labor, equipment, material, and coordination required to remove and reinstall granite stone in backwall of bridge abutments. The work also include remove and reinstall existing rail and ties, excavation and backfilling the wall with gravel borrow for backfilling structures and pipes.

B. QUALITY ASSURANCE

The masonry work shall be performed by, or under the direct supervision of, a Journey-level Mason.

C. SUBMITTAL

Submit Mix Design for masonry mortar.

D. MATERIAL

1. Portland Cement:
   Type II Portland Cement, as specified in AASHTO - M85. Alternatively, Type III cement, meeting the requirements of AASHTO T131 on approval as conditions warrant.

2. Aggregates:
   Fine aggregate for Mortar shall be as specified in Standard Specifications, Section M4.02.02 and approved by the Engineer.

3. Water:

   Use water from a potable or domestic source. Comply with the requirements of Section M4.02.15 of Standard Specifications.

4. Mortar Mix:

   Provide proportions of approved cement, aggregates, and water appropriate for the application in accordance with Section M4.02.15 of Standard Specifications. Color shall be approved by the Engineer.

5. Admixtures: Do not add calcium chloride.

6. Grout: Use only MassDOT pre-approved high strength non-shrinking grout.

7. Material for Gravel Borrow for backfilling structures shall be in accordance with the requirements in Section M1.03.0, Type b of the Standard Specification.

E. EXECUTION

1. Track Work

Track work consists of removal and reinstallation of exiting rails and cross ties. The work shall be performed in accordance with the contract drawings, ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA, with relevant requirements under MassDOT MW-1. The existing top rail elevations and track alignment should be maintained after reset of backwall stone, unless otherwise noted on the plans. The track work is incidental to Item 909.3.

2. Existing Granite Stones

   The existing granite stone shall be carefully removed from existing backwall at locations as shown on plans. The existing mortar adhered to the granite stone and the adjacent stones where new mortar joints will be placed shall also be removed.

   Before re-setting, granite stones shall be clean and free of dirt and foreign matter on all sides. Granite shall be set to match the existing alignment of adjacent backwall masonry. Joints shall be uniform in thickness. Direct bearing contact between granite pieces shall be prohibited.

3. Mortar:

   Mix mortar only in such quantities as can be used without adding additional water or admixtures. Apply mortar only to properly dampened surfaces and uniformly in quantities appropriate for the size and weight of the masonry to be used.

4. Backfilling:

   No backfilling behind the reset stone until the mortar joints has reached 75% design strength.

MEASUREMENT AND PAYMENT

Work under this item shall be measured and paid at the contract unit price per each stone under Item 909.3 Reset Rotated Granite Stone in Backwall.

Cost for temporarily removal and reinstall rails and ties of existing track is incidental to Item 909.3.

ITEM 912.5 DRILLED AND GROUTED #5 DOWELS N/A

The work to be done under this item shall consist of drilling and grouting holes in the existing structure for steel reinforcing dowels as shown on the Drawings, or as directed by the Engineer. The dowel embedment must be adequate to fully develop 125% of the yield strength of the bar. The embedment length, the method and equipment used to drill the dowel holes, and the diameter of the drilled hole shall at a minimum conform to the recommendations of the manufacturer and be submitted to the Engineer for approval.

MATERIALS

The grout to be used for these dowels shall be an injectable two-component epoxy adhesive. The epoxy adhesive shall be a moisture-insensitive, high-modulus, high-strength resin. The epoxy resin adhesive shall conform to ASTM C-881-90, Type IV, Grade 3, Classes B and C (AASHTO M235, Type IV, Grade 3, Class A, B and C).
The grout shall consist of a two-component epoxy adhesive whose cured components conform to the following requirements:

Bond Strength ASTM C882-91	
2 Day Cure	1800 psi
7 Day Cure	1800 psi
Compressive Strength ASTM D-695-96	12,000 psi
Compressive Modulus ASTM D-698-96	0.22 x 106 psi
Tensile Strength 7 day ASTM D-638-97	6310 psi
Elongation at break ASTM D-638-97	2.0%
Heat Deflection Temperature ASTM D-648-95	146°F
Absorption ASTM D-570-95	0.06%
Linear Coefficient of Shrinkage on Cure ASTM D-2566-86	0.004
Electrical resistance DIN IEC 93 (12.93)	1.7 x 1012 Ω/in.

Grouting material that has been tested, approved, and listed on the Approved Products List is acceptable for use on Massachusetts Department of Transportation bridge projects. However, all grouting material shall be field tested for use on this particular project.

The epoxy adhesive, drilled hole diameter, and embedment depth shall be field tested, as specified below, prior to approval for use on this project.

Two test dowel bars shall be installed in the existing concrete and tested by the Contractor for pullout. The pullout force shall correspond to 90% of the yield strength of the bar. If any of the tested bars pull out or if the surrounding concrete shows signs of cracking, the Contractor must adjust the holediameter, embedment length, and/or grouting material to meet this test requirement.

All testing of the drilling and grouted dowels shall be performed by the Contractor and is incidental to the work under this item. The method of applying the tension test load to the dowels shall conform to ASTM E488. The details of the testing equipment used and the locations and details of the test dowels shall be submitted to the Engineer for approval. The Contractor shall

perform this test as soon as possible in order to eliminate delays in construction due to the approval process. Dowels shall not be ordered until the embedment lengths have been approved by the Engineer.

Reinforcing steel dowels shall meet the requirements of ASTM A 615 Gr. 60. All reinforcing steel dowels shall be epoxy coated.

CONSTRUCTION METHODS

All dowel holes shall be drilled using a carbide drill bit. The diameter of the drilled dowel holes shall be in accordance with the recommendations of the grout manufacturer (generally 1/8-inch larger than the dowel diameter). 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 any existing reinforcing or portion of the structure that is to remain in place. Any damage to any existing portion of the structure that is to remain in place shall be repaired to a condition equal to or better than that existing prior to the beginning of the Contractor's operations and shall be repaired at the Contractor's expense.

The Contractor shall strictly 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 ACI code 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.

The Contractor shall arrange with the materials manufacturer or distributor to have the services of a competent field representative at the work site prior to any drilling of the proposed dowel holes to instruct the work crews in proper dowel installation procedures.

The field representative shall remain at the job site after work commences and continue to instruct until the representative and the Contractor, Inspector and/or Engineer are satisfied that the crew has mastered the technique of installing the dowels successfully. The representative shall make periodic visits to the project as the work progresses and shall confer on each visit with the Contractor, Inspector and/or Engineer. The manufacturer's field representative must be fully qualified to perform the work and shall be subject to the approval of the Engineer.

The Contractor shall be completely responsible for the expense of the services of the required field representative and the contract unit price shall consider full compensation for all costs in connection therewith.

METHOD OF MEASUREMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 912.5 DRILLED AND GROUTED #5 DOWELS shall be considered incidental to Items 995.1, 995.2, 995.3 and 995.6.

ITEM 945.10	**DRILLED MICROPILES**	**FOOT**
ITEM 948.60	**MICROPILE VERIFICATION LOAD TEST**	**EACH**
ITEM 948.61	**MICROPILE PROOF LOAD TEST**	**EACH**

GENERAL

This item shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications.

This work shall consist of constructing micropiles as shown on the plans, approved working drawings, and as specified herein. The Contractor is responsible for furnishing all materials, equipment, labor, services, and supervision; and for selecting means and methods for the installation and testing of micropiles for this project.

Micropiles shall consist of permanent casing sections and fully reinforced grout sections bonded with bedrock. Permanent casings shall be included as part of the micropiles and shall remain in place after grouting is complete. Temporary casings shall be installed if necessary to facilitate micropile construction and shall be removed during or after grouting. The Contractor is responsible for drilling through obstructions encountered during pile installation.

The micropiles load capacities shall be confirmed by verification and proof load testing. Testing must meet the test acceptance criteria specified herein. The bond length of the micropile may be modified by the Engineer, pending results of load testing performed as an initial part of the work.

MATERIALS

The materials for micropiles shall meet the following requirements:

Permanent/Drill Steel Casing used as Reinforcement: Permanent steel casing/pipe used as reinforcement shall be new "Prime" steel meeting the requirements of any API 5L PSL1 pipe with a yield strength of 52 ksi with SR15 supplemental requirements. The grade of the prime steel casing shall conform to the properties shown on the Plans. For steel pipe that is to be welded, the Carbon Equivalency, as defined in AWS D1.1 Section XI.1, shall be less than or equal to 0.45, as demonstrated by mill certificates. The sulfur content shall not exceed 0.05%, as demonstrated by mill certificates.

Permanent steel casing shall consist of ERW (Electric Resistance Welded) and/or seamless steel casing and shall be designed to withstand the design loadings determined by the Engineer or shown on the Plans and the verification/proof test loading described in this specification. Joints shall develop the full vertical capacity, and at least 60% of the moment capacity of the casing. As installed, there shall be no joints within three feet or as shown on the plans from the bottom of the pile cap.

The steel casing shall have certified mill test reports and shall be submitted for record purposes as the materials are delivered. The steel shall be traceable back to the mill certifications, and be free from defects (dents, cracks, tears, etc.).

New "mill secondary" steel pipe/casing will not be accepted regardless if they are accompanied by coupon test results.

Permanent steel casing shall be installed a minimum of 12 inches into intact bedrock.

Reinforcing Bars: Central reinforcing steel shall be full-length, continuously threaded bars. The bars shall conform to AASHTO M 31 Grade 75, or AASHTO M 275 Grade 150 as shown on the Contract Documents. The grade and size of the central reinforcement shall conform to any minimum and/or maximum properties shown on the Plans.

Reinforcing Bar Couplings: Reinforcing bar couplers shall be in accordance with Subsection M8.01.9 but are not required to be listed on the Qualified Construction Materials List (QCML). Where reinforcing bars are not specified with corrosion protection, bar couplers shall not be required to be epoxy coated or galvanized.

Independent testing shall be performed by a nationally recognized testing laboratory, approved by the Engineer, which shall provide certified test results showing that the reinforcing bar coupler meets the requirements of Subsection M8.01.9. Acceptance of the couplers shall be approved by the Engineer.

Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, or material non-detrimental to the reinforcing steel. Wood shall not be used.

They shall be securely attached to the reinforcement; sized to position the reinforcement to provide the grout cover specified in the table below; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing.

Table 1 - Minimum Grout Cover for Steel Reinforcement

Condition	Minimum Cover on Bar (in.)	Minimum Cover on Coupler (in.)
Micropiles in Soil	1	¼
Micropiles in Rock	½	¼
Coated or Encapsulated Bars	½	¼

Admixtures for Grout: Admixtures shall conform to the requirements of AASHTO M 194 and shall be selected from the QCML where applicable. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations or micropile top connections. Accelerators are not permitted. Admixtures containing intentionally added chlorides are not permitted. Admixtures shall be from the same Manufacturer and shall be compatible with the grout and mixed in accordance with the Manufacturer's recommendations.

Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to review and acceptance by the Engineer.

Cement: All cement shall conform to AASHTO M 85 Type I, Type II, Type III, or Type V and shall be the product of one Manufacturer.

Grout: Neat cement mixture with a minimum 3-day compressive strength of 50 percent of the 28-day unconfined compressive strength of 5,000 psi. The grout shall be proportioned and mixed as to provide a fluid grout capable of maintaining the solids in suspension without appreciable bleed. Preparation and placement of grout shall be in accordance with the recommendations of "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," ACI 304.

A minimum of 60 calendar days prior to the start of micropile construction the grout mix design shall be submitted to the Engineer and a trial batch shall be performed. The trial batch shall take place at a location approved by the Engineer and be performed in the presence of Department personnel. It shall be representative of the production grout placement and shall consist of the same materials, equipment, methods of mixing, and sample preparation and curing methods.

Trial batch samples will be tested to verify that the material meets all grout criteria specified in Table 2. The quantity of material batched shall be sufficient to perform all required tests specified.

Table 2 – Grout Material Acceptance Criteria for Trial Batch Testing

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 Or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 5000 psi
Consistency	API RP-13B-1	± 10% of the density specified in the mix design

Plates and Shapes: Structural steel plates and shapes for pile top attachments shall conform to M8.05.0, AASHTO M 270, and have minimum yield strength of 50 ksi.

Water: Water for mixing grout shall be potable, clean, and free from substances that may be injurious to cement and steel.

Fillers: Inert fillers such as sand (conforming to AASHTO M 45) may be used in the grout in special situations, such as presence of large voids in the ground or when grout take and travel are to be limited, with prior written approval by the Engineer.

CONSTRUCTION METHODS

QUALIFICATIONS

The Micropile Contractor must be experienced in the construction and load testing of micropiles and have successfully constructed at least 5 projects in the last 5 years involving construction

totaling at least 100 micropiles with similar capacity and requirements specified in these plans and specifications. The Micropile Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions and shall have available and be thoroughly familiar with the specialized type of equipment needed to perform work of this type.

The on-site foremen and drill rig operators shall also have experience on at least 3 projects over the past 5 years installing micropiles of equal or greater capacity than required in these plans and specifications.

Prior to the Pre-construction Meeting, the Micropile Contractor shall submit the following information to verify the firm's experience and the qualifications of personnel scheduled to perform the micropile design (load test frame) and construction:

1. Submit a list of at least five micropile projects successfully completed in the last five years. Include construction details, structural details, load test reports, and client contact for each project listed.
2. Submit a list of the equipment and resources the Micropile Contractor plans to mobilize and utilize for the performance of the project.
3. Provide the names and detail the experience of the micropile designer, on-site supervisor, foremen, and drill rig operators for this project.
4. A signed statement that the Micropile Contractor has inspected both the project site and all the subsurface information including any soil or rock samples made available in the Contract Documents.

Work on any micropiles shall not be started, nor materials ordered until the qualifications and submittals have been accepted by the Engineer. The Engineer may suspend the micropile construction if the Micropile Contractor substitutes unapproved personnel during construction. Requests for substitution of field personnel shall be submitted to the Engineer for acceptance. Additional costs resulting from the suspension of work will be the Micropile Contractor's responsibility, and no extension in contract completion date resulting from the suspension of work will be allowed.

The Micropile Contractor shall have, on site during all micropile construction activity, a minimum of one Quality Control (QC) inspector. This person shall be responsible for quality control of the micropiles during all phases of construction and will monitor and document all QC inspection and testing activities required by the specifications and outlined in the accepted procedures and Working Drawings. The QC person shall be a certified NETTCP Concrete Technician.

MICROPILE PRE-CONSTRUCTION SUBMITTALS

The Contractor shall prepare and submit to the Engineer: shop drawings, a micropile installation plan, construction procedures, load testing procedures, and equipment calibrations for review and acceptance. The Contractor shall verify the limits of the micropile structure before preparing the detailed working drawings and allow the Engineer four (4) weeks to review the submittal after a complete set has been received. Work shall not begin, nor materials ordered until all submittals have been received, reviewed, and accepted in writing by the Engineer.

The micropile submittals shall include:

A. Plans

1. A plan view of the micropile layout identifying the locations of micropiles, numbering system for records, and verification test and proof test micropile locations.

2. An elevation view of the test micropile(s) showing:
   i. A typical detail of test micropiles defining the micropile length, reinforcement, inclination, and load test bonded and unbonded test lengths.
   ii. Permanent casing length and diameter, casing plunge length, and grout bond zone length.
   iii. Estimated soil/bedrock strata.
   iv. Instrumentation to be installed.
   v. Minimum drill hole diameter.
   vi. Splice type and locations.
   vii. Centralizers and spacers.
   viii. Pile Top Plate attachment details
   ix. Corrosion protection details.
   x. Grout design strength.

3. Details for constructing micropile structures around utilities, as applicable.

B. Construction Procedures

1. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing, and equipment to assure quality control. This step-by-step procedure shall be shown in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles. Include methods of drilling the holes, advancing the casing, drilling through or removing obstructions, flushing drilled holes, installing reinforcement, and grout pressures.

2. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.

3. Information on space requirements for installation equipment that verify the proposed equipment can perform at the site.

4. Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.

5. Certified mill test reports for the central reinforcing steel. The ultimate strength, yield strength, elongation, and material properties composition shall be included.

6. Certified mill test reports for the permanent casing. Certification that the permanent casing meets the supplemental requirements of SR15 shall be included.

7. Quality Control Plan. The QC Plan should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor and Subcontractors) performing work required under this specification. The QC Plan shall be structured to follow the format and section headings outlined in the MassDOT Model QC Plan. It shall be submitted to the Engineer for review and approval a minimum of 30 days prior to the start of work.

   The QC Plan shall include complete descriptions, and details for the following:

   i. Micropile installation including drilling method and grouting procedure.
   ii. Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports. The Micropile Contractor shall also provide specific gravity and density of the wet mix design.
   iii. Methods and equipment for accurately monitoring and recording the grout depth and grout volume as the grout is being placed.
   iv. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance, and start of production work. During production, grout shall be tested in accordance with the Grout Testing Requirement specified herein.
   v. Procedure and equipment for Micropile Contractor monitoring of grout quality. At a minimum, the Micropile Contractor shall verify the specific gravity of the mixed grout prior to placement of the grout into each drilled micropile.

C. Load Testing Procedures

Detailed plans and procedures for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with the Micropile Load Testing section of this specification.

D. Equipment Calibration

Calibration reports and data for each test jack, pressure gauge, master pressure gauge, and electronic load cell to be used. The calibration tests shall have been performed by a certified testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge, and electronic load cell calibration data.

PRE-CONSTRUCTION MEETING

A mandatory pre-construction meeting will be scheduled by the Engineer and held prior to the start of micropile construction. The Design Consultant, MassDOT Resident Engineer, Prime Contractor, and Micropile Contractor, including QC personnel, shall attend the meeting. The preconstruction meeting will be conducted to clarify the construction and QC requirements for the work, to coordinate the construction schedule and activities, specifically those pertaining to excavation for micropile structures, installation of temporary sheeting, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control, and site drainage control.

SITE DRAINAGE CONTROL

The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with related specifications within the Contract Documents, and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the work, remove surface water control pipes or conduits from the site.

EXCAVATION

Coordinate the work and the excavation so the micropile structures are safely constructed and remain stable at all times. Perform the micropile construction and related excavation in accordance with the plans and accepted submittals. No excavation deeper than those specified herein or shown on the plans will be made above or below the micropile structure locations without written acceptance of the Engineer.

MICROPILE INSTALLATION

A. General

The Micropile Contractor shall select the drilling method, the grouting procedure, and the grout pressure used for installation of the micropiles. The construction method shall incorporate any special construction requirements specified on the plans. The production micropiles and its construction method shall be identical to the accepted verification test piles.

When the plans require uncased drilling of the micropile into bedrock, the permanent and/or temporary casing shall be drilled a minimum 12 inches into intact bedrock or to a depth within the bedrock so as to prevent subsidence of over burden into the uncased and/or bond zone portion of the drill hole (i.e. the rock socket).

Piles shall be installed only in the presence of the Engineer’s or MassDOT’s Representative.

B. Location and Survey

Micropiles shall be located and marked using survey and a template by the Contractor who shall maintain and be responsible for all location and elevation stakes.

C. Drilling

The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to overlying or adjacent structures, buried structures, or utilities.

Temporary casing or other accepted method of pile drill hole support is required, when drilling within 10 feet of an existing foundation, or utility, and/or in caving or unstable ground, to permit the pile shaft to be formed to the minimum design drill hole diameter. The casing shall be of the type and thickness that can be installed without distortion. Casings that fail, fracture, or otherwise distort during drilling or after drilling shall, unless otherwise directed, be withdrawn or replaced at the Contractor's expense. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to placing grout and reinforcement. The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures, in order to maintain site conditions as determined by the Engineer. Do not progress a new hole, pressure-grout, or post-grout, within a radius of 5 pile diameters or 5 feet, whichever is greater, of a micropile until the grout for that micropile has set 24 hours or longer. Do not allow vibration or excessive wheel loads to influence piles during installation and construction.

Use of drilling fluid containing bentonite or any other non-reverting drilling fluid is not permitted. Use of polymer slurry to remove cuttings from the cased hole shall be approved by the Engineer.

Piles shall be installed using equipment capable of penetrating boulders, cobbles, bedrock, dense till material, granite blocks, timber, concrete, or other man-placed materials that hinder the advance of the pile.

Use of drop-type impact hammers and blasting are not permitted. Prior to the use of down the hole air drilling methods the Contractor shall provide temporary fencing or barriers as necessary to prevent cuttings from leaving the work area and entering the adjacent traffic lanes.

Micropiles shall not be installed using auger cast methods.

Permanent casing must be installed in a manner which will not loosen the adjacent soils and will result in intimate contact between the casing and the soil. Driving of casing will not be allowed. Drilling shall be performed such that cuttings and/or wash fluid return through the inside of the casing. External flush will not be allowed. The method of drilling used shall prevent the loss of ground due to erosion, jetting, or blow-in at the bottom of the casing. No open-hole drilling will be allowed unless accepted by the Engineer.

D. Ground Heave or Subsidence

During construction, the Contractor shall observe the ground conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. The Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/accepted construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor.

E. Pipe Casing and Reinforcing Bars Placement and Splicing

Reinforcement shall be placed prior to grouting the drill hole. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease, or oil that might contaminate the grout or coat the reinforcement and impair bond. Reinforcement in the bond zone [i.e. rock socket] shall extend the minimum required length.

The Contractor shall install all micropiles to the planned elevations.

Centralizers and spacers shall be provided at a maximum spacing of 10 feet on center. The upper- and lower-most centralizers shall be located a maximum of 5 feet from the top and bottom of the micropile, respectively. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The Contractor shall re-drill and reinsert reinforcing steel when necessary to facilitate insertion.

Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of the Material section. Threaded pipe casing joints shall be located at least two casing outside diameters (O.D.) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 1 foot.

F. Grouting

Micropiles shall be grouted the same day the load transfer bond length is drilled, or the bond length shall be flushed prior to grouting procedures commence. The grouting equipment shall produce a grout free of lumps and undispersed cement. Admixtures, if used, shall be mixed in accordance with Manufacturer's recommendations. The Contractor shall have means and methods of measuring the grout quantity and pumping pressures during the grouting operations. The grout pump shall be a positive displacement pump equipped with a pressure gauge to monitor grout pressure. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauge shall be capable of measuring pressures of at least 145 psi or twice the actual grout pressure used, whichever is greater. The grout shall be kept in agitation prior to pumping. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each

pile to be grouted in one continuous operation. The grout volume being pumped shall be measured to an accuracy of 10 percent.

The hole shall be flushed with clean water immediately prior to grouting, to remove all contaminated water and cuttings. The hole shall be flushed through the grout pipe fully extended to the bottom of the hole with the temporary casing (if any) in place. The water shall be pumped at a high velocity until the wash water at the top of the casing is clear. After flushing, the depth of the hole shall be measured to confirm that the hole is clean and no sediment exists at the bottom of the drilled rock-socket/bond length. Installation of the steel reinforcing and grouting shall be done immediately after flushing. In case of delay, the hole shall be re-flushed and rechecked prior to grouting as directed by the Engineer.

The grout shall be injected from the lowest point of the drill hole, and injection shall continue until uncontaminated grout flows from the top of the pile. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed, the grout level is brought back up to the proposed level before the next length is removed. The use of compressed air to directly pressurize the fluid grout takes is not permissible. The tremie pipe or casing shall always extend below the level of the existing grout in the drill hole during grouting procedures. The grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. The entire micropile shall be grouted to the design cut-off level. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

If the Contractor elects to use a post-grouting system, Working Drawings and relevant details including grouting pressure, volume, location and mix design, shall be submitted to the Engineer for review.

G. Construction Tolerance

Unless otherwise stated on the Plans, the following shall be the maximum construction tolerances for micropiles:

1. Centerline of piling shall not be more than 3 inches from indicated plan location.
2. Pile shall be plumb within 2 percent of total-length design plan alignment.
3. Battered piles inclined up to 1:6 shall be within 4 percent of design plan alignment.
4. Battered piles inclined greater than 1:6 shall be within 7 percent of design plan alignment.
5. Top elevation of pile shall be plus 1 inch or minus 2 inch maximum from vertical design elevation indicated.
6. Centerline of reinforcing steel shall not be more than 3/4 inches from indicated center of pile.
7. Minimum volume of grout placed shall be the 110% of the theoretical volume of the whole micropile length from bottom to top at time of grouting.

H. Micropile Installation Records

The Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on a micropile installation log. A separate log shall be

provided for each micropile. The log for each micropile shall contain the following minimum information:

1. Project name, structure name, micropile number, and contract number.
2. Date and time of drilling, grouting, and completion.
3. Bottom elevation of the proposed footing and final top elevation of the micropile, to the nearest 0.1 feet.
4. Plumbness and deviation from design location and batter.
5. Micropile as-built information such as pile inclination, casing diameter and wall thickness, reinforcement size and length, casing length below bottom of footing, taped measurement inside casing to check cleanout, plunge length (cased bond length), bond length below casing, total pile length below and above bottom of footing, All dimensions shall be provided to the nearest 0.1 feet.
6. Drilling method, drill bit type and size, and drill operator's name.
7. Table showing the descriptions and approximate top and bottom elevation of each soil or rock layer encountered during pile drilling.
8. Grout mix, density, and quantity used, for initial grout and post-grout (if any) including cement type and admixtures.
9. Maximum and average grout pressure used during installation.
10. Damage (if any) to pile, description of any deviations from the design location and batter or from the approved pile design and installation procedures, and description of any unusual occurrences during drilling (including obstructions), installation, and grouting.

The example micropile installation log in the "Micropile Design and Construction Guidelines Manual," Report No. FHWA-NHI-05-039 or FHWA-SA-97-070 can be used as a reference in developing the micropile installation log.

The Contractor shall also submit within 2 weeks after installation of all piles, an as-built plan, certified by a surveyor, showing the as-installed location of all piles to the nearest ½ inch.

CONSTRUCTION QUALITY ASSURANCE

Contractor Quality Control

The Contractor's QC personnel will perform Quality Control inspection, sampling, and testing to ensure that the processes are providing work conforming to the contract requirements. Inspection, sampling, and testing shall be documented on appropriate forms and provided to the Engineer. The Engineer will not sample or test for Quality Control or assist in controlling the Contractor's operations.

A. Testing

1. Grout consistency: As measured by grout density shall be determined by the Contractor per API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be within ±10% of the density specified in the grout mix design submittal.

2. Compressive Strength: Grout within the micropiles shall be tested by the Contractor's Quality Control Inspector to ensure that it attains the minimum required compressive strength.

   Micropile grout shall be sampled and cured in accordance with AASHTO R 64 (for 2 inch by 2 inch cubes) or T 23 (for 3 inch by 6 inch cylinders) and tested for compressive strength in accordance with AASHTO T 106 (for cubes) or T 22 (for cylinders). Grout samples shall be taken directly from the grout plant (on-site mixer and pump).

   The QC Technician will take the following sets of grout samples for QC testing:

   i. Verification Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.

   ii. Proof Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.

   iii. Production Piles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation; whichever occurs more frequently.

   The Contractor shall provide grout cube compressive strength, grout density, can grout volume results to the Engineer within 24 hours of testing.

Table 3 – Grout Material Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 5000 psi
Consistency	API RP-13B-1	± 10% of the density specified in the mix design
Volume		≥ Theoretical volume of hole

MassDOT Acceptance

The Engineer is responsible for performing all Acceptance activities and making the final Acceptance determination. The Engineer's Acceptance system will include monitoring the Contractor's QC activity, performing Acceptance inspection, and utilizing available sampling and testing data.

A. Inspection

The Engineer will perform Acceptance inspection of all work items to ensure that all materials and completed work are in conformance with the contract requirements.

B. Testing

MassDOT will determine whether it will test 2-inch cubes or 3-inch by 6-inch cylinders for its Acceptance testing. The Contractor will be required to provide to MassDOT a sufficient amount of approved 2-inch cube molds or 3-inch cylinders. If it is determined that MassDOT will test 3-inch cylinders then a correlation between the 2-inch cube results and the 3-inch cylinders shall be determined by MassDOT.

MassDOT will take the following sets of grout samples for Acceptance testing:

i. Verification Test Piles – 3 sets of cubes or cylinders for 3-, 7-, and 28-day strength testing.

ii. Proof Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.

iii. Production Piles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation; whichever occurs more frequently.

Pile verification or proof load testing shall not be performed until MassDOT has confirmed the grout has reached the minimum 3-day design strength specified in Table 4.

Table 4 – Grout Material Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 5000 psi

MICROPILE LOAD TESTING

A. General

The Contractor shall perform pre-production verification pile load testing on one sacrificial pile per bond zone bearing stratum. The number and location of the verification test(s) shall be as specified on the Plans. In general, the location of the verification test(s) shall be within 10 feet of the footprint of a substructure unit, but at least 5 feet from any production pile as selected by the Contractor and accepted by the Engineer.

Pile proof load testing shall be performed on actual production micropiles and shall be performed on one pile per substructure unit or five percent of the total number of piles, whichever is greater, in conformance with the approved working drawings and testing procedures. The production proof test pile(s) shall be at a location selected by the Contractor and accepted by the Engineer.

The load tests shall conform to the requirements of ASTM D1143 (vertical compression load testing) or ASTM D3689 (vertical tension load testing) except as modified herein. The maximum test loads shall be 150% of the Factored Design Load (FDL) for the micropile verification test and 100% of the FDL for Micropile Proof Test. The Factored Design Load is defined as the Factored Axial Design Load (compression and/or tension) as shown on the Plans. The maximum test loads shall be as specified above but not more than 80% of the structural capacity of the micropile elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. The structural elements of the verification test micropile may be modified for testing the FDL of the micropile as accepted by the Engineer. The Alignment Load (AL) should not be more than 0.04 FDL.

Before starting the work, the Contractor shall submit to the Engineer for acceptance, a pile load test plan including a written description of the equipment and methods which are intended to be used. The methods must be of an accepted type and shall be altered as necessary to meet the acceptance of the Engineer. The pile load test plan and description shall be prepared and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

Grout within the micropile verification test pile shall attain the minimum required 3-day compressive strength prior to load testing. The top elevation of the test pile shall be determined immediately before the load testing. The head of each micropile shall be cut-off level or capped to produce a level horizontal bearing surface.

The Contractor shall provide all personnel and equipment needed to perform the test, measure loads and movements, and record test data. A representative of the Department or the Engineer may observe and witness the test and record data independently. No testing is to be performed unless all the agreed representatives are present.

Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The Contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the submittals Section.

Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Provide a reaction frame capable of safely supporting 125 percent of the maximum test load. Align the jack, bearing plates and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 100 psi increments or less. The jack pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required.

Calibrate the test load jacking system including the hydraulic jack couplings, gas pump, pressure gauge, and hydraulic load cell prior to the test so that the load applied is controlled to within 3 percent of the total applied load. Submit calibration reports prior to the start of the pile load test. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.

Readings of settlement and rebound shall be referred to a fixed benchmark and shall be made using at least three dial gauges (micrometer dial extensometers) graduated to 0.001 inches and located 120 degree intervals around the micropile. The gauges shall be mounted on a reference beam supported at each end by reliable supports located at least 10 feet from the center of the test pile and independent from the jack, pile, or reaction frame.

The dial gauges shall have a travel sufficient to allow the test to be done without having to reset the gauges. Visually align the gauges to be parallel with the axis of the micropile. Readings shall be taken at intervals specified in the Verification Test and Proof Test section.

The Contractor shall establish a survey reference point on the test pile and another reference point at the center of the reference beam. The reference points shall consist of graduated scales machine-divided into 0.02 inch and attached securely to the pile and reference beam. The reference points shall be monitored using survey equipment during the pile load test.

Protect the settlement measuring system against rain, wind, frost, and any other disturbances that could affect the reliability of the settlement observations. Provide sun shading for the measuring system for the duration of the test and for a minimum of 1 hour prior to the start of the test.

B. Micropile Verification Test

The Contractor shall perform pre-production verification pile load testing on sacrificial piles at a location selected by the Contractor and accepted by the Engineer. The location of the verification tests shall be within 10 feet of footprint of a substructure unit but at least 5 feet away from any production pile. Testing shall be performed in compression or tension in accordance with ASTM D1143 or ASTM D3689, respectively, except as modified herein.

Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the required FDL and load test acceptance criteria and to verify that the length of the micropile bond zone is adequate. The drilling-and-grouting method and casing outside diameter shall be identical to those specified for the production piles as indicated on the Plans.

Verification test piles shall be installed at the location accepted by the Engineer. The steel core may need to have a higher strength or a larger diameter than for the production piles to accommodate the test load.

Verification test piles shall include at least two, ¾-inch diameter PVC Schedule 40 pipes cast into the test pile to allow telltales to be installed for load testing. The pipes shall be securely fastened in straight alignment to prevent displacement during grouting. The pipes shall be sealed at the bottom with threaded steel caps and at the top with threaded PVC plugs. The pipes shall extend within one foot of the top and bottom of the bearing stratum (i.e. unbonded zone of the pile) at the test pile location. Strain gages may be substituted for telltales.

The micropile verification load test results must verify the micropile design and installation methods, and be reviewed and accepted by the Engineer prior to beginning installation of production micropiles. The verification test pile and reaction piles shall not be used as production piles.

Test verification pile to a maximum Test Load of 150% of the Factored Design Load (FDL) defined above, as indicated on the Plans. The verification pile load test shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Cycle 1	AL	-
		0.075 FDL	4
		0.15 FDL	4
		0.225 FDL	4
		0.30 FDL	4
		0.375 FDL	4
2	Cycle 2	AL	1
		0.15 FDL	1
		0.30 FDL	1
		0.375 FDL	1
		0.45 FDL	4
		0.525 FDL	4
		0.60 FDL	4
		0.675 FDL	4
		0.75 FDL	4
3	Cycle 3	AL	1
		0.30 FDL	1
		0.60 FDL	1
		0.675 FDL	1
		0.75 FDL	1
		0.875 FDL	4
		0.90 FDL	4
		0.975 FDL	10 or 60 (Creep Test)
4	Cycle 4	AL	1
		0.30 FDL	1
		0.60 FDL	1
		0.90 FDL	1
		0.975 FDL	1
		1.05 FDL	4
		1.125 FDL	4
		1.20 FDL	4
		1.275 FDL	4
		1.35 FDL	4
		1.425 FDL	4
		1.50 FDL	4
		1.20 FDL	4
		0.90 FDL	4
		0.60 FDL	4
		0.30 FDL	4
		AL	15

Creep Test: Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The verification test pile shall be monitored for creep at the 0.975 FDL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 0.975 FDL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the pile top movement between 1 and 10 minutes exceeds 0.04 inches, the 0.975 FDL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes. Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance criteria for micropile verification load tests are:

1. If the pile is tested in compression, acceptance will be based on the Davisson criteria. For this criterion, the ultimate load is defined as the load at which settlement measured relative to the top of the pile prior to the start of testing exceeds the sum of:
    I. The theoretical elastic compression of the pile assuming the load applied at the top of the pile act over the full length of the pile, and
    II. 0.15 inches plus 1 percent of the pile tip diameter.
2. If the pile is tested in tension, the ultimate load is defined as the load that produces an upward movement under load of 0.5 inch at the pile tip. The movement at the pile tip is:
    I. Measured directly by tell-tale, or
    II. Computed by deducting the theoretical elastic elongation of the pile from the upward movement measured relative to the top of the pile prior to the start of testing.
3. At the end of the 0.975 FDL increment, the test pile shall have a creep rate not exceeding 0.04 inch/log cycle time (1 to 10 minutes) or 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the creep load hold period.
4. Failure does not occur at any load increment up to and including the maximum test load, 1.50 FDL. Failure is defined as load where the slope of the load versus head settlement curve first exceeds 0.025 in/kip.

At the completion of verification testing, test piles shall be removed down to the elevation specified on the plans or by the Engineer.

For the verification load tests, reports must be written and submitted to the Engineer within 3 working days of the load test completion. This report will either confirm the micropiles' resistance and bond lengths specified on the plans or reject the piles based upon the test results. This report shall be reviewed and acceptance by the Engineer prior to beginning installation of production micropiles. The contents of the verification load test report shall include:

1. Brief project description.

2. Description of site and subsurface conditions including information on the ground conditions at the location of the load test and a comparison to actual conditions encountered.
3. Key personnel including the drill rig operator, the superintendent, the grout plant operator, and any other personnel involved in the installation and testing of the micropile.
4. Micropile installation data including information such as length of the micropile (cased and uncased), number of bags of cement used to construct the micropile, size and type of casing and reinforcement, geology encountered (e.g. soil material, rock material, and water levels) during drilling, grouting record and grout testing results.
5. Results of load test including load-movement curves/figures and filled-out data sheets.
6. Statement of load test requirements and acceptance criteria.
7. Comparison of load test requirements and acceptance criteria.
8. Summary statement on the load test results.

If a tested micropile fails to meet the Acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include but not limited to modifying the installation methods, increasing the bond length, regrouting the pile via preplaced regrout tubes or changing the micropile type. Any modification that necessitates changes to the structure design shall be submitted as a revision to the Working Drawings and require the Engineer's review and acceptance. Additional load testing may be required until an acceptable pile load test meets the designated load test requirements.

C. Micropile Proof Test

Proof test piles to a maximum test load of 1.00 FDL as defined above. Proof tests shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Cycle 1	AL	-
		0.10 FDL	4
		0.20 FDL	4
		0.30 FDL	4
		0.40 FDL	4
		0.50 FDL	4
		0.60 FDL	4
		0.70 FDL	4
		0.80FDL	4
		0.90 FDL	4
		1.00 FDL	10 or 60 (Creep Test)
		0.75 FDL	4
		0.50 FDL	4
		0.25 FDL	4
		AL	4

Creep Test: Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The proof test pile shall be monitored for creep at the 1.00 FDL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.00 FDL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the pile top movement between 1 and 10 minutes exceeds 0.04 inches, the 1.00 FDL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes. Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance criteria for Micropile Proof Load Test are the same as those for the Micropile Verification Load Test, except as modified below:

1. The creep test shall be held at the end of the 1.00 FDL increment.
2. Failure does not occur at any load increment up to and including the maximum test load, 1.00 FDL

Within 3 days of the completion of each proof load, the Contractor shall submit a report confirming the micropiles' capacities and bond lengths specified on the plans or reject the piles based upon the test results. The contents of the proof load test report shall be the same as those in the report for the Micropile Verification Load Test.

If a proof-tested micropile fails to meet the Acceptance criteria, the Contractor shall immediately proof test another micropile within that substructure. For failed piles and further construction of other piles, the Contractor shall modify the construction procedure. Failed micropiles shall be replaced at the Contractor's expense. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Verification and proof tests will be re-performed if the micropile type is changed.

NON-CONFORMING PILES

Non-conforming piles include piles that are installed out of tolerance, are damaged, the volume of grout placed is less than the theoretical volume of the hole, or the grout tests do not indicate the specified strength has been achieved. The Contractor shall submit a written remedial action plan to the Engineer for approval. The remedial action plan shall indicate how to correct the problem and prevent its reoccurrence. To mitigate or remediate non-conforming piles, the Contractor may be required to provide additional piles or supplement piles to meet specified requirements at no additional cost to the Owner.

METHOD OF MEASUREMENT

Drilled Micropiles will be paid for at the contract unit price per Foot.

Micropile Verification Load Test and Micropile Proof Load Test shall be measured for payment per Each.

BASIS OF PAYMENT

Drilled Micropiles shall be paid at the contract unit price per Foot, complete in place and accepted. Payment for drilled micropiles shall be considered complete compensation for providing all materials, labor, equipment, proper disposal of drilling spoil, and incidentals to complete the work.

There will be no separate measurement for mobilization and demobilization associated with this item. Any difference in the required length of permanent casing and micropile installed and accepted by the Engineer from the estimated lengths shall be measured for payment and/or credit. There will be no payment for differences in required length of temporary casing. The Micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

The Contractor shall anticipate encountering obstructions as noted herein and shall utilize equipment and methods necessary to advance through or remove the obstructions. The presence of obstructions, any lost production, replacement piles, and the removal of obstructions, if necessary, shall not be measured or paid for separately. Any costs associated with the presence of obstructions shall be considered incidental to the Drilled Micropiles Item.

Drilling tools that are lost during the drilling shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. If removal will degrade the hole, the hole shall be abandoned with a new hole located by the Engineer. All costs due to lost tool removal, drilling a new hole and filling the abandoned hole shall be borne by the Contractor.

Micropile Verification Load Test and Micropile Proof Load Test shall be paid at the contract unit price per each completed and accepted test, for which payment shall be considered complete compensation for providing all design, materials, labor, equipment, load test report, and incidentals to complete the work including the installation and materials of the test pile and reaction piles, if used. This payment shall also include full compensation for cutting the pile to the elevation necessary to properly incorporate the pile in the structure. If a pile is not to be incorporate in the structure, this payment item includes cutting the pile to the grade necessary to avoid its interference with the proposed construction. Payment for Micropile Verification Load Tests shall also include full compensation for installing the test pile. Micropiles installed as test piles for Proof Load Tests, if incorporated in the final structures, the length of pile installed in place shall be paid for at contract unit price of Drilled Micropiles.

Payment Items

945.10	Drilled Micropiles	Foot
948.60	Micropile Verification Load Test	Each
948.61	Micropile Proof Load Test	Each

ITEM 953.31 EXCAVATION SUPPORT SYSTEM N/A
BRIDGE NO. 74.17

The work under these items shall conform to the applicable provisions of Sections 940, 950 and 955 of the Standard Specifications and the following:

GENERAL

The work shall consist of the design, procurement, installation and removal of excavation support systems to maintain the railroad service and existing structures during staged construction and for retaining the embankments adjacent to excavation for the construction. The limits of the excavation support systems shall be determined by the Contractor and submitted for approval by the Engineer.

The excavation support systems for the proposed bridge and retaining wall structures are shown on the plans as either soldier pile and lagging or steel sheeting, but alternate forms of temporary shoring may be submitted for acceptance by the Engineer. Any necessary tie backs, soil anchors, and/or temporary bracing are considered incidental to this item. The excavation support systems provided shall be independent and not cause damage to the permanent structures when removed.

The Excavation Support System shall extend longitudinally such that the maximum slope of the excavated surface does not exceed 1 (vertical) to 1 ½ (horizontal).

Do not remove excavation support members installed within the zone of influence of track, new or existing structures or pipes. The zone of influence for track is defined as an imaginary line extending horizontally from 5.5 feet off centerline of adjacent track, then on a 2 (horizontal) to 1 (vertical) slope. The zone of influence for structures or pipes is defined as a line extending down and away from the outer edge of the structure or pipe springline at a slope of 1 horizontal to 1 vertical. All excavation support system installed adjacent to track shall be designed and installed in accordance with AREMA and designed for Cooper E80 live loading

Support members that are not removed shall be cut off at least 2 feet below finished grade or at a depth accepted by the Engineer and abandoned in place. No wood shall remain as part of the abandoned portion of the Work.

The Contractor is responsible for control of groundwater and surface runoff drainage to allow excavation work to be performed in the dry. This work is incidental to the items and will not be considered for additional compensation.

The Contractor is responsible for installation of survey deformation monitoring points (DMPs) on piles/sheeting to monitor movements that may be detrimental to performance of railroad and/or structures. This work is incidental to the items and will not be considered for additional compensation.

GEOTECHNICAL INSTRUMENTATION AND MONITORING

Deformation Monitoring

Where the excavation support systems extend within the zone of influence of existing structures or utilities, the Contractor shall furnish, install, protect, replace, monitor and report on survey deformation monitoring points (DMPs) established a minimum of one every 20 linear feet along the top of the excavation support wall and track within 100 feet of construction activities, to measure vertical horizontal displacements during the Work. The zones of influence are defined as above. The Contractor's registered Surveyor and Geotechnical Monitoring Consultant shall monitor and evaluate the instrumentation. The Contractor shall perform a baseline survey of each DMP consisting of two sets of independent readings prior to the beginning of excavation and demolition. During excavation, DMPs shall be monitored one time daily until excavation is complete. The Contractor shall provide survey data to the Engineer for review within 24 hours of collection of data. The number of points to be monitored on a daily basis and the frequency of monitoring may be increased or decreased in agreement with the Engineer based on the results of the monitoring. Survey data shall be reported to an accuracy of 0.01 feet.

The Contractor shall assure that movements do not exceed the tolerance specified herein at any time during construction in accordance MBTA Railroad Operation Directorate, dated August 2014. Refer to Section VII "Temporary Sheeting and Shoring" of the Directorate for track monitoring requirement. Stop work, immediately notify the Engineer, and take immediate remedial action if lateral or vertical movements exceeds half-inch (1/2") at the existing structure or earth support system and quarter-inch (1/4") at tracks during progress of this work. This movement criteria is intended only to establish a guideline, and in no way relieve the Contractor of his responsibility for preventing detrimental movements or damage causing structural distress in the various structures, tracks, or embankment. The Contractor shall provide all measures necessary to control movements to within the established performance criteria, or to lesser amounts as required to prevent damage. The Engineer may require the Contractor to take steps to control movements to levels which are lower, at no additional cost to the Owner, if in the Engineer's opinion the measured or observed movements are detrimental or damaging.

The work shall be executed in such a manner as to prevent damage to tracks, existing structures and other public and private property and existing improvements. The Contractor shall protect existing improvements from damage caused by settlement, lateral movement, loss of ground, undermining, washout, and other potential hazards which may be initiated by underpinning operations. Damage to existing facilities shall be repaired by the Contractor at his own expense.

EXCAVATION SUPPORT SYSTEM REQUIREMENTS

Plans and calculations of the excavation support systems shall be prepared and submitted to the Engineer for approval. The Contractor designed excavation support systems shall meet the minimum following requirements:

1. The Contractor is responsible for selecting, designing, furnishing, installing, maintaining, monitoring, and removing (where applicable) the excavation support systems.
2. The Contractor shall submit for review and approval, plans and calculations of the proposed systems. All plans and calculations submitted shall be prepared and stamped by a Professional Engineer registered in Massachusetts.
3. The excavation support systems shall be designed to safely resist all anticipated loads they may be subjected to while in place, including live load surcharge and any expected surcharge from construction vehicles (i.e. cranes). The design shall be in accordance with

the latest edition of American Railway Engineering and Maintenance-of-Way Association (AREMA) and designed for Cooper E80 live loading.

The Contractor shall submit shop drawings indicating the instrumentation and monitoring point locations, sizes, material types, and installation procedures. Contractor submittals shall be acceptable to the Engineer prior to undertaking the work.

METHOD OF MEASUREMENT

These items will be measured in the unit of Lump Sum for all temporary excavation support systems required on the project.

BASIS OF PAYMENT

Separate Measurement and Payment will not be made for the work of this Special Provision. All costs for ITEM 953.31 EXCAVATION SUPPORT SYSTEM BRIDGE NO. 74.17 shall be considered incidental to ITEM 995.1 BRIDGE STRUCTURE NO. 74.17.

ITEM 955.10 STEEL GRATING WALKWAY N/A

GENERAL

These specifications apply to steel bar grating walkway as hereinafter defined and described. This work shall consist of furnishing and installing steel bar grating at the locations shown on the plans or as directed by the Engineer. Construction of the steel bar grating shall be done in accordance with this specification, the plans, and the manufacturer's instructions.

Work under this item is for furnishing and installation of steel grating walkways on Bridge No. 76.23.

The work under these items shall conform to the following standards:

1. The applicable provisions of Section 995 of the standard Specifications and the Supplemental Specifications.
2. The Contract Documents and Volume 2, Chapter 15 of the AREMA Manual for Railway Engineering, latest edition.
3. The specific requirements stipulated below for this item.

Work under this item shall include all material, equipment and labor needed to install steel grating walkways.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of this bridge structure or which may be incidental to its construction and are not specifically included for payment under another item shall be considered incidental to the work performed under these items and shall be included in the unit price of the component of which they are a part.

REFERENCES

American National Standards Institute (ANSI)

MBG 531-09 Metal Bar Grating Manual

American Society for Testing and Materials (ASTM)

ASTM A 1011/A 1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low- Alloy with Improved Formability, and Ultra-High Strength

ASTM A 510/A 510M Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel

DEFINITIONS

a. A metal bar grating is an open grid of metal bars. These bearing bars, which have a cross-sectional depth much greater than width, are held at regular spacing, usually parallel, either by:

   i. Straight, sinuous or corrugated cross bars having their longitudinal axis perpendicular to the bearing bars and being connected to them by welding, forging or mechanical locking, or by:

   ii. Bent connecting bars alternately contacting adjacent bearing bars and riveted to them at regular intervals.

b. Definitions of other terms shall conform to those given in the Glossary of Terms in MBG 531-09

MATERIALS

1. Steel Grating:

   a. Steel used in bearing bars, cross bars and connecting bars of rectangular section shall conform to ASTM A 1011/A 1011M commercial Steel (Type B) for hot rolled carbon steel sheet and strip.

   b. Cross bars made of wire rod shall conform to ASTM A 510/A 510M for carbon steel wire rods and coarse round wire, except that permissible tolerance on diameter of coarse round wire shall be ± 0.005 in. (± 0.13 mm).

   c. Combinations of ASTM A 1011/A 1011M and A 510/A 510M steels are permitted to be welded together.

   d. Rivets shall be of steel, ¼ in. (6 mm) minimum diameter, flat head type

   e. Finish shall be hot dip galvanized in accordance with ASTM A123 after fabrication

Suppliers of the steel grating which conform to the contract documents include, but are not limited to the following:

Manufacturer

Nucor Grating Fisher & Ludlow, Inc.
1115 E 5000 N Road
Bourbonnais, IL 60914

Mc Nichols Co.
2 Home News Row

New Brunswick, NJ 08901-3602

Indiana gratings, Inc.
212 W. Douglas St.
Martinsville, IN 46151

or approved equal.

SUBMITTALS

The contractor shall submit catalog cuts or detailed shop drawings to the Engineer for review. Drawings shall clearly show all materials, finishes, and connection methods. No work shall commence prior to the approval of the Engineer.

All tolerances shall be within the limits shown on the Metal Bar Grating Manual.

Bandings, nosings, carriers and toe plates, when specified, shall be attached by welding as shown on page 20 of the Metal Bar Grating Manual.

All cutouts where more than one bearing bar is cut and bearing bars are not supported shall be load banded.

Unless specifically ordered otherwise, no welds anywhere shall be ground.

MEASUREMENT AND PAYMENT

The work described under this section shall be paid under Item 995.2 BRIDGE STRUCTURE NO. 76.23 for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to design and install STEEL GRATING WALKWAY.

ITEM 975.1 BRIDGE HANDRAIL N/A

DESCRIPTION

1. CONTRACTOR: The CONTRACTOR shall furnish all labor, tools, equipment and material necessary for the design and installation of BRIDGE HANDRAIL on Bridge No. 74.17 and 76.23 and on retaining wall on Br. 85.32 in accordance with the plans and as specified herein.
2. Provisions: Design of handrails and railings shall, at minimum, comply with OSHA 1910.23(e).

SUBMITTALS

1. Submittals: The CONTRACTOR shall prepare and deliver technical submittals for review and approval of the ENGINEER. All submittals must be approved before related work may begin. Listed below are submittals required for this item of work, additional submittals may be required due to site conditions or the nature of the work. In order to maintain correspondence records each submittal shall be assigned a submittal number and transmittal number for use by the CONTRACTOR and the ENGINEER. For additional information regarding each submittal refer to the appropriate section of this specification.
    a. Product data;
    b. Product specifications;
    c. Material Certifications;
    d. Plans showing location of handrail required with all necessary dimensions, and detail drawings showing standard handrail elevations, typical connections, anchoring systems, and expansion joints.
2. Shop Drawings: CONTRACTOR shall furnish one (1) complete electronic copy of detailed shop drawings for approval prior to starting fabrication. By approving and submitting shop drawings, the CONTRACTOR thereby represents that they have determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, or will do so, and that they have checked and coordinated the shop drawings with the requirements of the work and of the contract documents.
3. Design Requirements:
    a. Rails shall be continuous wherever possible and shall be attached to a minimum of three posts.
    b. Top of handrail shall be not less than 3’-6” above surface of walkways. An intermediate rail, or rails, shall be provided, with clear space between rails, or between rail and top of walkways, not to exceed 1’-9”.
    c. Field welding is not allowed.
4. Submittal Review: Approval by the ENGINEER is only for the purpose of confirming compliance with the contract plan and specifications. Approval shall not relieve the CONTRACTOR from responsibility for correctness, quantity and quality,

nor for completeness of Work in accordance with the plans and specifications.

MATERIAL

GENERAL

1. Rails: ASTM A53/A53M, standard weight (Schedule 40), 2" nominal diameter pipe, galvanized or ASTM A500 Grade B, 2"x1"x3/16" tube, unless otherwise noted on the plans.
2. Posts and Connection Plates: Structural steel ASTM A36, galvanized, unless otherwise noted on the plans.
3. Bolts: ASTM A325 galvanized, unless otherwise noted on the plans.
4. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with The Society for Protective Coating SSPC-Paint 20 or ASTM A780.

HANDLING AND STORING MATERIALS

1. Handling: All material shall be handled in a manner which will prevent members from being distorted or damaged. Stored material shall be piled securely, and no material shall be placed closer than 25 feet to the centerline of the nearest tracks. Material shall be placed on level platforms, skids, or other supports above the ground and shall be kept clean and properly drained.
2. Shipping: All materials shall be carefully loaded so as to avoid damage in transit. Members weighing more than 3 tons shall have the weight marked thereon. All small parts such as bolts, pins, washers, and small connection plates shall be packed in containers of adequate strength. The contents of each unit shall be plainly marked on the top of each container.

EXECUTION

1. Installation:
    a. Install in accordance with manufacturer's instructions.
    b. Install components plumb, straight and true, accurately fitted, free from distortion or defects.
    c. Assemble with mechanical fittings to accommodate tight joints and secure installation.
    d. At time approved by ENGINEER, remove protective wrap. Clean handrail with mild soap and water. Do not use solutions, steel wool, or abrasives.

MEASUREMENT AND PAYMENT

The work described under this section shall be paid under Items 995.1, 995.2 and 995.4 for furnishing all labor, materials, tools, equipment, forms, supplies, accessories, supervision, engineering and all other items of expense to design and install BRIDGE HANDRAIL.

ITEM 991.1	**CONTROL OF WATER – BRIDGE NO. 74.17**	**LUMP SUM**
ITEM 991.2	**CONTROL OF WATER – BRIDGE NO. 77.28**	**LUMP SUM**
ITEM 991.3	**CONTROL OF WATER – BRIDGE NO. 80.72**	**LUMP SUM**

GENERAL

The work to be done under these Items shall conform to the relevant provisions of Subsection 140 of the Standard Specifications and the following:

The work to be performed under Item 991.1 shall include all pumping, sandbagging, earth, and other measures, required for maintaining for sufficient water control, for retaining adjacent embankments, and for accomplishing the demolition of the existing bridge structure and the construction of the proposed precast concrete box bridge structure and cast-in-place concrete transition walls for Bridge No 74.14.

The work to be performed under Item 991.2 and Item 991.3 shall include all pumping, sandbags, earth, and other measures, required for maintaining for sufficient water control, for retaining adjacent embankments, and for accomplishing the rehabilitation of Bridge No 77.28 and Bridge No. 80.72, respectively.

Dewatering shall be conducted to ensure that all structural concrete and stone masonry mortar joints are placed and cured in the dry.

It is the responsibility of the Contractor to determine the need and extent of dewatering required and to submit methods and materials he proposes to use for the Engineer's approval.

The water flow under the bridges shall be maintained during construction.

The Contractor shall follow the guidelines of this specification for which dewatering is to be accomplished. However, except for payment, all work shall conform to the relevant requirements of Subsection 140 of the Standard Specifications, and to the allowed dewatering methods listed herein:

The Contractor shall submit complete working drawings and computation of his or her proposed dewatering system with supporting data, as necessary, to the Engineer for approval. These drawings shall be accompanied by design calculations. Both shall be prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Contractor shall make his or her own evaluation of existing conditions and water flow, and of the effects of his or her proposed temporary works and construction methods and shall provide in his or her design for all loads and construction conditions necessary to permit demolition and construction of the specified structure while maintaining public safety and protecting complete work and all third party property from damage resulting from construction operations.

The Contractor shall use such equipment and shall perform his operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. The Contractor shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils.

Measures to control the discharge of pollutants into water resource areas shall include, but not be limited to the following:

- Rigorous management of construction operations involving potentially hazardous materials, such as refueling and maintenance of construction equipment.
- Formulation of contingency plans to control accidental spillage from potentially hazardous materials.
- Siting of construction laydown and staging areas outside of the riverfront inner riparian area and Wetlands buffer zones and locating construction staging on relatively flat ground.
- Scheduling of work within the resource areas to avoid periods of high flood (e.g., spring floods) and inclement weather.
- Installation and continuous maintenance of sediment barrier fences to prevent sediment migration into adjacent downstream resource areas. Placement of erosion controls shall be as shown on the plans, as specified herein, or as required by the Engineer to accomplish maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the Contract.
- All discharge resulting from dewatering activities shall be directed to temporary construction tanks for sedimentation/retention provided as necessary to control turbidity. At no time shall said discharge be directly released into adjacent resource areas.

The Contractor shall provide temporary sandbagging, water barriers, filtering fabrics, silt fencing, sedimentation/retention basins, and/or other effective procedures or structures together with all labor, materials, and equipment necessary for controlling water in, under, and around the bridge. Such work shall be subject to the approval of the Engineer, but such approval will not relieve the Contractor of responsibility for the adequacy of construction, maintenance, operation, and safety of the water control system.

Also included shall be all necessary permits that may be required in performing the work under this Item.

Upon completion of the work, temporary sandbagging, water barriers, and any other water control devices or constructions shall be removed from the site.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Items 991.1, 991.2 and 991.3 will be paid for at the Contract unit price per LUMP SUM, which price shall be considered full compensation for all labor, tools, equipment, materials, installation, maintenance, and removal of any temporary water barriers such as, sandbagging, or other diverting systems or material, filter fences, sedimentation/retention basins, and all incidental costs required to complete the work.

Payment will be made based upon the following percentages: 10% upon approval of design, 70% upon complete installation, and 20% made upon the removal and satisfactory disposal of water control system from the project site at the completion of the work.

ITEM 995.1 BRIDGE STRUCTURE NO. 74.17 LUMP SUM

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications and the requirements below.

Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Selective clearing and thinning at bridge approach areas.
- Excavation required for demolition of the existing bridge and construction of the proposed bridge.
- Excavation Support System
- Crushed stone base for Precast Concrete Box Bridge Structure and cast-in-place concrete transition walls.
- Precast Concrete Box Bridge Structure: Fabricate, deliver and install Precast Concrete Box Structure as shown on the Drawings including all precast units. The work shall include all materials, equipment, tools and labor to fabricate, deliver, construct and install the precast concrete box bridge staructure.
- Cast-in-place concrete transition walls
- Backfilling Precast Concrete Box Bridge Structure and cast-in-place concrete transition walls.
- Bridge handrail

Contractor is responsible for providing an independent material testing company for concrete, drilled and grouted dowels and earth work compaction that are specified within the project documents. No separate payment for testing will be made and it shall be considered incidental to the work.

Cost for temporarily removal and reinstall ballast and existing track for construction phasing is incidental to Item 995.1.

For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The work does not include any items listed separately in the proposal. Precast concrete headwalls, precast concrte cutoff walls, steel pipe railing, joint fillers, miscellaneous steel and bolts, caulking, forms, joint sealers, waterstops, fillers, fastenings, bonded closed cell foam, drain pipes, waterproofing, bituminious damp-proofing, construction joints and site restoration shall be considered as incidental to the work involved in the furnishing and placing of the precast concrete box structure and transition walls. Payment for materials shown on the Plans as being part of this 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 section.

SELECTIVE CLEARING AND THINNING

Work should be performed in accordance with requirements under Item 102 in this special provisions.

BRIDGE EXCAVATION

Work should be performed in accordance with requirements under Item 140.0 in this special provisions.

CRUSHED STONE

The work under this section shall conform to Subsection 150 of the Standard Specifications.

Material for 1 ½" crush stone for bridge foundations shall be in accordance with the requirements in Section M2.01.1 of the Standard Specification.

GRAVEL BORROW

The work under this section shall conform to Subsection 150 of the Standard Specifications.

Material for Gravel Borrow for backfilling structures shall be in accordance with the requirements in Section M1.03.0, Type b of the Standard Specification.

GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL

The work under this section shall conform to Item 698.4 Geotextile Fabric for Permanent Erosion Control.

STREAMBED MATERIAL

DESCRIPTION

This work shall consist of furnishing and placing new stream bed material within freshly dug stream channels, and on bottom slab of the proposed Precast Concrete Box Bridge Structure as shown on the plans or as directed by the Engineer. The work shall be completed in conformity with the lines, grades, thicknesses and typical sections as shown on the plans or as established by the Engineer.

MATERIAL

The top 1.5 feet of streambed material excavated from the existing streambed shall be removed and stockpiled to facilitate reinstallation and replication of the natural streambed. The excavated streambed material below the top 2 feet shall be stockpiled and reused to fill the voids in the proposed riprap placed below the top streambed restoration layer.

If the excavated material is not suitable or there is not enough available suitable material, additional streambed restoration material shall be locally sourced that matches the composition of the existing native riverbed. The design team shall determine the final streambed restoration material gradation building on the provided approximate size distribution.

RELATED ITEMS

Crushed Stone shall conform to the requirements in Section M2.01.1 for Crushed Stone for Slope Treatment and Riprap Stone shall conform to the requirements in Section M2.02.2 for Dumped Riprap.

CONSTRUCTION
The streambed material shall be reinstalled over riprap as depicted on the plans to an average thickness of 0.5 feet, with variations in thickness as necessary to replicate existing channel conditions. This treatment will apply to the precast concrete box bridge structure. The initial placement of streambed material shall fill / choke the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Environmental Monitor.

Reinstallation of the stockpiled streambed material shall be placed on top of the riprap to restore streambed habitat and fish passage. The streambed materials shall be installed during normal low water conditions behind cofferdams in accordance with the environmental permits.

TEMPORARY SNOW FENCE FOR ENVIRONMENTAL PROTECTION
This work shall consist of constructing, maintaining, removing, and disposing of a temporary snow fence for environmental protection as shown on the plans and as described herein.

Materials: Temporary fence shall be a minimum of 4 ft. in height and shall be a high visibility orange heavy duty oval mesh poly LLDPE snow control fence.

Fence Stakes: The nominal size of wood stakes shall be minimum 2 in. x 2 in. Stakes shall be placed at maximum of 8 ft apart.

Construction Requirements: The Contractor shall install fence at boundaries for permitted work areas as shown on the plans.

The Contractor shall remove the temporary fence at the completion of the project.

BRIDGE HANDRAIL
Work should be performed in accordance with requirements under Item 975.1 Bridge Handrail in this special provisions.

HIGH PERFORMANCE CONCRETE
The work under this heading shall conform to the relevant provisions of Section 901 of the MassDOT Standard Specifications. Concrete shall be 5000 PSI-3/4 IN-685 High Performance Concrete for cast-in-place concrete. The concrete mix shall be approved by MassDOT and used in previous MassDOT projects.

STEEL REINFORCEMENT FOR STRUCTURE – EPOXY COATED
The work to be done under this heading shall conform to the relevant provisions of Section 901 of the Standard Specifications. Epoxy coated bars shall be used unless noted otherwise on the plans.

DRILLED AND GROUTED #5 DOWELS
The work to be done under this heading shall conform to the relevant provisions of Section 901 of the Standard Specifications and Item 912.5 in this special provisions.

MEMBRANE WATERPROOFING

The work under this section shall conform to Subsection 966 of the Standard Specifications. Membrane waterproofing and waterproofing protective course shall be applied to surfaces on Precast Concrete Box Bridge Structure as shown on the plans.

BITUMINOUS DAMP-PROOFING

Furnish and Install bituminous damp-proofing. The limits of damp-proofing shall be along the sides and top of precast concrete box.

The bituminous damp-proofing shall consist of a cut-back asphalt, a protective seal coat emulsion or an asphalt emulsion. If material other than specified herein is permitted to be used, the method of application shall conform to the published specifications of the manufacturer.

Materials shall meet the requirements:

1. Cut-Back Asphalt: these materials shall be blends of asphalt cements and suitable solvents. They shall be homogeneous, free from water and conform to the requirements of AASHTO-M81 for the rapid curing type and AASHTO-M82 for the medium curing type.

2. Emulsified Asphalt: these materials shall be homogeneous and shall show no separation after mixing within thirty days after delivery. They shall conform to the requirements of AASHTO-M140 with the following exception: Viscosity determination will not be required for material sampled at point of delivery.

3. Protective Seal Coat Emulsion: this material shall be a homogeneous emulsion consisting of coal tar pitch dispersed in water by means of a mineral colloid. Any separation or coagulation of its components shall be capable of being overcome by moderate stirring. It shall contain no asphaltic materials or chemical emulsifiers. When tested according to prescribed methods it shall meet the following requirements:

Department Designation: PSC-1	Minimum	Maximum
Percent Water (AASHTO-T55)		50
Percent Non-Volatile Matter (ASTM-D2939, Sec. 7)	48	
Percent Ash in Non-Volatile Matter (ASTM-D2939, Sec. 9)	20	45
Percent Solubility of Non-Volatile Matter in CS_2 (AASHTO-T44)	40	
Resistance to Water (ASTM-D466)	No blistering, Loss of Adhesion or Re-Emulsification	
Resistance to Petroleum Solvents (ASTM-D466 — with Solvents substituted for water)	No penetration and no loss of adhesion.	

Bituminous Damp-proofing shall be applied in accordance with the manufacturer specifications. The material shall be moped or sprayed on the designated surfaces as directed and in amount to obtain 2 coat coverage of not less than 5 gallons of asphaltic material per 100 square feet area. The initial coat of damp-proofing shall be allowed dry thoroughly before a second coat is applied. The final coat shall be thoroughly dry before any fill is placed against it. Damp-proofing shall be applied prior to installation of Precast Box Bridge.

PRECAST CONCRETE BOX BRIDGE STRUCTURE

The work under this section shall conform to Item 995.014 Precast Concrete Bridge Elements. The existing electrical wires over the bridge limit the headroom for construction. Two alternatives including Precast Split Box Alternative and Precast Concrete Monolithic Box Alternative are provided. The Contractor shall select one alternative to bid based on capacity of equipment and means and methods of construction.

TRACK WORK

Track work consists of removal and reinstallation of exiting rails and cross ties and placement of new ballast. The work shall be performed in accordance with the contract drawings, ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA, with relevant requirements under MassDOT MW-1, and Items 458.6.1 FURNISH BALLAST & 492.8.1 SURFACE AND ALIGN BALLASTED TRACK. The existing top rail elevations and track alignment should be maintained after bridge replacement. The track work is paid ITEM 492.11.2, ITEM 458.6.1 and ITEM 492.8.1.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

Within 10 days after the date of the Notice to Proceed, the Contractor shall submit, in duplicate, for the approval of the Engineer, a schedule of unit prices for the major component Sub-Items that make up the bridge work as well as his/her total bridge structure Lump Sum cost for the bridge work. 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 995.1 and no further compensation will be allowed.

Item 995.1, BRIDGE STRUCTURE, BRIDGE NO 74.17

Sub-Item	Sub-Item Description	Quantity	Unit	Unit Price	Total
102.	Selective Clearing and Thinning	1	LS		
140.1	Bridge Excavation within Cofferdam	300	CY		
156.1	Crushed Stone	45	CY		
151.2	Gravel Borrow for Backfilling Structures	375	CY		
953.31	Excavation Support System	1	LS		
698.4	Geotextile Fabric for Permanent Erosion Control	105	SY		
151.6	Streambed Material	30	CY		
975.1	Bridge Handrail	25	LF		
975.7	Temporary Snow Fence for Environmental Protection	270	LF		
904.3	5000 PSI-3/4 IN-685 High Performance Concrete	25	CY		
910.1	Steel Reinforcement for Structures-Epoxy Coated	1800	LB		
912.5	Drilled and Grouted #5 Dowels	100	EA		
965.	Membrane Waterproofing	40	SY		
966.	Waterproofing Protective Course	40	SY		
970.	Bituminous Damp-Proofing	60	SY		
995.014	Precast Concrete Box Bridge Structure	1	LS		
	Total Cost of Item 995.1 =				

END OF SECTION

ITEM 995.2 BRIDGE STRUCTURE NO. 76.23 LUMP SUM

DESCRIPTION

The work specified under this section shall conform to the applicable provisions of Section 995 of the MassDOT Standard Specifications for Highways and Bridges, the Supplemental Specifications, and the specific requirements stipulated below for the component parts of these items. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Selective clearing and thinning at bridge approach areas
- Excavation required for partial demolition of the existing bridge and construction of the proposed bridge
- Gravel Borrow for Foundations under Precast Concrete Abutment Caps
- Gravel Borrow for Backfilling Precast Concrete Abutment Caps
- Steel grating walkway
- Bridge handrail
- Precast Concrete Abutment Caps: Fabricate, deliver and install Precast Concrete Abutment Caps as shown on the drawings including all precast units. The work shall include all materials, equipment, tools and labor to design, fabricate, deliver, construct and install the Precast Concrete Abutment Caps
- Fill the voids of Precast Concrete Abutment Caps with High Early Strength Concrete
- New Special Slope Paving Under Bridge on top of existing abutments to remain
- Incidental relocation of removed abutment and wingwall masonry stones to support installed ballast at regraded areas at both ends of the installed walkway
- Structural steel superstructure
- Elastomeric bearings
- Membrane Waterproofing for bridge deck
- Spray-Applied Integrated Ballast Mat
- Asphaltic Protection Board
- Bituminous Damp-Proofing on precast abutments caps

Contractor is responsible for providing an independent material testing company for concrete, drilled and grouted dowels and earth work compaction that are specified within the project documents. No separate payment for testing and shall be considered incidental to the work.

Cost for temporarily removal and reinstall ballast and existing track for construction phasing is incidental to Item 995.2.

The Contractor shall coordination with the Town of Lee and the owners of buildings adjacent to the railroad prior to construction. The Contractor shall take all measures necessary to protect pedestrian and vehicular traffic from his construction operations. The Contractor shall coordinate with the Town and Police Department to determine if any police detail and temporary traffic management plan are required for the bridge work. The Contractor is responsible for preparation and execution of traffic management plan, if required. Cost for police details, preparation and

execution of traffic management plan is incidental to Item 995.2.
For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of these bridge structures or which may be incidental to their construction and are not specifically included for payment under another item shall be considered incidental to the work performed under these items and shall be included in the unit price of the component of which they are a part.

SELECTIVE CLEARING AND THINNING
Work should be performed in accordance with requirements under Item 102 in this special provisions.

BRIDGE EXCAVATION
Work should be performed in accordance with requirements under Item 140.0 in this special provisions.

GRAVEL BORROW
The work under this section shall conform to Subsection 150 of the Standard Specifications.

Material for Gravel Borrow for backfilling structures shall be in accordance with the requirements in Section M1.03.0, Type b of the Standard Specification.

Material for Gravel Borrow for Bridge Foundations shall be in accordance with the requirements in Section M1.03.0, Type a of the Standard Specification.

STEEL GRATING WALKWAY
Work should be performed in accordance with requirements under Item 955.10 Steel Grating Walkway in this special provisions.

BRIDGE HANDRAIL
Work should be performed in accordance with requirements under Item 975.1 Bridge Handrail in this special provisions.

PRECAST CONCRETE ABUTMENT CAPS
The work under this section shall conform to Item 995.014 Precast Concrete Bridge Elements.

HIGH EARLY STRENGTH CONCRETE FOR PRECAST CONCRETE ABUTMENT CAP VOIDS
The work under these headings shall conform to the relevant provisions of Section 901 of the Standard Specifications and the following:

High early strength concrete shall meet the requirements of the Standard Specifications for Highways and Bridges Sections, 430, M4.02.00, with Type III cement or an accelerator meeting the requirements of AASHTO M194. Concrete compressive strength shall be a minimum of 4,000 PSI at 24 hours and a minimum of 5,000 PSI at 28 days with coarse aggregate gradation of 3/4

inch stone designation. The concrete mix shall be approved by MassDOT and used in previous MassDOT projects.

The Contractor shall furnish, set and maintain line and grade.

The Contractor shall perform the following and provide the results to the Engineer. The following tests are considered incidental items:

1. Concrete cylinder tests, carried out on 6" diameter by 12" high cylinders, conforming to the requirements of ASTM C39 / C39M.
2. One complete slump test per concrete batch conforming to ASTM C143 / C143M.

Existing surfaces in contact with the new concrete shall be thoroughly cleaned.

The concrete shall be protected for 24 hours to allow curing. Installation of bridge bearings may be performed during the 24-hour curing period, but installation of the bridge superstructure is not allowed.

SPECIAL SLOPE PAVING UNDER BRIDGE – CEMENT CONCRETE

Work under this heading includes the cement concrete special slope paving under bridge between the precast cap and front face of breastwall. The work under this heading shall conform to the relevant provisions of Subsection 983 of the Standard Specifications.

STRUCTURAL STEEL – COATED STEEL (GALVANIZED)

The work under this heading shall conform to the applicable provisions of the AREMA Manual of Railway Engineering, Chapter 15, Section 960 of the Standard Specifications and the following:

All welding and the preparation and assembly of material for welding shall conform to the current editions of the Standard Specifications, the AREMA Manual for Railway Engineering, Section 1.14 for Fracture Critical Members (FCM) and the AASHTO/AWS Bridge Welding Code (ANSI/AASHTO/AWS D1.5).

All structural steel shall conform to ASTM A709, Grade 50 unless otherwise noted.

All structural steel shall be galvanized to meet ASTM A123. All hardware shall be galvanized to meet ASTM A 153 or ASTM B695. Refer to MEMBRANE WATERPROOFING FOR BRDGE DECKS – SPRAY APPLIED for surface preparation requirements for the galvanized steel deck plate.

If cranes or other heavy equipment are to be used at track level at the bridge approaches during steel erection, the stability of the existing and proposed abutments and retaining walls shall be verified by the contractor. Stability calculations shall be prepared and stamped by a professional engineer registered in Commonwealth of Massachusetts and be submitted to the Engineer for approval.

STEEL ERECTION

The Contractor shall submit a detailed construction and sequencing and erection plan to the Engineer for review and approval prior to the start of any work involving structural steel erection. It shall outline all details required for structural steel erection including, but not

limited to, lifting equipment specifications, temporary shoring and bracing designs, temporary support layout and details, crane locations and construction sequencing plans and schedule.

The construction sequencing and erection plan shall include the following submittals:

1. Design computations demonstrating compliance with any and all temporary components with the criteria specified herein and shown on the Plans, prepared and signed and stamped by a registered professional engineer licensed in the Commonwealth of Massachusetts. The design calculations shall include:
    a. Statement of all assumptions made and copies of all references used in the calculations
    b. Analysis demonstrating compliance with all applicable loads and load combinations, as shown on the plans and required by the AASHTO Guide Specifications for Bridge Temporary Works, 2nd Edition.
2. All field welders shall be certified by MassDOT and possess the Department's Welder Qualification Test Record and the Welder Qualification Certificate. All Welding Procedures shall be approved by the Engineer.
3. All galvanizing shall be removed a minimum of 2 inches on either side of the weld line prior to welding.
4. Submit descriptive data and operating procedures for all equipment to be used. This shall include at a minimum, machinery required to:
    a. Deliver, lift, and install proposed bridge elements

Submit all pertinent data including sizes, weights, capacities, torques and operating frequencies.

Review of the Construction Sequencing and Steel Erection Plan by the Engineer will not relieve the Contractor from the responsibility for the adequacy of any associated design and construction to achieve the required results. The Contractor is responsible for the stability and safety of all temporary structures, and the bridge components they are supporting, through all phases of construction.

BEARING ASSEMBLIES

The work under this heading shall conform to the applicable provisions of Section M9.14.5 of the Standard Specifications and Standard Subsection M9.14.5 of the supplemental specifications. Anchor bolts for bearings shall conform to ASTM F 1554 Grade 55 and shall be hot dip-galvanized in accordance with AASHTO M 232.

MEMBRANE WATERPROOFING FOR BRIDGE DECKS - SPRAY APPLIED

The work under this Item shall conform to applicable sections of Section 965 of the Standard Specifications and the following:

Surface preparation for the galvanized steel deck plate shall be in accordance with waterproofing manufacturer's instructions and requirements.

ASPHALTIC PROTECTION BOARD

Work under this heading includes the furnishing and installation of high-density asphaltic protection board as shown on the contract drawings. Protection board shall conform to AREMA Manual for Railway Engineering, Chapter 8, Section 29.10.3, Asphaltic Panels. Adhesives and/or sealants shall be as recommended by the manufacturer.

SPRAY APPLIED INTEGRATED BALLAST MAT

Work under this Item shall confirmed to the manufacturer's requirements for Spray Applied Integrated Ballast Mat.

Spray Applied Integrated Ballast Mat shall be manufactured by one of the following or approved equal.

- Bridge Preservation LLC
- Chemline
- D.S Brown

BITUMINOUS DAMP-PROOFING

Furnish and Install bituminous damp-proofing. The limits of damp-proofing shall be along the back sides of Precast Concrete Abutment Caps.

Material specifications see the same section under Item 995.1.

TRACK WORK

Track work consists of removal and reinstallation of exiting rails and cross ties and placement of new ballast. The work shall be performed in accordance with the contract drawings, ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA, with relevant requirements under MassDOT MW-1, and Items 458.6.1 FURNISH BALLAST & 492.8.1 SURFACE AND ALIGN BALLASTED TRACK. The existing top rail elevations and track alignment should be maintained after bridge replacement. The track work is paid ITEM 492.11.2, ITEM 458.6.1 and ITEM 492.8.1.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

Within 10 days after the date of the Notice to Proceed, the Contractor shall submit, in duplicate, for the approval of the Engineer, a schedule of unit prices for the major component Sub-Items that make up the bridge work as well as his/her total bridge structure Lump Sum cost for the bridge work. 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 995.2 and no further compensation will be allowed.

Item 995.2, BRIDGE WORK FOR BRIDGES 76.23

Sub-Item	Sub-Item Description	Quantity	Unit	Unit Price	Total
102.	Selective Clearing and Thinning	1	LS		
140.	Bridge Excavation	120	CY		
151.2	Gravel Borrow for Backfilling Structures	25	CY		
151.1	Gravel Borrow for Bridge Foundations	16	CY		
995.10	Steel Grating Walkway	131	SF		
975.1	Bridge Handrail	44	LF		
995.014	Precast Abutment Caps	1	LS		
905.3	High Early Strength Concrete for Precast Cap Voids	7	CY		
985.0	Special Slope Paving Under Bridge – Cement Concrete	34	SY		
960.1	Structural Steel – Coated Steel (Galv.)	80729	LB		
921.	Bearing Assemblies	4	EA		
965.	Membrane Waterproofing for Bridge Deck-Spray Applied	77	SY		
966.	Asphaltic Protection Board	41	SY		
967.	Spray Applied Integrated Ballast Mat	51	SY		
970	Bituminous Damp-Proofing	38	SY		
	Total Cost of Item 995.2 =				

END OF SECTION

ITEM 995.3 REHABILITATION OF BRIDGE 77.28 LUMP SUM

DESCRIPTION

The work specified under this section shall conform to the applicable provisions of Section 995 of the MassDOT Standard Specifications for Highways and Bridges, the Supplemental Specifications, and the specific requirements stipulated below for the component parts of these items. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Selective clearing and thinning at bridge approach areas
- Clean debris on bridge seats
- Cast-in-place concrete for south abutment breastwall
- Cast-in-place concrete cap on top of southeast wingwall
- Reset bearing pedestals under west girder and south end of east girder, and raise south end of bridge deck by 1 ½".

Contractor is responsible for providing an independent material testing company for concrete and drilled and grouted dowels that is specified within the project documents. No separate payment for testing and shall be considered incidental to the work.

Cost for temporarily removal and reinstall ballast and existing track for construction phasing is incidental to Item 995.3.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of these bridge structures or which may be incidental to their construction and are not specifically included for payment under another item shall be considered incidental to the work performed under these items and shall be included in the unit price of the component of which they are a part.

SELECTIVE CLEARING AND THINNING

Work should be performed in accordance with requirements under Item 102 in this special provisions.

HIGH PERFORMANCE CONCRETE

The work under this heading shall conform to the relevant provisions of Section 901 of the MassDOT Standard Specifications.

Concrete shall be 5000 PSI-3/4 IN-685 High Performance Concrete. The concrete mix shall be approved by MassDOT and used in pervious MassDOT projects.

STEEL REINFORCEMENT FOR STRUCTURE – EPOXY COATED

The work to be done under this heading shall conform to the relevant provisions of Section 901 of the Standard Specifications.

Epoxy coated bars shall be used unless noted otherwise on the plans.

DRILLED AND GROUTED #5 DOWELS

The work to be done under this heading shall conform to the relevant provisions of Section 901 of the Standard Specifications and Item 912.5 in this special provisions.

DRAINAGE GEOTEXTILE

Drainage Geotextile shall conform to Division III Subsection M9.50.0 Geotextile Fabrics for the intended application.

RESET BEARING PEDESTALS

Work under Item shall include all materials, equipment and labor needed to replace the two existing bearing pedestals under west girder and one pedestal under east girder at the south end. The work also includes jacking and temporarily supporting existing bridge superstructure prior to removal of existing pedestals for bridge bearings and installation of new pedestals. The new pedestals shall have the same dimensions as the existing pedestals except the two new pedestals on the south abutment shall be increased by 1.5" in thickness. The work will be performed during an extended weekend track closure.

High early strength, non-shrink concrete should be used for new bearing pedestals that are more than 2" thick. High early strength concrete shall meet the requirements of the Standard Specifications for Highways and Bridges Sections, 430, M4.02.00, with Type III cement or an accelerator meeting the requirements of AASHTO M194. Concrete compressive strength shall be a minimum of 4,000 PSI at 24 hours and a minimum of 5,000 PSI at 28 days with coarse aggregate gradation of 3/8 inch stone designation. The concrete mix shall be approved by MassDOT and used in previous MassDOT projects.

High strength, non-shrink grout should be used for new bearing pedestals that are no more than 2" thick. Grout shall be on MassDOT pre-approved material list.

JACKING UP AND TEMPORARILY SUPPORT WEST GIRDER

The work includes loosening rail spikes within minimum 10'-0" on each side of the girder ends and loosening nuts for bearing anchor bolts; jacking up girder ends (< 1/8" on northwest end and 1.5" on south ends) to relieve the dead load on pedestals and temporarily support of the girder prior to bridge pedestal replacement; removal of temporary support and jacking device and tightening rail spikes after the completion of pedestal replacement.

SUBMITTALS

A. The contractor shall prepare and submit a work plan prior to construction.
B. Submit concrete mix information.
C. Submit grout manufacturer's product data indicating type, chemical make-up, applications, use methods, mixing ratios, physical properties and strengths.
D. Details of jacking and temporary shoring. Jacks used at each end of girders shall have a minimum capacity of 5 tons.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

Within 10 days after the date of the Notice to Proceed, the Contractor shall submit, in duplicate, for the approval of the Engineer, a schedule of unit prices for the major component Sub-Items that make up the bridge work as well as his/her total bridge structure Lump Sum cost for the bridge work. 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 995.3 and no further compensation will be allowed.

Item 995.3, BRIDGE STRUCTURE, BRIDGE NO 77.28

Sub-Item	Sub-Item Description	Quantity	Unit	Unit Price	Total
102.	Selective Clearing and Thinning	1	LS		
904.3	5000 PSI-3/4 IN-685 High Performance Concrete	18	CY		
910.1	Steel Reinforcement for Structures-Epoxy Coated	3600	LB		
912.5	Drilled and Grouted #5 Dowels	162	EA		
968.2	Drainage Geotextile	13	SY		
924.0	Reset Bearing Pedestals	3	EA		
	Total Cost of Item 995.3 =				

END OF SECTION

ITEM 995.4 REHABILITATION OF BRIDGE 80.72 LUMP SUM

DESCRIPTION

The work specified under this section shall conform to the applicable provisions of Section 995 of the MassDOT Standard Specifications for Highways and Bridges, the Supplemental Specifications, and the specific requirements stipulated below for the component parts of these items. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Selective clearing and thinning at bridge approach areas.
- Clean and disposal of debris on bridge seats and girder bottom flanges.
- Clean and disposal of debris and brush under bridge within 20’ from centerline of track.

For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of these bridge structures or which may be incidental to their construction and are not specifically included for payment under another item shall be considered incidental to the work performed under this section.

SELECTIVE CLEARING AND THINNING

Work should be performed in accordance with requirements under Item 102 in this special provisions.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under Item 995.4 shall be paid for at the Contract lump sum price for the respective items and shall include all necessary labor, equipment, materials and incidental work necessary for the completion of the work.

ITEM 995.5 REHABILITATION OF BRIDGE 85.32 LS

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications and the requirements below.

Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Selective clearing and thinning on bridge and at bridge approach areas.
- Clearing and disposing of debris, brush and tree branches under bridge within 30' from centerline of track.
- Excavation required for demolition of the existing wall and construction of the proposed wall.
- Monitoring of the existing structure during construction
- Foundation for Precast Modular Retaining Wall System.
- Precast Modular Retaining Wall System: Design, fabricate, deliver and install Precast Modular Retaining Wall System as shown on the Drawings including all precast units. The work shall include all materials, equipment, tools and labor to design, fabricate, deliver, construct and install the Precast Modular Retaining Wall System.
- Backfilling Precast Modular Retaining Wall System.
- Bridge handrail

Contractor is responsible for providing an independent material testing company for earth work compaction that is specified within the project documents. No separate payment for testing and shall be considered incidental to the work.

Cost for temporarily removal and reinstall ballast and track, is incidental to Item 995.5.

For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of these bridge structures or which may be incidental to their construction and are not specifically included for payment under another item shall be considered incidental to the work performed under this section.

SELECTIVE CLEARING AND THINNING

Work should be performed in accordance with requirements under Item 102 in this special provisions.

BRIDGE EXCAVATION

Work should be performed in accordance with requirements under Item 140.0 in this special provisions.

Excavation shall be coordinated by the contractor to minimize stresses on the existing arch structure. An excavation and backfill plan that includes methods of monitoring the existing structure during construction shall be submitted by the Contractor for review prior to the start of work at Bridge 85.32. Excavation and backfill shall follow this general guidance:

Excavation within the structural backfill zone shall be done carefully to ensure a uniform and symmetrical distribution of dead load to keep the arch in place. The structural backfill zone at the arch is the area above the arch barrel and the area extending 6' horizontally from both sides of the arch barrel. The minimum cover over the arch barrel shown on the plans shall be maintained at all times, unless controls are established in the approved excavation and backfill plan. When working below the minimum cover elevation within the structural backfill zone, the Contractor shall limit the weight of equipment and the use of heavy trucks until the minimum cover is reached.

BRIDGE HANDRAIL

Work should be performed in accordance with requirements under Item 975.1 Bridge Handrail in this special provisions.

TRACK WORK

A. Track work consists of removal and reinstallation of exiting rails and cross ties and placement of new ballast. The work shall be performed in accordance with the contract drawings, ITEM 492.11.2 TRACK CONSTRUCTION – BRIDGE AREA, with relevant requirements under MassDOT MW-1, and Items 458.6.1 FURNISH BALLAST & 492.8.1 SURFACE AND ALIGN BALLASTED TRACK. The existing top rail elevations and track alignment should be maintained after wall replacement. The track work is incidental to wall replacement.

MONITORING OF EXISTING STRUCTURE DURING CONSTRUCTION

PART 1 - GENERAL

1.1 Description of Work

A. This work includes surveying, furnishing, installing, protecting, reading, reporting, maintaining and removing instrumentation as part of a Monitoring Program required for evaluation of existing bridge movements during construction. The locations of all instruments and monitoring points shall be as specified herein. The Work includes implementing required remedial and precautionary measures based on instrumentation data.

B. The purpose of this program is to provide data that, when used with other observations and measurements, will be the basis of evaluating the performance of the existing during construction of the replacement bridges.

C. Work in connection with the Monitoring Program shall include, but not necessarily be limited to the following:
- Furnishing and installing instrumentation and respective readouts.
- Surveying, monitoring, reporting and interpreting instrumentation data.

D. Instrumentation Layout
- Locations and types of instruments to be installed shall be as specified herein. The Contractor shall submit a plan of the instrumentation layout meeting these requirements.

- Engineer reserves the right to modify the instrument layout as is deemed necessary to monitor the impact of the Contractor's proposed method of construction.

1.2 Quality Assurance

A. All equipment shall be approved by the Engineer.
B. Materials, designs and construction shall be of highest quality to provide robust, corrosion and vibration resistant instruments. Accuracy and dependability of equipment shall be selected considering changes in temperature, humidity, stray currents or other adverse conditions that may be encountered.
C. Installation procedures acceptable to the Engineer shall be developed for each type of instrumentation. All instrumentation shall be installed in the presence of the Engineer.
D. Qualifications

1. Manufacturer: Select a firm regularly engaged in the manufacture of monitoring instrumentation of the type specified herein.
2. Personnel:
   a. Instrumentation Engineer: Employ a Professional Engineer, registered in the Commonwealth of Massachusetts, specializing in geotechnical engineering, who has experience in installation of instruments of the type specified in this Section in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer. The Contractor's Instrumentation Engineer shall supervise and direct instrument installation technicians and shall be responsible for instrument installation and monitoring, and reduction and interpretation of instrumentation monitoring data.
   b. Qualified geotechnical instrumentation personnel must be available on call at all times during the work that would affect geotechnical instrumentation.
   c. Provide a Land Surveyor, Registered in the Commonwealth of Massachusetts, responsible for layout and subsequent verification of all instrument locations and elevations.

E. Tolerances

1. Establish the initial coordinates of each instrument at the point of installation to 0.01 foot or less.
2. Establish the initial elevation of settlement reference points to 0.005 feet. Achieve level circuit closure with an error of closure of 0.01 foot, or less.

F. A factory calibration shall be conducted on all instruments prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology.
G. A final quality assurance inspection shall be made prior to shipment. During the inspection, a checklist shall be completed to indicate each inspection and test detail. A completed copy of the checklist shall be supplied with each instrument.
H. Contractor shall provide the manufacturer's warranty for each portable readout unit furnished for the Engineer's monitoring program.

1.3 Submittals

A. Qualifications:

1. Submit qualifications of Land Surveyor, Registered in the Commonwealth of Massachusetts, and Geotechnical Instrumentation Engineer.

B. Working Drawings:

1. Submit Working Drawings of instrumentation location layout and details before installation. Indicate methods of installation and maintenance for instrumentation systems.

C. Documentation:

1. Submit manufacturer's catalogs and printed installation instructions for instruments furnished.
2. Submit, within 24 hours of completion of equipment installation, three copies of installation notes, initial readings, and monitoring data taken immediately after installation.

D. Certification:

1. Submit certification of equipment manufacturers at least 21 calendar days prior to installation.
2. Submit certificates of equipment calibration.

E. Monitoring Documentation:

1. Unless otherwise provided by the Engineer, submit proposed forms to be used for recording observations, and monitoring and reporting data. Submit a sample showing proposed format for recording of readings, calculations and plots.
2. Submit the following within 12 hours after monitoring any instrument:
   a. A copy of the data sheet containing a cumulative history of all readings, including weather conditions at time of each reading.
   b. A copy of the plot of measured value versus time, which also includes a time history of construction activity likely to influence such readings (e.g., depth of excavation, presence of heavy equipment).

1.4 Responsibility of Contractor

A. Furnish components of instrumentation that are to be installed during construction, portable readout units for the Contractor's use, portable readout units for the Engineer’s use, and install instruments. The Contractor shall protect and maintain installed instruments and replace or repair damaged or inoperative instruments.
B. Maintain and calibrate portable readout units. Maintain readout unit(s) at the Site for use by the Engineer.
C. Collect, reduce, process, plot, interpret, and report data from instrumentation; henceforth the monitoring program.
D. Provide safe access to the Engineer for data collection. Coordinate with the Engineer to verify the consistency of collected data. Implement remedial measures based on interpretations of monitoring program data.
E. Contractor is responsible for obtaining all necessary permits for installation of all specified instruments.

1.5 Job Conditions

A. Disclosure of Instrumentation Data:

1. Do not disclose instrumentation monitoring data to third parties and do not publish instrument monitoring data without the prior approval of the Engineer. The data from the instrumentation program shall be the property of MASSDOT.
2. Be responsible for interpretation of instrumentation data as input to evaluating structure performance and controlling deformations to prevent damage to structures, facilities and utilities.
3. The Engineer will also interpret the instrument monitoring data and will make the interpretation available to the Contractor.

B. Determine exact location of the instruments to be installed in the field with approval of the Engineer.

C. Access to Instruments: Provide and facilitate safe access to each instrument for the Engineer at all times. Access includes ladders, working platforms and other necessary facilities, and the removal thereof.

1.6 Monitoring Schedule

A. All equipment and installation accessories required for operation of instrumentation system and recording of measurements shall be furnished by Contractor and shall be available at least four (4) weeks in advance of construction in the area where they are to be installed and shall be securely stored where they will not suffer physical damage or damage arising from excessive moisture, extremes of temperature or other adverse conditions.
B. Contractor shall provide and maintain adequate lighting and provide a safe means of access to all instruments to allow installation, repair, and reading of instruments at times selected by Engineer.
C. Structural deformation monitoring points (DMPs) shall be installed and initial surveys completed a minimum of two (2) weeks prior to any construction activity related to excavation or installation of sheet piles or steel piles.
D. The instruments shall be monitored in accordance with the requirements of Table 1 specified herein.

E. If, in the opinion of Engineer, there appears to be excessive movement, the monitoring points shall be surveyed as often as deemed necessary by Engineer, at no additional cost to MASSDOT.

PART 2 – PRODUCTS

2.1 Materials for Instrumentation

All instrumentation hardware, protective covers, read-out equipment, and equipment and materials

A. necessary to conduct the monitoring program shall be purchased or rented by the Contractor. Prior to installation, all materials and equipment shall be available for inspection by the Engineer to ensure compliance with these specifications.

B. Surface protection shall be flush with the ground surface in paved or other areas.
C. For each instrument type, provide an instruction manual that shall include the following:

1. A description of the purpose of the instrument.
2. Theory of operation.
3. Step-by-step procedures for:
   a. Pre-installation acceptance test when instruments are received on site, to ensure the instruments are functioning correctly prior to installation.
   b. Calibration of readout units.
4. A list of calibration equipment required, and recommended frequency of calibration.
5. Step-by-step instrument installation procedure including materials, tools, spare parts and any borehole requirements, and post-installation acceptance tests.
6. Maintenance procedure.
7. Step-by-step data collection procedure.
8. Data reduction, processing, and plotting procedures.

D. All graduations shall be in U.S. Customary Units, for example feet, inches, pounds.

2.2 Deformation Monitoring Points

A. Deformation monitoring points (DMPs) shall be used to monitor vertical and horizontal deformation of various facilities at selected locations specified herein.

B. The following types of DMPs shall be used to monitor deformation:

1. DMPs shall be used to monitor movements of structures, and shall consist of a 5/16 in. dia. x 4-1/2 in. long (or longer) hex bolt, ASTM A307-UNC Thread, screwed into a 1 in. long x 5/16 in. dia. tamp in screw anchor (for stone/brick masonry structures). The anchor and the casing shall meet the requirements of Federal Specification FF-S-325 Group 1, Type 1, Class 1. A 5/16 in. dia. x 3/4 in. long carriage bolt shall replace the 4-1/2 in. long (or longer) hex bolt when readings are not being taken. These screw anchors shall typically be installed into surfaces of structures. Alternatively, reflective survey prisms may be used as structural DMPs.

2.3 CRACK MONITORS

A. Provide portable comparator/reticule crack monitor system, with linear scale 0.75 in. long, graduated every 0.005 in., and a triplet lens to create a flat optical field over the entire reticule area. Alternatively, displacement transducers may be used to monitor cracks.

PART 3 - EXECUTION

3.1 General Requirements

A. All instruments shall be installed in the presence of the Engineer. Cooperate with the

Engineer to allow safe access to the work area at all times for the purpose of observing instrumentation installation.

B. Contractor's nstrumentation Engineer shall be fully responsible for the installation, testing, calibration, reading, and maintenance of the instrumentation, interpretation of the field readings and
C. implementation of appropriate corrective measures. Verify the reliability of all installed instruments a minimum of 2 weeks prior to construction.
D. Location and arrangement of the instrumentation shall be planned so that monitoring can continue until completion. Adequate access for maintenance and reading of the instrumentation shall be provided.
E. All instruments shall be securely fixed such that they are capable of resisting movement and pressure changes underground, or vandalism and adverse climatic conditions at surface locations.
F. The Contractor shall install, monitor, and interpret data from instrumentation, in addition to that specified herein, that the Contractor deems necessary to ensure the safety of personnel and the Work, at no additional cost to MASSDOT. Data shall be reported to the Engineer as specified herein.
G. Maintain records relating to problems encountered, delays, unusual aspects of the installation, and details of any events that may have a bearing on instrument behavior. These records should be submitted along with monitoring data.

3.2 Installation of Instruments

A. Install the equipment according to the manufacturers' recommendations.
B. Testing shall be undertaken as necessary to ensure satisfactory functioning of the equipment at each stage of the installation.
C. Instruments found to be malfunctioning at any time shall be replaced within one week.

3.3 Installation od Deformation Monitoring Points

A. Deformation monitoring points (DMPs) including survey pins (SP) shall be installed per the approved plan, and as directed by the Engineer. As a minimum, DMPs shall be installed on bottom of arch barrel, spandrel walls, and retaining walls.
B. DMPs shall be located on bottom of arch barrel, spandrel walls, retaining walls at a spacing not to exceed 10 feet on center.
C. After installation of a DMP, determine as-built location in horizontal position to an accuracy of +/- 0.01 ft, and in elevation to an accuracy of +/- 0.005 ft.

3.4 Installation of Crack Monitors

A. Cracks to be monitored on structures shall be identified and marked clearly for identification purposes at locations determined by the pre-construction survey performed by the Contractor and as approved by the Engineer.
B. The initial reading of crack monitors where installed shall be documented and photographed with date stamp.

3.6 Maintenance of Instrumentation

A. Prevent damage to the instruments and ancillary equipment during handling, installation and subsequent operation. Maintain all the instruments required for long term monitoring in a satisfactory working order for the duration of the monitoring program. Should an instrument become damaged or become nonfunctional, it shall be the Contractor's responsibility to replace, within one week, the damaged instrument to the satisfaction of

the Engineer at no additional cost to MASSDOT.

B. Ensure that all the instrumentation in use has been correctly calibrated. Carry out periodic checks to confirm the validity of calibration of equipment in accordance with the manufacturer's instructions and carry out any adjustments that are found necessary. Suspect readings shall be repeated.

C. Keep records of all calibration certificates and, when necessary, send equipment off site for re-calibration by an independent accredited testing laboratory.

D. Record the location of all instrumentation on as-installed Working Drawings. As-installed drawings shall include the routing of all cabling. Hidden electrical instrumentation shall be identifiable by color codes and/or tagged cables. The reference coding shall also be recorded on the as-installed drawings.

E. Ensure that electrical instrumentation is not adversely affected by other temporary or permanent electrical services.

3.7 Instrument Reading and Records

A. Instruments shall be read as soon as possible after installation to establish datum readings that shall be established from a minimum of two independent reading operations giving consistent results. The method of reading shall be as recommended by the manufacturer.

B. Monitoring Schedule

1. Monitor instrumentation in accordance with the schedule shown in Table 1.
2. Monitor instrumentation more frequently, if instrumentation detects significant anomalous or suddenly changing readings.

C. In the event of any change in circumstances, for example the influence of the construction of other structures nearby, the program of readings shall recommence.

D. The same recording devices shall be used at any given location through the monitoring program. If forany reason this becomes impracticable, due to instrument breakage for example, new datum readings shall be taken immediately with a replacement instrument, and the new instrument used for the future readings. Similarly, should a monitoring location become unavailable, the instrument previously read from this point shall, within one week, be read from an alternative point, the latter then being used for subsequent readings.

E. Readings shall, wherever possible, be taken by the same personnel. Should the personnel be replaced for any reason, a series of duplicate readings shall be carried out by the out-going person and the replacement.

3.9 Limiting Instrumentation Readings

A. The Contractor shall perform all work in a manner to prevent instrumentation readings from exceeding limiting values specified in Table 2. Where the Contractor's operations result in instrumentation readings approaching the limiting values in Table 2, the Contractor shall modify his means and methods so that the work may be accomplished without exceeding the limiting values. Any delays or modifications to the Contractor's means and methods shall be at no additional cost to MASSDOT.

3.10 Data Reduction, Processing, Plotting and Reporting

A. The Contractor's instrumentation personnel and surveyors shall reduce, process, plot, and report data from the Contractor's monitoring program.

B. Each week the Contractor shall submit to the Engineer a weekly data report together with all new data on a CD or by email, as specified herein. The weekly data report shall be bound and indexed and shall include:

1. A section for each type of instrument. This section shall include: a brief description of the cumulative changes in instrument readings, a brief description of the changes in readings from the previous weekly data report, a table summarizing instruments, actual readings, and if any limiting readings have been reached. Raw and reduced data collected during the week, on summary tables (8-1/2in. x 11in. sheets of paper). Plots of data versus time and including key construction activities and other events that could influence changes in the data shall be shown. Plots of like instruments shall be done at the same scale to facilitate graphical comparison.

2. A description of work being performed during the week by the Contractor and any possible activity in the area that may have an effect on instrument readings. Describe groundwater control and temporary relief operations, including pump locations, times of operation, and estimated quantity of flow.

3.11 Damage to Instrumenttaion

A. The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, weather, traffic, and vandalism.
B. If an instrument is damaged or inoperative, including an existing instrument installed by others, the Contractor's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours, at no additional cost to MASSDOT. The Engineer will be the sole judge of whether repair or replacement is required. The Engineer may impose a work stoppage in the vicinity of the damaged or inoperative instrument until it is again operational, at no additional cost to MASSDOT.
C. Contractor shall repair or replace at its own cost any of the readout devices used for the Contractor's monitoring program that become damaged, inoperative, or, in the judgment of the Engineer, unreliable.

3.12 Removal of Instruments

A. Prior to completion of the Contract, remove all instrumentation installed under this Contract. Protect and maintain all instrumentation until such time as written approval authorizing removal of instrumentation has been received from the Engineer.
B. Removal of instruments shall include removing and disposing of protective covers, and recovery of salvageable portions of instrumentation.
C. All instruments or portions thereof removed by the Contractor shall remain the property of the Contractor.
D. Instrumentation readout and calibration equipment purchased under this Contract shall become the property of MASSDOT.
E. Remove the instrumentation specified herein as directed by the Engineer.

TABLE 1: MONITORING SCHEDULE

INSTRUMENT	SCHEDULE
All Instruments	(1) One reading immediately after installation. (2) One reading each workday until, as determined by the Engineer, repeatability indicates that any data changes resulting from the installation process have ceased. (3) Formal initial reading. (4) One reading immediately prior to any construction activity. Thereafter, reading frequency shall follow the schedule given below.
Crack Monitors	Readings shall be taken once daily if limiting values are exceeded and until the readings have equilibrated to the satisfaction of the Engineer. Readings will continue to be taken weekly until the wall replacement is completed.
Structural Deformation Monitoring Points	Readings shall be taken once daily if limiting values are exceeded and until the readings have equilibrated to the satisfaction of the Engineer. Readings will continue to be taken weekly the wall replacement is completed.

TABLE 2: LIMITING INSTRUMENTATION READINGS

INSTRUMENT	LIMITING VALUE
Structural Deformation Monitoring	± 0.5 inch
Crack Monitors	None (1)

TABLE 2 NOTES:

1. Crack monitor data shall be evaluated by the Contractor in conjunction with DMP data.

PRECAST MODULAR RETAINING WALL SYSTEM

1. Description

This work shall consist of the design, manufacture and construction of a Precast Modular Retaining Wall System in accordance with this specification and in close conformity with the lines, grades, design, and dimensions shown in the Contract Documents & Plans or established by the Engineer.

The Precast Modular Retaining Wall System shall be manufactured by one of the following or approved equal:

- T-Wall manufactured by Reinforced Earth Company
- GRAVIX Rail Precast Wall System by Earth Wall Products, LLC.
- Conspan Precast Concrete Wall by Contech Engineered Solutions

2. Design Criteria

The Contractor is responsible for the wall design. Design shall be in accordance with the following:

2.1. Primary Design References

AREMA *Manual for Railway Engineering,* 2023 edition

2.1.1. Loads

The live load surcharge (Cooper E-80) is calculated per AREMA Section 8.2.2.3c. The lateral earth pressure from the live load surcharge is calculated as a strip load based on a Boussinesq distribution, AREMA Section 8.20.3.2.2.

Lateral earth pressures shall be calculated using well established methods, such as Rankine theory, Coulomb theory, log-spiral charts or the equivalent fluid pressure method.

Live loads from railing on top of wall in accordance with AREMA Section 8.5.3.1.

2.1.2. Foundation Analysis

The wall design shall be in accordance with the soil and foundation parameters specified in the contract documents.

2.1.3. Minimum required Stability Analyses

Stability analyses shall include sliding, overturning, bearing capacity, global stability and pullout. Minimum factors or safety are:

Sliding	1.5
Overturning	Normal resultant underneath the wall base within the middle 1/3 of the base width
Bearing Capacity	2.0
Pullout	1.5
Global stability	1.4

Backfill shall meet the gradation requirements of Gravel Borrow (M1.03.0). The contact friction factor between backfill soil and precast concrete shall be 0.45. Contact friction angle between the back of the wall and backfill soil shall be 24 degrees. The moist unit weight of backfill compacted to a relative compaction of 95% of the backfill maximum dry density evaluated based on AASHTO T180/ASTM D1557 shall be 130 pcf. The backfill soil internal friction angle shall be 34 degrees.

2.2. Submittals

2.2.1. All submittals shall be sealed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts.

Contractor shall submit the required copies of complete shop drawings, design calculations and fabrication drawings for the Precast Modular Retaining Wall System in accordance with the details shown in the Contract drawings. Design calculations shall include at a minimum, all the stability analyses indicated

herein and the structural design of the wall elements.

2.2.2. Shop Drawings

Shop drawings shall show plan, details dimensions and cross sections necessary to construct the wall including:

a. The retaining wall plan, layout and wall elevations
b. Typical wall sections
c. Types, locations and properties of all drainage materials, utilities, appurtenances and any special installation requirements as shown in the contract drawings.
d. Any shoring or temporary support of excavation used during the work.

2.2.3. Fabrication Drawings

Fabrication Drawings shall include unit-reinforcing diagrams and rebar schedules, special hardware requirements and dimensioning for custom cast pieces.

2.2.4. Erection Plan

The Contractor shall submit his proposed method of precast wall erection, including crane capacity and location, erection sequence for wall panels, railroad traffic windows approved by the Housatonic Railroad, schedule of operations, lift loads, equipment, tools, procedures, temporary supports, etc., to the Engineer for review. The submittal shall specify that the requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61.B, Erection of the Standard Specifications. The erection procedure and any necessary calculations (loads, selection of crane equipment, and lifting hardware). Work under this item may not commence until the Engineer has given written approval of the method of erection.

3. Materials

3.1. Primary Material References

AREMA *Manual for Railway Engineering*, 2023 Edition.
Chapter 8 ACI 318 – 22
CRSI

3.2. Wall Units

The wall units shall be manufactured in an NPCA, PCI or DOT certified precast concrete plant. A quality control plan shall be submitted by the precaster and approved prior to start of production.

The concrete mix design shall be Self-Consolidating Concrete (SCC) with a minimum compressive strength of 5,000 psi at 28 days. The mix design shall be submitted and approved by the Engineer prior to the manufacture of any units.

3.2.1. Testing and Inspection

Acceptability of the concrete for the precast units will be determined on the

basis of compression tests, certifications and visual inspection. The concrete strength requirements for the precast units shall be considered satisfied regardless of curing age when compression test results indicate that the concrete strength will conform to 28-day specifications. The precast manufacturer shall furnish facilities and perform all necessary sampling and testing in an expeditious and satisfactory manner.

3.2.2. Casting

The units shall be cast in steel forms with dimensional tolerances that will assure the production of uniform units.

3.2.3. Curing

The curing method shall be as submitted and approved in the quality control plan.

3.2.4. Removal of Forms

The forms shall remain in place until the units can be removed from the forms without damage to the unit.

3.2.5. Marking of Precast Units

Clearly and permanently mark each precast unit on the butt end of the stem with the unit type, the date of manufacture, the lot number if applicable, and the manufacturers name.

3.2.6. Wall Unit Finish and Tolerances

a. Steel Form Finish - Unit Tolerances - all dimensions shall be within ± 1/4 inch.

b. Surface Finish - all honeycomb or open texture shall be properly repaired.

c. Architectural Form Liner Finish – shall be as called for on the Contract drawings.

d. Front Face Tolerance - length and height of front face shall be within ±1/4 inch.

3.2.7. Rejection of Precast Components

Precast concrete wall components not meeting the quality standards of this Section and referenced Specifications will be rejected or repaired. In addition, any of the following defects may be sufficient cause for rejection if not satisfactorily repaired:

- Defects that indicate unsatisfactory molding
- Defects indicating honeycombed or open texture concrete
- Defects in the physical characteristics

3.2.8. Handling, Storage and Shipping

All units shall be handled, stored, and shipped in such a manner as to avoid chipping, cracking, fracturing and excessive bending stresses.

3.2.9. Reinforcing Steel

• Must meet the requirements of ASTM A 615 grade 60.

• Reinforcing steel shall be epoxy coated unless otherwise noted on the contract drawings.

• The minimum concrete cover for the reinforcing steel shall be in accordance with the referenced specifications.

Primary Reinforcement	2
inches Stirrups, ties	1-1/2
inches	

• Rebar cage fabrication by welding is not permitted and is cause for rejection

3.3. Joint Materials

a. Horizontal Joints

Neoprene blocks with a minimum durometer of 60 placed as shown in the approved wall drawings.

b. Joint Filter Fabric
Horizontal and vertical joints shall be backed by a 12-inch wide geotextile fabric such as Mirafi 1120N or approved equal

c. Shear Keys
Precast shear keys shall be made of the same concrete mix as the wall units and cured in the same manner.

d. Shear Key Wrap
The shear keys are to be wrapped with a 1/4” closed cell polyethylene foam such as AVI Astro-Foam or equal.

3.4. Select Granular Backfill shall meet the gradation requirements of Gravel Borrow (M1.03.0) type b.

• Locally produced materials with a gradation meeting the gradation of M1.03.0 would be considered satisfactory.

• General Design Parameters

Angle of Internal Friction	34°
Unit Weight (density)	130 pcf or as specified in the
Contract Compaction -	95% of Modified Proctor,
AASHTO T180/ASTM D-1557	

If the locally available material meets the gradation and angle of internal friction requirements stated above, but not the unit weight, the wall design may be modified to reflect the actual properties of the available material.

• Backfill between the Wall Units meeting the above criteria may be one of the following locally available materials:

- Crushed or natural sand
- Crushed or uncrushed gravel
- Recycled concrete

- Old ballast

3.5. Unclassified Backfill shall meet the requirements of Ordinary Borrow (M1.01.0)

This is the backfill material beyond the limit of the concrete stems.

Angle of Internal Friction 30° Minimum
Unit Weight (density) 125 pcf or as specified in the
Contract Compaction - 95% of Modified Proctor,
AASHTO T180/ASTM D-1557

3.6. Leveling Pad Concrete

The leveling pad concrete shall have a nominal minimum compressive strength of 4,000 psi at 28-days.

4. Construction Requirements

Installation procedure shall be in accordance with the *Wall System Construction Manual for Railroad Projects* provided by the manufacturer.

4.1. Site Examination

Verify locations of utilities and existing structures prior to excavation.

Promptly notify the Engineer in writing of any conditions that may interfere with the proper construction of the wall or delay completion.

Promptly notify the Engineer of site conditions that may affect wall performance, soil conditions observed other than those assumed, or other conditions that may require a reevaluation of the wall design.

4.2. Structure Excavation

Contractor shall excavate to the lines and grades shown on the contract drawings. The foundation for the wall structure shall be excavated and graded level for a width equal to or exceeding the length of the wall stem using the top of the leveling pad as the grade elevation. The contractor shall be careful not to disturb base beyond the lines indicated and shall be responsible for slope stability and protection of the open excavation.

Over-excavated areas shall be filled with suitable base or backfill material and compacted to 95% of the backfill maximum dry density evaluated based on AASHTO T180/ASTM D1557.

4.3. Foundation Subgrade Preparation

The foundation soil shall be evaluated by a Geotechnical Engineer, to ensure that the bearing soils meet or exceed the design conditions, the assumptions in the geotechnical report and the approved wall design.

Compact the graded area with an appropriate roller weighing a minimum of 2 tons by at least 3 passes or as directed by the Engineer.

Remove and replace any soft or loose foundation soils to insure that there is adequate

bearing capacity as directed by the Geotechnical Engineer or the Engineer.

The soil foundation shall be approved, by the Geotechnical engineer, prior to installation of the wall units.

4.4. Leveling Pads

At each unit foundation level, two concrete leveling pads shall be provided as shown on the approved wall drawings. Leveling pads shall be level and flat within ±1/4 inch per 15 feet and shall not exceed a 1/4 inch overall over 100 feet. Leveling pads that do not meet this requirement shall be repaired or replaced as directed by the Engineer at no additional cost.

4.5. Surface Drainage

Contractor shall be responsible for the stability of all excavated slopes and shall assure that surface runoff is diverted away from the wall. The contractor is responsible for providing dewatering of excavated areas in order to maintain dry working conditions during construction of the wall.

4.6. Wall Drainage

A wall drainage system shall be installed as required in the contract drawings.

4.7. Wall Erection:

a. Sequence of Wall Panel Placement

- Wall panels parallel to track shall be placed in a sequence symmetrically to the centerline of bridge arch.

b. Tolerance and alignment shall be as follows:

- Horizontal joint openings between panels shall be 3/4 inch (+ 1/4" –1/2")
- Vertical joint openings between panels shall be 1/2 inch ± 3/8 inch
- Vertical tolerance (plumbness) as the wall is constructed shall not exceed ±3/4 inch when measured with a 10-foot straight edge. Horizontal alignment tolerance as the wall is constructed shall not exceed ± 3/4 inch when measured with a 15-foot straight edge and shall not exceed 3/4 inch overall.

  The overall vertical tolerance of the wall (plumbness from top to bottom) shall not exceed ±3/4 inch per 10 feet of wall height.

c. Horizontal Joints

Neoprene blocks with a minimum durometer of 60 placed as shown in the approved wall drawings.

A 12-inch width of geotextile fabric such as Mirafi 1120 N or approved equal shall be tacked with adhesive on the back face to cover the horizontal joints. Care shall be taken to avoid blocking the joints with adhesive.

d. Vertical Joints

A 12-inch width of geotextile fabric such as Mirafi 1120 N or approved

equal shall be placed on the back face and held in place by the backfill to cover the vertical joints.

e. Shear Keys

Precast shear keys shall be made of the same concrete mix as the wall units and cured in the same manner. The shear keys are to be wrapped with a closed cell polyethylene geotextile material (shear key wrap) to fit snugly into the wall stem keyways.

4.8. Repairs

Repairs to the units in the field are possible only with a pre-approved repair procedure and prior permission of the Owner.

4.9. Field Quality Control

Unless otherwise provided by the Owner, the contractor shall employ the services of an independent engineering firm to monitor soil testing and perform daily quality assurance and inspection for wall construction and soils work. Contractor shall provide any quality control testing or inspection not provided by the Owner. Contractor shall be responsible for proper installation and quality control of all wall components and appurtenant materials.
Quality Assurance shall include but not be limited to foundation soil inspection, frequent backfill compaction testing, verification of geotechnical design parameters and compliance with approved shop drawings, *Retaining Wall System Construction Manual* and Project Specifications.

4.10. Backfill Placement

Backfill placement shall closely follow the erection of each course of wall units. The backfill lifts should be uniform in thickness, not to exceed 12 inches. Each lift shall be compacted to 95% of standard proctor in accordance with ASTM D-698 and shall be completed prior to starting placement of the following lift, in order to help maintain relatively uniform dead loading on the arch barrel.
Placement and compaction of the backfill shall be accomplished without displacement of the wall units.

Material certifications and test reports for the select and unclassified backfill shall be maintained by the Contractor. Conduct sampling and testing at a minimum frequency listed below:

- Compaction Test: Each course of units at 100 ft intervals.
- Gradation Test: Weekly

4.11. Cleaning

After completion of wall installation, remove construction debris and restore any adjacent finished areas affected by wall construction to their pre-construction state. Wash the wall face to remove soiling and stains. Do not use acid or detergents that may “burn” or discolor the face.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under Item 995.5 shall be paid for at the Contract lump sum price for the respective items and shall include all necessary labor, equipment, materials and incidental work necessary for the completion of the work.

ITEM 995.6 REHABILITATION OF BRIDGE 85.52 LS

The work under this section shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications and the requirements below.

Work under this section shall include all materials, equipment and labor needed to complete the construction of the following:

- Selective clearing and thinning at bridge approach areas.
- Remove vegetations and debris from bridge seats and bottom flanges of girders at abutments.
- Repair bridge seats for east girder as shown on the plans
- Repair bridge seats under stringers as shown on the plans

Contractor is responsible for providing an independent material testing company for concrete and drilled and grouted dowels that is specified within the project documents. No separate payment for testing and shall be considered incidental to the work.

The Contractor shall coordination with the City of Pittsfield and the owners of buildings adjacent to the railroad prior to construction. The Contractor shall take all measures necessary to protect pedestrian and vehicular traffic from his construction operations. The Contractor shall coordinate with the City and Police Department for police detail and temporary traffic management for the bridge work. The Contractor is responsible for execution of traffic management plan in Document A00904. Cost for police details, preparation and execution of traffic management plan is incidental to Item 995.6.

The Contractor is responsible for coordination with utility companies for temporary relocation and reinstallation of existing wires and cables on the south abutment.

For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of these bridge structures or which may be incidental to their construction and are not specifically included for payment under another item shall be considered incidental to the work performed under this section.

SELECTIVE CLEARING AND THINNING

Work should be performed in accordance with requirements under Item 102 in this special provisions.

HIGH EARLY STRENGTH CONCRETE FOR BRIDGE SEAT REPAIR

The work under these headings shall conform to the relevant provisions of Section 901 of the Standard Specifications and the following:

High early strength concrete shall meet the requirements of the 2015 Supplemental Specifications to the Standard Specifications for Highways and Bridges sections, 430, M4.02.00, with Type III

cement or an accelerator meeting the requirements of AASHTO M194. Concrete compressive strength shall be a minimum of 4,000 PSI at 24 hours, with course aggregate gradation of 3/4 inch stone designation. The concrete mix shall be approved by MassDOT and used in pervious MassDOT projects.

The Contractor shall furnish, set and maintain line and grade.

The Contractor shall perform the following and provide the results to the Engineer. The following tests are considered incidental items:

3. Concrete cylinder tests, carried out on 6" diameter by 12" high cylinders, conforming to the requirements of ASTM C39 / C39M.
4. One complete slump test per concrete batch conforming to ASTM C143 / C143M.

Existing surfaces in contact with the new concrete shall be thoroughly cleaned.

Forms where required shall be an approved wood or metal type of a width equal to the depth of the concrete, true to line and free from warp of sufficient strength to resist movement when concrete is placed. The forms shall be jointed neatly and tightly, set to proper line and grade and thoroughly cleaned.

The concrete shall be protected for 24 hours to allow curing.

EPOXY BONDING COMPOUND

Work under this section shall conform to the relevant provisions of Section 901 and shall consist of the application of an epoxy bonding compound to the surfaces of the existing stone.

The existing concrete surface shall be thoroughly cleaned and roughened. Application of the epoxy bonding compound shall follow the manufacturer's recommendations.

STEEL REINFORCEMENT FOR STRUCTURE – EPOXY COATED

The work to be done under this heading shall conform to the relevant provisions of Section 901 of the Standard Specifications.

Epoxy coated bars shall be used unless noted otherwise on the plans.

DRILLED AND GROUTED #5 DOWELS

The work to be done under this heading shall conform to the relevant provisions of Section 901 of the Standard Specifications and Item 912.5 in this special provisions.

REPAIR BRIDGE SEATS UNDER STRINGERS

Work under Item shall include all materials, equipment and labor needed to replace the existing bearing pedestals under stringers. The work also includes jacking and temporarily supporting existing bridge superstructure, removal of existing concrete pedestals under stringers, installation of new pedestals. The new pedestal shall have the same dimensions as the existing pedestal. The work will be performed during an extended weekend track closure.

High early strength, non-shrink concrete should be used for new bearing pedestal if it is more than 2" thick. High early strength concrete shall meet the requirements of the Standard Specifications for Highways and Bridges Sections, 430, M4.02.00, with Type III cement or an accelerator meeting the requirements of AASHTO M194. Concrete compressive strength shall be a minimum of 4,000 PSI at 24 hours and a minimum of 5,000 PSI at 28 days with coarse aggregate gradation of 3/8 inch stone designation. The concrete mix shall be approved by MassDOT and used in previous MassDOT projects.

High strength, non-shrink grout should be used for new bearing pedestal if it is no more than 2" thick. Grout shall be on MassDOT pre-approved material list.

JACKING UP AND TEMPORARILY SUPPORT STRINGERS

The work includes loosening rail spikes within 10'-0" on each side of the stringer ends and loosening nuts for bearing anchor bolts; jacking up stringer ends (< 1/8") to relieve the dead load on pedestals and temporarily support of the stringers prior to bridge pedestal replacement; removal of temporary support and jacking device and tightening rail spikes after the completion of pedestal replacement.

SUBMITTALS

A. The contractor shall prepare and submit a work plan prior to construction.
B. Submit concrete mix information.
C. Submit grout manufacturer's product data indicating type, chemical make-up, applications, use methods, mixing ratios, physical properties and strengths.
D. Details of jacking and temporary shoring. Jacks used at each end of girders shall have a minimum capacity of 5 tons.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under Item 995.6 shall be paid for at the Contract lump sum price for the respective items and shall include all necessary labor, equipment, materials and incidental work necessary for the completion of the work.

ITEM 996.1 PERMANENT TIEBACK ANCHORS FOR BR. 77.28 EACH

General

Includes furnishing all materials, equipment, supervision, labor, and services for design, installation and testing of permanent tieback anchors for rehabilitation of south abutment of Bridge 77.28, as shown on the Drawings and as specified herein. Tieback anchors shall be constructed using post-tensioned tendon bars as described herein. Post-tensioned strands may be considered by the Engineer on a case-by-case basis after submittal of request for information by the Contractor. The work includes, but is not limited to:

1. Designing the anchors and anchor connection details in accordance with the minimum design criteria and performance criteria specified herein.
2. Furnishing all materials, labor and equipment for the anchors including suitable drill rig and drilling tools, steel bar tendons, connections, corrosion protection, cement grout, and all equipment and hardware required for installation, testing, and tensioning of the anchors.
3. Installing and grouting the anchors in drilled holes to be drilled at the locations shown on the Drawings.
4. Load testing each anchor and locking off the anchor tension at the specified load.
5. Regrouting and retesting, or replacing, any anchors that do not meet the specified acceptance criteria during testing.

Taking all necessary measures to locate and protect existing utilities and buried structures and to protect the existing railroad tracks and bridge.

References and Standards

ASTM A36 – Standard Specification for Carbon Structural Steel.

ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

ASTM A615 – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.

ASTM A722 - Standard Specification for High-Strength Steel Bars for Prestressed Concrete.

ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM C150 - Standard Specification for Portland Cement.

American Welding Society (AWS) D1.1 - Structural Welding Code - Steel.

Post-Tensioning Institute (PTI) - Recommended Practice for Grouting of Post-Tensioned Prestressed Concrete.

Post-tensioning Institute (PTI) - Recommendations for Prestressed Rock and Soil Anchors.

Anchor Design

A. Design Standards – Design the anchors in accordance with PTI - Recommendations for Prestressed Rock and Soil Anchors, latest edition, and the requirements specified herein.

B. Anchor Design Load –

   a. Bridge 77.28 – The design horizontal load is 15.5 kip/ft for anchors #1 through #4 and 4.6 kip/ft for anchor #5. Anchors shall be installed as shown on the drawings

   b. The yield strength of the prestressing steel shall be not less than 1.67 times the design load.

C. Bond Length - The Contractor is responsible for designing the bond length of the anchors to meet the specified acceptance criteria at the specified design load. The anchors shall be designed to develop bond capacity solely in the cohesionless soil or into dolomite bedrock. The contractor's design bond length shall be verified by load testing of the anchors. The top of the bond length shall be located at least 5 feet beyond a line extending upward from the heel of the abutment at an inclination of 29 degrees from vertical. The bond length in the dolomite bedrock evaluated to resist the design load as specified herein is shorter than 15 feet (Bridge 77.28), the bond length of the tieback anchors shall be increased to a minimum of 15 feet (Bridge 77.28).

D. Unbonded Length - The unbonded portion of the anchor tendon located above the design bonded length shall be encased by a smooth bond breaker sheath. The unbonded length shall be a minimum of 20 feet, measured from the front face of the proposed wall.

E. Stressing Length - Provide a sufficient length of anchor tendon above the anchor head connection for load testing and tensioning the anchor.

F. Anchor Inclination - due to restricted access conditions at the existing bridge abutments, the horizontal and vertical inclination of the anchors will depend on contractor's selected means and methods. The Contractor shall evaluate the horizontal and vertical anchor inclinations and design the anchors based on the selected angles and the design load indicated herein.

G. Anchor Head Connection - The Contractor is responsible for design of the anchor head connection details. The anchor head connection shown on the drawings is schematic only. The anchor head connection shall be compatible with the corrosion protection requirements specified below, and shall include a grease-filled or grout-filled trumpet to protect the portion of the anchor tendon extending from the top of the tendon corrosion protection to the underside of the anchor head.

H. Corrosion Protection - The anchor tendon shall be completely encapsulated over both the bonded length and unbonded length to provide a positive corrosion barrier in addition to the anchor grout. The corrosion protection system shall conform to PTI Class I protection.

   1. The corrosion protection system and anchor head details shall be designed to:

      a. Provide an impermeable encapsulation barrier over the full length of the anchor tendon.

b. Transfer stresses from the encapsulation grout to the anchor grout in the bonded length.
c. Accommodate anchor tendon movement during testing and load lock-off.
d. Be resistant to chemical attack from aggressive environments, grout, and grease.
e. Fabricated from material non-detrimental to the tendon.
f. Be compatible with the contractor's proposed anchor installation procedures.
g. Withstand abrasion, impact, and bending during handling and installation.
h. Be leak proof.

Site and Subsurface Conditions

A. The anchors will be installed adjacent to and through the stone masonry abutment of an existing rail bridge within the active right-of-way with limited access and work area, and will require appropriate management of drilling fluids and spoils.

B. Subsurface information can be found in the following document:

Report titled "Geotechnical Recommendations forSelected Bridge and Track Improvements Along the, Berkshire Line Railroad, Lenox, Massachusetts," dated February 28, 2025, prepared by HDR.

The subsurface information contained in this document was obtained primarily for use in preparing the foundation design and is included in the Contract Documents for the convenience of the Contractor. Interpretation of the subsurface information for purposes of the work of this Contract is the sole responsibility of the Contractor. Subsurface information contained in these documents represents the conditions at the boring and probe locations at the time of the investigations and may not accurately reflect the subsurface conditions between the boring and probe locations or the present conditions at the site.

Quality Control/Quality Assurance

A. Qualifications: The Contractor performing the work of this Section must demonstrate at least five years of experience in the design and installation of tieback anchors including corrosion protection of permanent tieback anchors. Provide a field supervisor for this project with at least five years of experience in installation of tieback anchors. Submit for review documentation of experience, including a list of previous projects, references, and resumes of key personnel.

B. The Engineer or their site representative will observe the anchor installation and testing on a full-time basis. Notify the Engineer of anticipated installation and testing schedule at least two weeks prior to the start of the work.

C. Inspect all anchor tendon assemblies for visible defects or damage immediately prior to installation.

D. Perform all anchor testing in the presence of the Engineer or their site representative. Tests results will not be accepted without approval of the test setup and procedures by the Engineer.

Submittals

A. Do not start tieback anchor installation until all the related submittals have been reviewed and approved by the Engineer.

B. Qualifications: Submit documentation of required tieback anchor experience.

C. Anchor Design, Details, and Installation Procedures: Anchor design calculations and design drawings shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Submit the following items:

1. Proposed anchor bond zone design including drilling methods, drill hole diameter, casing diameter, length of bonded tendon, unbond length, horizontal and vertical angle of inclination of the anchors, anchor design load, grouting procedures, and any provisions for regrouting.
2. Proposed grout mix for anchor grout and encapsulation grout including type of cement, mix proportions, additives, and design strength.
3. Proposed details and materials for the corrosion protection system, including:
   a. Drawings showing complete details of the proposed system including tendon encapsulation, anchor head details, coatings, temporary seals, installation procedures, etc.
   b. Manufacturer's literature or samples for all special materials or products.
4. Design and details of the proposed anchor head connection.
5. Proposed equipment and methods for drilling and grouting the anchors.
6. Proposed equipment and test setup for stressing and testing the anchors including details of stressing equipment, measurement of anchor load, and measurement of anchor displacement.

D. Shop Drawings:

1. Submit drawings showing complete details of the tendon assembly and anchor head connection including corrosion protection. Include a plan and typical cross section showing tieback anchors horizontal and vertical angle of installation, and the design unbonded and bonded lengths. Anchor location shall be as shown on the drawings.

E. Test Certificates:

1. Submit manufacturer's test certification for steel anchor tendons and connections.
2. Submit mill certifications for the anchor head bearing plates.
3. Submit certified calibration curve for load-measuring system to be used for anchor testing.

F. Installation Records - Submit records of anchor installation and testing within two working days following completion of each anchor installation or load test.

Materials

Anchors

A. Anchor Bar Tendons: Threaded bars conforming ASTM A722/A722M type II.

B. All connections shall be capable of developing the full capacity of the anchor tendon and shall conform to the recommendations of the tendon manufacturer.

C. Bearing Plates: Conform to ASTM A36 or ASTM A572. Hot-dip galvanized per ASTM A153 with a minimum coating thickness of 3 mils. Bearing plates shall be designed to support the maximum anchor test load.

D. Trumpets: Fabricate from steel pipe or tube conforming to ASTM A53 (pipe) or ASTM A500 (tube). Minimum wall thickness shall be 0.20 inch. The trumpet shall be welded to the underside of the bearing plate, have an inside diameter at least 0.25 inch greater than the diameter of the tendon at the anchorage, and extend a minimum of 6 inches below the top of the tendon corrosion protection. Provide a positive seal between the inside of the trumpet and the outside of the tendon corrosion protection using a rubber seal or grout.

E. Anchor Head Covers: Fabricate from steel, steel pipe or steel tube conforming to ASTM A36, ASTM A572, ASTM A53 (pipe) or ASTM A500 (tube). Minimum thickness shall be 0.15 inch. Hot-dip galvanized per ASTM A153 with a minimum coating thickness of 3 mils.

F. Corrosion Inhibiting Grease: Conform to PTI Recommendations for Prestressed Rock and Soil Anchors, latest edition.

G. Anchor Grout: ASTM C150 Type II Portland cement, potable water, and additives approved by the Engineer.

1. The cement shall be fresh and not contain any lumps or other indications of hydration. The water content of the grout shall be the minimum necessary for proper placement and shall not exceed a water/cement ratio of 0.45 (by weight). The grout shall have a minimum compressive strength at 28 days that is as shown on the drawings. Minimum 7-day compressive strength shall be 3,000 psi.

2. Grout additives may be used only with the approval of the Engineer. Do not use accelerators and expansive agents. Mix and place additives in accordance with the manufacturer's recommendations.

3. The total chloride content of the Portland cement and any additives shall not exceed 0.05% by weight of cement.

H. Bond Length Encapsulation Sheath: Corrugated PVC, polypropylene or high-density polyethylene sheath filled with Portland cement grout (encapsulation grout). The encapsulation sheath shall have a minimum wall thickness conforming to PTI

recommendations, and the corrugations shall be approximately rectangular in cross section with approximately equal slot and rib widths. Use tendon spacers/centralizers inside the encapsulation sheath to ensure adequate load transfer between the tendon and the encapsulation sheath. Provide permanent, leak-tight seals at the ends of the encapsulation sheath using a heat-shrinkable sleeve or other approved method. Attach centralizers to the outside of the encapsulation sheath to provide a minimum 0.5-inch grout cover between the encapsulation sheath and the soil or rock.

I. Unbonded Length Bond Breaker Sheath: Smooth PVC, polypropylene or high-density polyethylene sheath conforming to PTI recommendations. The bond breaker sheath shall consist of a grease-filled sheath over a bar tendon, or a sheath installed over the encapsulation sheath in the unbonded length of a bar tendon with full length grouted encapsulation.

Anchor Testing Equipment

A. Stressing equipment: Use electrically powered hydraulic stressing equipment (jack, pump, and pressure gauge) having a load capacity between 1.25 and 2.0 times the maximum test load and sufficient travel to accommodate the full anchor extension at the maximum test load. The jack must be capable of applying each test load increment in less than 60 seconds.

B. Load measurement: Use load cells or a calibrated pressure gauge with an accuracy of ±2 kips to measure the load on the anchor. A recent (within 3 months of the load test) certified calibration curve must be provided for each load cell or pressure gauge. If a pressure gauge is used, then the jack and pump must be calibrated together as a unit.

C. Displacement measurement: Measure the displacement of the end of the anchor tendon with a dial indicator reading to 0.001 inch and having a minimum of 2 inches of travel. Mount the dial indicator on a fixed datum that is independent of the stressing system and wall, such as a surveyor's tripod. Displacement measurements that are not made from an independent fixed datum, such as measurement of ram extension or measurement of tendon displacement relative to the wall, are not acceptable.

Product Inspection, Storage and Handling

A. Prior to installation, allow inspection of each tendon by a representative of the Engineer. Repair to the tendon corrosion protection system shall be in accordance with Chapter 7 of PTI - Recommendations for Prestressed Rock and Soil Anchors, latest edition.

B. Store and handle the tendons in a manner that will prevent damage to the corrosion protection system.

C. Keep Portland cement covered and protected from moisture at all times.

Construction Methods

General Requirements

A. The Contractor is responsible for selecting the tieback anchor installation procedures and controlling the installation to prevent damage to existing structures and facilities.

B. Locate all underground utilities and structures near the work prior to installing tieback anchors.

C. Immediately notify the Engineer or their site representative of any obstructions encountered during tieback anchor installation.

Tendon Fabrication

A. Shop-fabricate and deliver to the job site the anchor tendons as fully assembled units.

B. The encapsulation grout inside the tendon encapsulation sheath can be placed either prior to or during the anchor installation.

Anchor Installation

A. Drill anchor boreholes using the approved equipment and method of installation. Install anchors to the diameter, length, clearences, and horizontal and vertical angles indicated on the approved shop drawings and calculations. Install the anchors inside a drill casing extending through all soil strata and seated tightly into bedrock. Advance the casing using a duplex rotary or rotary-percussion drilling system in which the drill fluid and drill cuttings return through the inside of the casing. Use drilling equipment that is capable of penetrating through granite blocks, boulders and bedrock. Take all necessary precautions to prevent ground loss (i.e., removal of a volume of soil greater than the volume of the drill hole) during drilling.

B. Installation Tolerances: The total maximum deviation in the horizontal and vertical alignment of the anchor shall not exceed 2 percent along the length of the tieback. The entry angles tolerance shall not exceed 3 degrees.

C. After completion of drilling, flush the drill hole with clean water injected at the bottom of the drill hole through the drill rods or through a flush tube until clean water returns at the top of the casing.

D. Carefully lower the anchor tendon inside the drill casing to the required embedment depth without dropping or forcing. If the anchor tendon cannot be inserted to the required depth without forcing, remove the tendon and clean or redrill the hole to permit proper installation.

Grouting

A. Provide a mixer capable of producing grout free of lumps and undispersed cement. Use a positive displacement grout pump. The pump shall be equipped with a pressure gauge to monitor grout pressures. Size the grouting equipment to enable the anchor to be grouted in one continuous operation with a duration not exceeding 30 minutes. Screen the grout to remove lumps. Provide a screen with maximum size openings of 0.25 inch. Limit

mixing and storage times so as not to cause excessive temperature buildup in the grout. Use a mixer capable of continuously agitating the grout.

B. Inject the grout from the lowest point of the anchor through a tremie tube. Pump grout until good quality grout (no dilution from groundwater or contamination from soil) is returned at the top of the drill hole. If the grout level in the drill hole drops after initial filling, add additional grout until the grout level stabilizes at the top of the drill hole. Record the quantity of the grout and the grout pressures.

C. If the encapsulation grout is placed after tendon installation, perform the grouting in a controlled manner that prevents rupture of the encapsulation sheath due to unbalanced grout pressure inside the sheath or collapse of the encapsulation sheath due to unbalanced grout pressure outside the sheath.

D. Withdraw the temporary drill casing after grouting. Add grout as required to maintain the grout level within 2 feet of the top of the drill hole during casing removal.

Anchor Load Testing

A. Test every anchor as indicated on the drawings and herein. Perform all testing in the presence of the Engineer or their site representative. All testing equipment type, setup, calibration and calibration reqiuirements shall be as specified in Chapter 7 of PTI - Recommendations for Prestressed Rock and Soil Anchors, latest edition. Test results will not be accepted unless the test setup and procedures have been approved by the Engineer.

B. Performance/Creep Tests – Test frequency shall be as indicated on the drawings. Test anchor as follows:

1. After obtaining initial displacement readings under a nominal seating load, apply 133 percent of the design load in the following increments: 25, 50, 75, 100, 120, and 133 percent.
2. Following application of each load increment, reduce the load to the nominal seating load and measure the residual displacement before proceeding to the next higher load increment. Take intermediate readings at the previous load increments as the load is increased to the next higher load increment. Intermediate readings are not required during unloading.
3. Record the load and total tendon displacement at each load increment and the residual displacement that remains after each load increment is reduced to the nominal seating load.
4. Hold each load increment to within ± 2 kips for no longer than 1 minutes and until the rate of movement is clearly decreasing. A load hold is not required for the readings at intermediate loads.
5. At the maximum test load increment, hold the load for 60 minutes and record the displacement versus time at 1-minute intervals for the first 10 minutes and at 5-minute intervals for the remaining 50 minutes. Begin the observation period when the jack starts to apply the load increment to the anchor. Increase the load from the previous load increment in less than 60 seconds. Take the 1-minute reading 1 minute

after the start of loading. Adjust the jack pressure as required to maintain a constant load.

6. Plot the total and residual displacements versus test load. On the total displacement plot, show: (1) the line corresponding to the theoretical elastic elongation of the unbonded length plus the additional length to the point of load application by the jack and (2) the apparent elastic elongation curve constructed by subtracting the residual displacement from the total displacement at each load increment.
7. Plot the displacement versus the logarithm of time for the maximum test load increment.

C. Proof Tests - Proof test all anchors that are not tested by the Performance/Creep Test procedure as follows:

1. After obtaining initial displacement readings under a nominal seating load, apply 133 percent of the design load in the following increments: 25, 50, 75, 100, 120, and 133 percent. Record the load and tendon displacement at each load increment. After measurements at each load increment are completed, increase load to the following load increment. Following application of the maximum test load increment, reduce the load to the nominal seating load and record the residual displacement.
2. At the maximum test load increment, hold the load for at least 10 minutes and record the displacement versus time at 1-minute intervals. If the rate of movement exceeds 0.04 inch between 1 minute and 10 minutes, continue to hold the load for an additional 505 minutes and take displacement readings at 5-minute intervals. Plot the total tendon displacement versus test load.
3. Show the line corresponding to the theoretical elastic elongation of the unbonded length plus the additional length to the point of load application by the jack. Also show the apparent elastic elongation at the maximum test load increment, which is equal to the total displacement at the maximum test load increment minus the residual displacement that remains after the load is reduced to the nominal seating load.
4. Plot the displacement versus the logarithm of time for the maximum test load increment.

D. Acceptance Criteria -A tested anchor will be considered acceptable if, in the opinion of the Engineer, it meets the following criteria:

1. The load-displacement curve exhibits no sharp break toward large displacement.
2. The creep movement during the load hold period is less than 0.08 inch per log cycle of time and is decreasing with time.
3. The anchor capacity is developed within the design anchorage zone without significant contribution from friction in the unbonded length, as indicated by comparison of the theoretical and apparent elastic elongation of the unbonded length of the tendon.

E. If, in the opinion of the Engineer, a tested anchor does not meet the acceptance criteria specified herein, then the anchor shall be regrouted and retested, or replaced, at no additional cost to the Owner.

Tensioning (Lock-off)

A. Tension all successfully tested anchors to 75% of the design load as follows:

1. Load the anchor to 75% of the design load plus an allowance for seating losses and lock-off the anchor.
2. Reduce the jack load to the seating load.
3. Perform a lift-off test to measure the actual lock-off load.
4. If the actual lock-off load is not within 10% of the required lock-off load, repeat and adjust the load lock-off and recheck the lock-off load.
5. Lock off load not to exceed 70% of the tendon bar yield strength.

B. In general, tensioning can be performed immediately following successful testing of the anchor while the load testing equipment is still in place. If tensioning is performed immediately following testing, record the tendon displacement after reloading to the maximum test load and at lock-off.

C. Do not cut off tendon protrusions until permission is obtained from the Engineer in writing. Cut off tendon protrusions with a saw; flame cutting is not permitted.

Records

A. Maintain complete and accurate records of each tieback anchor installation including:

1. Anchor number and location.
2. Total installed length (measured from the permanent anchor head connection), unbonded tendon length, and bonded tendon length.
3. Length of unbonded tendon during testing (including the length of tendon extending from the wall to the point of load application at the jack).
4. Tendon bar size.
5. Type of grout and any additives used.
6. Grout pressure and volume of grout injected.
7. Dates of grouting, testing, and tensioning.
8. Complete test records including load-deflection plots.
9. Description of any deviations from normal installation and testing procedures.

B. Distribute records of tieback installation and testing to the Engineer or the site representative on a daily basis.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under this section will be paid for at the contract unit price EACH under Item 996.1 Permanent Tieback Anchors for Bridge No. 77.28, and shall include all labor, equipment and materials necessary to complete the work described under this section.

ITEM 995.014 PRECAST CONCRETE BRIDGE ELEMENTS N/A

A. General.

The work under this Heading consists of fabricating, transporting and installing the following:

- Precast Concrete Box Bridge Struture Elements for Br. 74.17
- Precast Concrete Abutment Caps for Br. 76.23

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

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.

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

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 speciefied 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 $Ti \geq 50°F$.
(b) Immediately after placement to verify that $T_i \geq 50°F$ 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.

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 AASHTO T 23	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)]				

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 sublot of concrete produced
(p) Non-Conformance Reports (NCRs)
(q) Documentation of Repairs (if applicable)

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 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 activites 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.

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)]	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.

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.

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% ≤ AC ≤ 8%	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°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 kΩ-cm at 28 days	MassDOT
Freeze/Thaw Durability [(c)]	AASHTO T 161 (Procedure A)	Per AASHTO	Relative Dynamic Modulus of Elasticity after 300 cycles ≥ 80%	Quality Control

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
(b) Trial batch compressive strength testing shall be performed by MassDOT. Laboratory mixed trial batch compressive strength results shall achieve 130% Design Strength (f'_c). Batch-mixed trial batch compressive results shall achieve 120% f'_c. Acceptance will be based on compressive strength testing performed by MassDOT.
(c) If an AASHTO accredited laboratory is preparing the trial batch test specimens, MassDOT Acceptance presence is not required. If the Fabricator is preparing the trial batch test specimens, MassDOT Acceptance presence is required during trial batch test specimen preparation.

(d) Alkali Silica Reaction (ASR) testing shall meet the requirements of M4.02.00. Independent laboratories performing ASR testing shall be listed on the MassDOT Quality Construction Materials List (QCML).
(e) Calcium nitrite shall be removed from mix designs containing the admixture and replaced by an equivalent quantity of water when preparing Chloride Ion Penetration resistance trial batch test specimens.
(f) The Wenner probe tip spacing "a" shall be 1.5.

2. Vertical Adjustment Assembly.

Vertical Adjustment Assembly details and material requirements shall be as shown on the plans. Alternate devices may be used provided that they are adjustable and can support the anticipated loads. The design of the leveling devices, with necessary calculations, shall be submitted to the Engineer of Record for approval.

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:

(a) Number and type and/or piece mark of the precast concrete bridge element including overall length, width and height.
(b) Skew angle.
(c) Location, size and geometry of all steel reinforcement, including mechanical reinforcing bar splicers to be used for connecting Precast Concrete Bridge Elements together in the field.
(d) Location and details of all inserts, anchors, Vertical Adjustment Assemblies, and any other items required to be cast into the Precast Concrete Bridge Elements (whether detailed on the plans by the Engineer of Record or provided for the Contractor's convenience). Precast Concrete Bridge Elements shall not be fired or drilled into for attachment purposes. All hardware shall be galvanized except as noted.
(e) Locations and details of the lifting devices, including supporting calculations, type and amount of any additional reinforcing required for lifting. The Fabricator shall design all lifting devices based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (7^{th} 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

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.

Tolerances for steel reinforcement placement shall be in accordance with 901.62. Tolerances for precast concrete elements 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. 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.

L. Finishing of Concrete.

The top of the prestressed concrete beams shall be given a float finish except for those areas that will have concrete cast against them, which shall receive a rake finish with a ¼" amplitude applied longitudinally along the length of the beam to the limits shown on the plans.

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.

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.

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.

(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*).

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 ft^2/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 occured, 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.

(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

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 ¼-inch deep, except when classified as Category 4
(b) Cracks less than or equal to 0.006 inches wide
(c) Cracks less than or equal to 0.125 inches wide on surfaces that will receive a field-cast concrete overlay

2. Category 2, Minor Defects.

Category 2 defects shall be repaired, but an NCR does not need to be filed. Minor defects are defined as the following:

(a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
(b) Cracks less than or equal to 0.016 inches that will not receive a concrete overlay

(c) Broken or spalled corners that will be covered by field-cast concrete

Minor defects shall be repaired according to PCINE-18-RNPCBE. Cracks shall be sealed according to the PCI Repair Procedure #14 in PCINE-18-RNPCBE.

3. Category 3, Major Defects.

For Category 3 defects, the Fabricator shall prepare an NCR that documents the defect and describes the proposed repair procedure. The NCR shall be submitted to MassDOT for approval prior to performing the repair. Major defects are defined as the following:

(a) Spalls, honeycombing and surface voids that are deeper than 2 inches or have any dimension greater than 12 inches, when measured along a straight line
(b) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area.
(c) Exposed reinforcing steel
(d) Cracks greater than 0.016 inches and less than or equal to 0.060 inches in width that will not receive a concrete overlay
(e) Bearing area spalls with dimensions not exceeding 3 inches
(f) Cracks, spalls and honeycombing that will be encased in cast in place concrete need not be repaired, but the limits and location of the defects shall be documented with an NCR

Upon MassDOT approval, defects and cracks shall be repaired according to PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor.

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

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.

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 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.

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.

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 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.

Field construction staff shall verify that the Resident Engineer has accepted all Precast Concrete Bridge Elements prior to installation.

B. Erection Procedure.

Prior to the erection, the Contractor shall submit an Erection Procedure 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 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 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.

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.

C. Field Welding

Field welding of embedded plates to driven piles and lateral restraint brackets shall be per Section 960 of the Standard Specifications.

D. 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.

E. 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.

F. Erection.

The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure. 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.

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.

F. Back filling Precast Concrete Box Bridge Structure

Backfilling operations shall not begin until the following checks have been made:

(a) Dowels connecting the top slab to walls are grouted as shown on the plans;
(b) All joint seals are properly placed.
(c) Membrane waterproofing and waterproofing protective course are installed.

The backfilling procedures shall be in accordance with Sections 120, 150, and 170 of the Standard Specifications and Supplemental Specifications modified as follows:

(a) Fill shall be placed and compacted in layers not exceeding one foot in depth;
(b) Dumping of fill shall not be allowed any nearer to the structure than 3.25 feet from a vertical plane extending from the back of the 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.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 995.014 Precast Concrete Bridge elements is incidental to Items specified in other sections. No payment will be made under this Item.

DOCUMENT A00803

DRAWINGS AND SKETCHES

Document A00803 Drawings and Sketches Posted Separately on COMMBUYS

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT A00820

Massachusetts Department of Transportation
Conditions of Custody

REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM
(Only to be used following award of contract)

City/Town: LEE, LENOX AND PITTSFIELD

Project File Number: 614004

Contract Number: 129534

Project Description: MassDOT Berkshire Line Civil Improvements

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Project Manager at the MassDOT -Rail and Transit Division at the following email address:

scott.conti@dot.state.ma.us
Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

_____

Telephone number: _____

Email address: _____

Signature/Date: _____

THIS PAGE IS INTENTIONALLY LEFT BLANK

DOCUMENT A00830

PERMIT APPLICATIONS
Lee Conservation Commission

Notice of Intent Application

THIS PAGE IS INTENTIONALLY LEFT BLANK

LEE CONSERVATION COMMISSION
STANDARD CONDITIONS
NOTICE OF INTENT
DEP FILE #196-0498

1. **The term "Applicant"** as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The Commission shall be notified in writing within 30 days of all transfers of title of any portion of property that take place prior to issuance of the Certificate of Compliance.

2. Pursuant to General Condition 9, the Order of Conditions must be registered in the Berkshire Middle District Registry of Deeds prior to commencement of any work. The Lee Conservation Commission hereby orders that it be recorded in the Registry and P. 5 of the Order filed with the Commission no later than 21 days from the date of receipt of this Order. Failure to comply with this Order shall be deemed cause to revoke this Order of Conditions. As an alternative, the Commission may record this Order in the Registry and charge the applicant the cost of recording.

3. **Prior to work commencing on site,** the applicant shall submit to the Commission for approval a detailed sequence of construction, including the construction of compensation and retention areas and re-vegetation, to be completed before other work begins on site.

4. **Prior to the initiation of any work on site,** the applicant shall submit a letter of understanding to the Commission stating that he/she has received, read, understood and shall comply with these Orders.

5. **Prior to work commencing on site,** all state and town permits must be obtained and copies sent and received by the Lee Conservation Commission.

6. **Prior to the initiation of any work,** the excavator, contractor, site foreman and/or construction manager shall submit a letter (or email) of understanding to the Commission stating that they have received, read, understood and shall comply with these Orders.

7. **The Order of Conditions** shall be included with all construction-related documents. All contractors working at the site shall be made aware of the provisions contained within this Order of Conditions and adhere to all Special Conditions herein. At all times, the site foremen, supervision engineer or construction manager shall have a copy of this Order of Conditions at the site and direct compliance with the requirements of this Order. The Commission shall be notified if the contractor changes during the life of the order and must give a letter as per item #6. The Commission reserves the right to impose additional conditions on portions of this project or this site to mitigate any actual or potential impacts resulting from the work herein permitted.

8. **Prior to the initiation of any work,** all erosion control measures shall be constructed and installed as shown on the referenced plan(s) in the Order of Conditions unless otherwise agreed upon by the applicant and the Commission. The erosion control specifications provided in the Notice of Intent and the erosion control provision in Order of Conditions will be the **minimum** standards for this project. These erosion controls shall be maintained until the Commission agrees they are no longer needed or until the Certificate of Compliance is issued.

9. **Notify the Lee Conservation Commission in writing prior to commencing work so a site inspection can be made to insure that proper erosion control measures are in place.**

10. **Prior to any work on site,** the limits of work shall be clearly marked with stakes or flags (or erosion controls if a part of the Order) and shall be confirmed by the Conservation Commission. Such markers shall be checked and replaced as necessary and shall be maintained until all construction is complete. Workers shall be informed that no use of machinery, storage of machinery or materials, stockpiling of soil, or construction activity is to occur beyond this line at any time.

11. A minimum of ___25%___ per cent of both silt fencing and straw bales shall be stored on site to be used for replacement and/or emergency use.

12. In accordance with **federal and state storm water** requirements, all project sites shall incorporate trap rock at all construction entrances and shall maintain either a 25-foot undisturbed buffer of vegetation or a sedimentation/silt fence barrier between the work site and any public roads or neighboring properties to prevent erosion and sedimentation from being carried off the site.

13. Soils exposed or expected to be exposed for periods greater than two months shall be stabilized with erosion control blankets or netting, or covering of straw mulch, or a temporary cover of rye or other native grass to prevent erosion and sedimentation. Drainage ditches shall be hydro-seeded with a perennial grass mixture. Any stabilization material such as jute netting shall be firmly anchored to prevent them from being washed from slopes by rain or flooding. Preference should be given to biodegradable materials.

14. The areas of construction shall remain in a stable condition at the close of each construction day. Erosion control measures shall be inspected at this time and maintained or reinforced as necessary. All such devices shall be inspected, cleaned or replaced during construction and remain in place until such time as stabilization of all areas that may impact resource areas is permanent. Any entrapped silt shall be removed to an area outside the buffer zone and resource areas.

15. Site grading and construction shall be scheduled to avoid periods of heavy rainfall and periods of high surface water. Erosion controls shall be inspected after every rainfall to assure that maximum control has been provided. Any breach of erosion controls and mitigation of silt sedimentation outside erosion control barriers must be reported to the Conservation Commission immediately.

16. All disturbed areas shall be graded, loamed and seeded prior to November 30th of each year. No disturbed areas or stockpiled materials shall be left unprotected or without erosion control during the winter. If seeding is not an option, soils shall be stabilized with through the use of erosion control blankets or other approved means.

17. All equipment shall be inspected regularly for leaks. Any leaking hydraulic lines, cylinders or any other components shall be fixed immediately and the Commission notified. Leaked material shall be cleaned up per instructions of the Commission. Used petroleum products from the maintenance of construction equipment and construction debris shall be collected and properly disposed of off-site and not in any resource area. Refueling, maintenance and/or lubrication of any equipment shall be done no less than one hundred (100) feet from any resource area.

18. All debris, fill, excavated material, construction material and building material shall be stockpiled more than 100 feet from any wetland or resource area at a location to prevent sediment from surface runoff from entering any wetland or resource area. At no time shall any debris or other material be buried or disposed of in or within 100 feet of a wetland resource area or within 200 feet of a river or perennial stream.

19. All waste products, refuse, debris, grubbed stumps, slash, excavate, construction materials, etc. shall be contained and ultimately deposited in an approved landfill and shall not be incorporated in any manner into the project site unless otherwise specified in the Order.

20. A Conservation Commissioner or agent of the Commission shall have the right to halt all work on the site if the Commissioner or agent determines that any of the work is not in compliance with this Order of Conditions. Work shall not resume until the Commission is satisfied that the work will comply, and has so notified the applicant in writing.

21. The Commission reserves the right to amend this Order of Conditions after a legally advertised public hearing if plans or circumstances are changed or if new conditions or information so warrant.

22. Within 30 days of final grading (or within 30 calendar days after the commencement of the following growing season if the project is completed after October 31st), all disturbed areas shall be permanently stabilized with rapidly growing cover and a minimum of 4 to 6 inches of organic topsoil, if necessary and a USDA Natural Resources Conservation Service-approved seed mixture should be used in accordance with the measure outlined in "Vegetative Practices in Site Development: Massachusetts Conservation Guide, Volume II" or other acceptable stabilization methods to assure long-term stabilization of disturbed areas. Maintenance of these areas shall be in a manner that assures permanent stabilization and precludes any soil erosion and shall be the responsibility of the owner of record of the property or the responsibility of the applicant.

23. Fertilizers utilized for landscaping and lawn care on this lot shall be slow release, organic, low nitrogen types and shall not be used within 50 feet of a Wetland Resource Area. Pesticides and herbicides shall not be used on any lawn area within the buffer zone. **This condition shall be included in the Certificate of Compliance. The maintenance activities specified in this Order shall not expire with the issuance of a Certificate of Compliance.** It shall be the responsibility of the property owner of record to see that maintenance conditions are complied with as required by this Order.

24. Upon completion of this project, an "As Built Plan" signed and stamped by a professional engineer will be submitted to the Lee Conservations Commission verifying that if conforms to the Notice of Intent submitted.

25. Pre and post pictures are to be provided.

Massachusetts Department of Environmental Protection

eDEP Transaction Copy

Here is the file you requested for your records.

To retain a copy of this file you must save and/or print.

Username:	**LEECONCOM**
Transaction ID:	**1885498**
Document:	**WPA Form 5 - OOC**
Size of File:	**153.63K**
Status of Transaction:	**In Process**
Date and Time Created:	**4/7/2025:11:26:16 AM**

Note: This file only includes forms that were part of your transaction as of the date and time indicated above. If you need a more current copy of your transaction, return to eDEP and select to "Download a Copy" from the Current Submittals page.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 - Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:196-0498
eDEP Transaction #:1885498
City/Town:LEE

A. General Information

1. Conservation Commission: LEE
2. Issuance: a. ☑ OOC b. ☐ Amended OOC

3. Applicant Details

a. First Name	SCOTT	b. Last Name	CONTI		
c. Organization	MASSDOT RAIL AND TRANSIT DIVISION				
d. Mailing Address	10 PARK PLAZA				
e. City/Town	BOSTON	f. State	MA	g. Zip Code	02116

4. Property Owner

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town	f. State		g. Zip Code

5. Project Location

a.Street Address	HOUSATONIC RAIL LINE MM 74.17 TO MM 77.28		
b.City/Town	LEE	c. Zip Code	01238
d. Assessors Map/Plat#	ROW	e. Parcel/Lot#	ROW
f. Latitude	42.28718N	g. Longitude	73.25067W

6. Property recorded at the Registry of Deed for:

a. County	b. Certificate	c. Book	d. Page

7.Dates

a. Date NOI Filed : 2/6/2025 b. Date Public Hearing Closed: 3/5/2025 c. Date Of Issuance: 4/7/2025

8.Final Approved Plans and Other Documents

a. Plan Title:	b. Plan Prepared by:	c. Plan Signed/Stamped by:	d. Revised Final Date:	e. Scale:
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK S-201THROUGH S-210; E1, E2 REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK GENERAL NOTES S-401 THROUGH S-405;S-1 THROUGH S-4	VARIED		varied	

B. Findings

1.Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

a. ☐ Public Water Supply	b. ☐ Land Containing Shellfish	c.☐ Prevention of Pollution
d. ☑ Private Water Supply	e. ☑ Fisheries	f. ☑ Protection of Wildlife Habitat
g. ☑ Ground Water Supply	h. ☑ Storm Damage Prevention	i. ☑ Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. ☑ The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b.☐ The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c.☐ The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act , and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3.☐ Buffer Zone Impacts:Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a). _____ a. linear feet

Inland Resource Area Impacts:(For Approvals Only):

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☑ Bank	36 a. linear feet	b. linear feet	c. linear feet	36 d. linear feet
5.☑ Bordering Vegetated Wetland	37 a. square feet	b. square feet	c. square feet	37 d. square feet
6. ☑ Land under Waterbodies and Waterways	1372 a. square feet	1372 b. square feet	1167 c. square feet	1167 d. square feet

	e. c/y dredged	f. c/y dredged		
7.☐ Bordering Land Subject to Flooding	a. square feet	b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8.☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9.☑ Riverfront Area	3908 a. total sq. feet	3908 b. total sq. feet		
Sq ft within 100 ft	3908 c. square feet	3908 d. square feet	e. square feet	3908 f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts:

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10.☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11.☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12.☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13.☐ Coastal Beaches	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
14.☐ Coastal Dunes	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
15.☐ Coastal Banks	a. linear feet	b. linear feet		
16.☐ Rocky Intertidal Shores	a. square feet	b. square feet		
17.☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18.☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19.☐ Land Containing Shellfish				

	a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
			c. c/y dredged	d. c/y dredged
21. ☐ Land Subject to Coastal Storm Flowage				
	a. square feet	b. square feet		

22.

☐ Restoration/Enhancement (For Approvals Only)

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c & d or B.17.c & d above, please entered the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

23.

☐ Streams Crossing(s)

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

a. number of new stream crossings

b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. the work is a maintenance dredging project as provided for in the Act; or
   b. the time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order.
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not exceed the issuance date of the original Final Order of Conditions.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal

has been taken, until all proceedings before the Department have been completed.

9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..
10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"
[or 'MassDEP"]
File Number :"196-0498"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

19. The work associated with this Order(the "Project") is (1) ☐ is not (2)☑ subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;

a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period

erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii.*. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv.* all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v.* any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.

g) The responsible party shall:
   1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
   2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission")

upon request; and

3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.

k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.

l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions:

LEE CONSERVATION COMMISSION STANDARD CONDITIONS ADDITIONAL CONDITIONS CONSTRUCTION MUST BE IN THE SUMMER IN THE LOWEST FLOW PERIOD BASED ON HISTORICAL DATA (LIKELY AUGUST). LONG RANGE FORECASTS SHOULD BE MONITORED FOR PREDICTED STORMS AND PRECAUTIONS TAKEN TO MINIMIZE IMPACT ON THE WORK SITES, STAGING AREAS, AND RESOURCE AREAS. THE WORK AREA IS TO BE DELINEATED AND APPROVED BEFORE THE PROJECT COMMENCES. CONSTRUCTION CANNOT IMPEDE OR RESTRICT THE FLOW OF THE BROOK. AN ENVIRONMENTAL INSPECTOR MUST BE ASSIGNED TO ENSURE CONDITIONS ARE BEING MET. THE INSPECTOR MUST ATTEND THE PRE-CONSTRUCTION MEETING FOR THE WASHINGTON MOUNTAIN BROOK SITE AND IF SCHEDULED, THE WILLOW BROOK SITE. THE INSPECTOR SHALL DO UNANNOUNCED INSPECTIONS TWICE A WEEK. THERE IS TO BE NO TREE CUTTING ON THE BANKS OF THE BROOK. THERE IS TO BE NO CONSTRUCTION ACTIVITY OUTSIDE THE STAGING AREA. VIDEOS ARE TO BE TAKEN BEFORE THE START OF THE PROJECT, DURING THE WORK AND AT THE COMPLETION OF THE WORK WITH SPECIAL EFFORT TO INCLUDE SURROUNDING BRUSH AND TREES, DISMANTLING OF THE BRIDGE, DIVERSION OF THE BROOKS, AND SHOWING ACTUAL WORK IN PROGRESS. EXTRA CARE IS TO BE TAKEN TO PREVENT ANY EXTRA DEBRIS FROM ENTERING THE BROOK, CHANNEL OR ANY RESOURCE AREA. THE SITE IS TO BE RESTORED TO AT LEAST ITS PRIOR CONDITION. NO CHANGE IS ALLOWED TO THE ORIGINAL CHANNEL BED.

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1.Is a municipal wetlands bylaw or ordinance applicable? ☐ Yes ☑ No

2.The Conservation Commission hereby(check one that applies):

a.☐ DENIES the proposed work which cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order or Conditions is issued. Which are necessary to comply with a municipal ordinance or bylaw:

b.☐ APPROVES the proposed work, subject to the following additional conditions.

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

3.The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:

E. Signatures

This Order is valid for three years from the date of issuance, unless otherwise specified pursuant to General Condition #4. If this is an Amended Order of Conditions, the Amended Order expires on the same date as the original Order of Conditions.

4/7/2025
1. Date of Original Order

Please indicate the number of members who will sign this form. This Order must be signed by a majority of the Conservation Commission.

4
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signatures:

Kathleen Arment

John Philpott

John Coty Jr

☐ by hand delivery on

Date

Marilyn Hansen

Toni Thomas

Mark Navin

☐ by certified mail, return receipt requested, on

Date

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

G. Recording Information

This Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land

subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

LEE
Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

LEE
Conservation Commission

Please be advised that the Order of Conditions for the Project at:

HOUSATONIC RAIL LINE MM 74.17 TO MM 77.28 — Project Location
196-0498 — MassDEP File Number

Has been recorded at the Registry of Deeds of:

County — Book — Page

for:

Property Owner

and has been noted in the chain of title of the affected property in:

Book — Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant

Rev. 4/1/2010

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
196-0498
MassDEP File #
0
eDEP Transaction #
Lee
City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

1. Date of Issuance

Please indicate the number of members who will sign this form. This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Lee

Signature	Printed Name
	Kathleen Arment
John Philpott	John Philpott
John Coty Jr.	John Coty, Jr.
Marilyn Hansen	Marilyn Hansen
	Toni Thomas
Mark Devin	MARK DEVIN

☐ by hand delivery on

Date

☐ by certified mail, return receipt requested, on

Date

Bureau of Resource Protection - Wetlands

Form 3 – Notice of Intent
Massachusetts Wetlands Protection Act (M.G.L. c.131 s.40)

Bridge Replacement Willow Brook (Bridge 74.17) & Repairs at Washington Mountain Brook (Bridge 77.28) Housatonic Rail Line Lee, MA

Submitted to:
Lee Conservation Commission
32 Main Street
Lee, MA 01238

MassDEP Western Regional Office
436 Dwight Street
Springfield, MA 01103

Prepared for:
Massachusetts Department of Transportation – Rail & Transit Division
10 Park Plaza
Boston, MA 02116

Prepared by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

In Association with:
HDR, Inc.
99 High Street, Suite 2300
Boston, MA 02110

February 3, 2025

Epsilon ASSOCIATES INC.

February 3, 2025

Lee Conservation Commission
32 Main Street
Lee, MA 01238

Subject: Notice of Intent Application, Bridge Replacement over Willow Brook (Bridge 74.17) and Bridge Repairs over Mount Washington Brook (Bridge 77.28), Housatonic Rail Line, Lee, MA

Dear Commissioners:

Enclosed for your review, please find a Notice of Intent ("NOI") prepared by Epsilon Associates, Inc. ("Epsilon") On behalf of the Massachusetts Department of Transportation – Rail & Transit Division ("MassDOT-Rail"), (the "Applicant"), Epsilon Associates, Inc. ("Epsilon") is pleased to submit this Notice of Intent ("NOI") to the Lee Conservation Commission for a proposed bridge replacement crossing of Willow Brook (Bridge 74.17) and bridge repair at the crossing of Mount Washington Brook (Bridge 77.28), along the Housatonic Rail Line, in Lee, MA (the "Project Area"). This NOI has been prepared in accordance with the Massachusetts Wetland Protection Act (MGL c.131 s.40) (the "Act") and implementing Regulations (310 CMR 10.00) ("Regulations") and is being proposed as a Limited Project under 310 CMR 10.53(3)(i).

Bridge 74.17 replacement work will involve impacts to Inland Bank ("Bank") and Land Under Waterbodies and Waterways ("LUW") associated with Willow Brook, a perennial stream, and temporary impacts to the associated 200-foot Riverfront Area, and also to the 100-foot buffer zone to Bank and BVW. Bridge 77.28 repairs will involve temporary impacts to Bank and LUW. The work described herein has been designed to conform to the Wetlands Protection Act performance standards that are applicable to these resource areas.

We have included one electronic PDF copy of the complete NOI via email and two hard copies are included with this letter. Enclosed is the legal ad fee of $105.00 and we understand that the Commission will publish the public notice in a local newspaper at least five days prior to the hearing date. Also enclosed are the filing fees pursuant to the Wetlands Protection Act for the sum of $267.50 (municipal share). MassDOT does not pay local filing fees.

Please note that according to 310 CMR 10.05(4), MassDOT is exempt from abutter notification, pursuant to Chapter 472 of the Acts of 1993.

This NOI is being submitted for the Commission's review at the next available public hearing, believed to be on February 19, 2025. If you have any questions regarding this submittal or need additional information, please feel free to reach out at (978) 461-6271 or ajacobs@epsilonassociates.com.

Sincerely,
EPSILON ASSOCIATES, INC.

Alyssa Jacobs, PWS
Principal and Manager, Ecological Sciences

cc: Scott Conti, MassDOT Rail and Transit
June Wu, HDR
DEP WERO

Table of Contents

TABLE OF CONTENTS

WPA FORM 3 – NOTICE OF INTENT

ATTACHMENT A – PROJECT NARRATIVE **1**

1.0 Introduction 1
2.0 Existing Site Conditions 1
2.1 Bridge 74.17 – Willow Brook Crossing 1
2.1.1 Wetland Resource Areas 2
2.1.1.1 Inland Bank and Riverfront Area 2
2.1.1.2 Bordering Vegetated Wetlands 3
2.1.1.3 Land Under Water Bodies and Waterways 4
2.2 Bridge 77.28 Washington Mountain Brook Crossing 4
2.2.1 Wetland Resource Areas 5
2.2.1.1 Inland Bank and Land Under Water 5
3.0 Description of Proposed Work 6
3.1 Bridge 74.17 Willow Brook Crossing Bridge Replacement 6
3.1.1 Construction Sequence 7
3.2 Bridge 77.28 Washington Brook Crossing Abutment Repairs 8
3.2.1 Construction Sequence 8
4.0 Project Impacts 9
5.0 Compliance with General Performance Standards 10
5.1 Inland Bank 10
5.1.1 Compliance with Massachusetts Stream Crossing Standards 12
5.2 Riverfront Area (Bridge 74.17 only) 13
5.3 Land Under Water Bodies and Waterways 15
6.0 Mitigation Measures 17
6.1 Sedimentation and Erosion Controls 17
6.2 Spill Prevention and Response Plan 17
6.3 Water Diversion Pipe 17
6.4 Dewatering Measures 17
6.5 Soil and Construction Material Stockpile Locations 18
7.0 Conclusions 18

ATTACHMENTS

ATTACHMENT B – FIGURES
ATTACHMENT C - SITE PHOTOGRAPHS
ATTACHMENT D – PERMIT DRAWINGS
ATTACHMENT E – FILING FEE INFORMATION
ATTACHMENT F – WETLAND DELINEATION REPORT

LIST OF TABLES

Table 4-1	Summary of Permanent Wetland Resource Area Impacts	9
Table 4-2	Summary of Temporary Wetland Resource Area Impacts	10

WPA Form 3

Notice of Intent

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

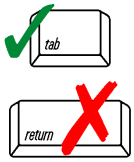
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Mile Marker 74.17 & 77.28 Housatonic Rail Line — a. Street Address
Lee — b. City/Town
01238 — c. Zip Code

Latitude and Longitude:
42.28714 / 42.32769 — d. Latitude
-73.25062 / -73.24206 — e. Longitude

No parcel information - railroad right-of-way — f. Assessors Map/Plat Number
No parcel inforomation - railroad right-of-way — g. Parcel /Lot Number

2. Applicant:

Scott — a. First Name
Conti — b. Last Name
Massachusetts Department of Transportation - Rail & Transit Division — c. Organization
10 Park Plaza — d. Street Address
Boston — e. City/Town
MA — f. State
02116 — g. Zip Code
(857) 368-8965 — h. Phone Number
i. Fax Number
Scott.Conti@dot.state.ma.us — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Alyssa — a. First Name
Jacobs — b. Last Name
Epsilon Associates Inc. — c. Company
3 Mill & Main, Suite 250 — d. Street Address
Maynard — e. City/Town
MA — f. State
01754 — g. Zip Code
978-461-6271 — h. Phone Number
i. Fax Number
ajacobs@epsilonassociates.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

500.00 — a. Total Fee Paid
237.50 — b. State Fee Paid
262.50 — c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

A. General Information (continued)

6. General Project Description:

To replace a bridge with a culvert at Willow Brook (Bridge 74.17) as well as abutment and wingwall repairs at Washington Mountain Brook (Bridge 77.28). Activities are proposed within Bank, Land Under Water & Riverfront Area

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☒ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53(3)(i)
2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☒ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☒ Land Under Waterbodies and Waterways	204 perm. 1167 temp. 1. square feet 3. cubic yards dredged	0, 1167 restored 2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☒ Riverfront Area	Inland: Willow Brook, Washington Mountain Brook, & Housatonic River	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: N/A square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.
3,908 (temp)	3,908 (temp)	0

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☒ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☒ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   August 01, 2021
   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☒ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☒ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Bourne to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Plymouth to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☒ Yes ☐ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   Upper Housatonic River ACEC

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☐ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☐ A portion of the site constitutes redevelopment

      3. ☐ Proprietary BMPs are included in the Stormwater Management System.

   b. ☒ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK and REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK

HDR	June Wu, P.E.
b. Prepared By	c. Signed and Stamped by
1/17/25	varies
d. Final Revision Date	e. Scale

f. Additional Plan or Document Title | g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☐ Attach Stormwater Report, if needed.

E. Fees

1. ☐ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

56821	1/29/25
2. Municipal Check Number	3. Check date
56820	1/29/25
4. State Check Number	5. Check date
Epsilon Associates	
6. Payor name on check: First Name	7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Lee
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

Scott Conti	1-29-2025
1. Signature of Applicant	2. Date
3. Signature of Property Owner (if different)	4. Date
Alyssa Jacobs	1/29/25
5. Signature of Representative (if any)	6. Date

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Attachment A

Project Narrative

ATTACHMENT A – PROJECT NARRATIVE

1.0 Introduction

On behalf of the Massachusetts Department of Transportation – Rail & Transit Division ("MassDOT-Rail"), (the "Applicant"), Epsilon Associates, Inc. ("Epsilon") is pleased to submit this Notice of Intent ("NOI") to the Lee Conservation Commission for work associated with the replacement and repairs at two separate bridge locations along the Housatonic Railroad line in Lee, MA (the "Project Area"). This NOI has been prepared in accordance with the Massachusetts Wetland Protection Act (MGL c.131 s.40) (the "Act") and implementing Regulations (310 CMR 10.00) ("Regulations"). This project entails a proposed bridge replacement with a culvert at Willow Brook (Bridge 74.17) as well as abutment and wingwall repairs at Washington Brook (Bridge 77.28). The purpose of these projects proposed by MassDOT is to mitigate existing structural problems that have the potential to jeopardize the integrity of the railroad facility and infrastructure, resulting in potential safety concerns related to the passage of people, material, and goods. For these reasons, the applicant is asking for relief as a Limited Project Provision under 310 CMR 10.53(3)(i).

This work will involve temporary impacts to Inland Bank ("Bank"), Land Under Waterbodies and Waterways ("LUW"), Bordering Vegetated Wetlands ("BVW") associated with Willow Brook, a perennial stream, along with 200-foot Riverfront Area ("RFA"), and the 100-foot buffer zone to Bank and BVW. Permanent impacts to LUW total 204 square feet. The work described herein has been designed to conform to the Wetlands Protection Act performance standards that are applicable to these resource areas. The following sections present details regarding the existing wetland resource areas and the proposed bridge replacement and repairs.

2.0 Existing Site Conditions

2.1 Bridge 74.17 – Willow Brook Crossing

The proposed Willow Brook bridge replacement will occur along the railroad line right-of-way at mile marker 74.17 in Lee, MA (see Attachment B, Figures 1 and 2). This bridge is a 11-foot single span timber superstructure with an open timber deck on masonry abutments and wingwalls. The bridge carries one track on a flat profile. Willow Brook, a USGS-mapped perennial flows west to east beneath the bridge. The bridge construction date is unknown. The brook then flows easterly to the Housatonic River approximately 500 feet away. The bridge is in fair condition with one beam in poor condition. Additionally, the bearing timbers at the north abutment exhibits crushing and splitting.

The substructure consists of two stone masonry abutments with masonry wingwalls at all four corners and stone masonry backwalls. The abutments are experiencing significant deterioration and is in serious condition due to settlement, displacement and voids (see the photos in Attachment C).

The Project Area is bounded to the west by open space associated with a transmission line right of way, along Willow Brook Creek, to the northeast by a large quarry, to the east and south by emergent and forested wetland. A transmission line also crosses the rail line in this location, creating an additional site restriction and construction safety issue.

According to the 15th Edition Natural Heritage Atlas (effective August 01, 2021), the Project site is not located within mapped Priority Habitat or Estimated Habitat of Rare Wildlife. There are no Potential Vernal Pools or Certified Vernal Pools present in the project area.

According to FEMA Firmette panel 2500280009B, the Project site is not located within a FEMA-mapped flood zone (see Attachment B, Figure 2). Natural Resources Conservation Service ("NRCS")-mapped soils associated with the bridge in the Study Area consist of Kendaia silt loam, 0-3 percent slopes, and Natchaug and Catden mucks, 0-2 percent slopes.

Representative photographs of the site, bridge, and resource areas are provided in Attachment C.

2.1.1 Wetland Resource Areas

On July 2nd and October 3rd, 2018, wetland scientists from Epsilon delineated wetland resource areas within the vicinity of the project site. Inland Bank and Bordering Vegetated Wetlands (BVW) associated with a perennial stream, Willow Brook, were identified and delineated within the Project Area as well as within neighboring parcels immediately east and west of the Project Area, as shown on Figure 4A and marked on the plans in Attachment D.

Wetlands were delineated in accordance with the U.S. Army Corps of Engineer's "1987 Wetland Delineation Manual" (USACE, 1987) and the "Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region" (USACE, 2012); the Act and Regulations (310 CMR 10.00); and the MassDEP handbook entitled "Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act" (MassDEP, 1995).

Refer to the Wetland Delineation Figure in in Attachment B and the permit drawings provided in Attachment D for the location of wetland resource areas and related buffer zones. Resource areas in and adjacent to the Project Area are described below.

2.1.1.1 Inland Bank and Riverfront Area

According to 310 CMR 10.54, a Bank is the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a BVW and adjacent flood plain, or, in the absence of these, it occurs between a water body and upland. The upper boundary of Bank is the first observable break in slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level. Where Banks are composed of concrete, asphalt, or other artificial impervious material, said Banks are likely to be significant to flood control and storm damage prevention. Under the Act, Bank has a 100-foot buffer zone extending from its edge.

Additionally, according to 310 CMR 10.58, a Riverfront Area is the area of land between a river's mean annual high-water line and a parallel line measured horizontally. The riverfront area may include or overlap other resource areas or their buffer zones. The riverfront area does not have a buffer zone. Riverfront areas are likely to be significant to protect the private or public water supply; to protect groundwater; to provide flood control; to prevent storm damage; to prevent pollution; to protect land containing shellfish; to protect wildlife habitat; and to protect the fisheries. The RFA extends 200 feet horizontally from the mean annual high-water line of Willow Brook.

There is bank and riverfront area associated with Willow Brook located both east and west of the bridge proposed to be replaced, described below:

Bank series B/Ba (flags B-1 to B-3, B-1a to B-3a to Wingwall 1, Wingwall 4 to B-B1 to B-B2, and Wingwall 2a to B-B1a to B-B2a) delineates the banks of Willow Brook, where it flows under Bridge 74.23. The brook was approximately 8 feet wide beneath the bridge with a cobble and silt substrate. Dominant vegetation along the banks included black willow, elderberry (*Sambucus sp.*) and swamp rose (*Rosa palustris*). Willow Brook is a perennial stream and thus has an associated 200-foot Buffer Zone that is jurisdictional under the Wetlands Protection Act.

The proposed work will require some temporary disturbance to the Bank consisting of the stone abutment walls. Approximately 36 linear feet of Bank will be affected at this location to allow for the removal of the existing culvert and the installation of the new box culvert inlet and concrete wall tie-ins. Additional work is proposed within the 100-foot buffer zone to Bank.

2.1.1.2 Bordering Vegetated Wetlands

Bordering Vegetated Wetlands (BVW) are defined at 310 CMR 10.55 and BVWs generally include freshwater wetlands that border on creeks, rivers, streams, ponds, and lakes. Types of freshwater wetlands include wet meadows, marshes, swamps, and bogs. BVWs are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the plant community that occur in each type of freshwater wetland are specified in the Act. The boundary of BVW is the line within which 50 percent or more of the plant community, based on visual inspection, consists of wetland indicator plants and saturated and inundated conditions exist. There is a 100-foot Buffer Zone associated with BVW. The Lee Conservation commission administers the Wetlands Protection Act and does not have a separate wetlands bylaw.

Three wetland series were identified and delineated within and adjacent to the bridge. Wetland Series A, C and D are all associated with Willow Brook. Wetland A is located along the toe-of-slope of the railway line to the northwest of Bridge 74.23. Wetland C is located opposite Wetland A on the southeastern side of Willow Brook. Wetland D is located on the northeastern side of Bridge 74.23, and along the northern banks of Willow Brook.

Wetland Series A (Flags A-1 through A-6) delineates the edge of a BVW as it runs along the toe-of-slope of the Railway line north of Bridge 74.23. Water from this wetland drains southwest into Willow Brook. Dominant species included green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus Americana*), gray dogwood (*Cornus racemosa*), narrow-leaved goldenrod (*Euthamia graminifolia*), silky dogwood (*Cornus amomum*), phragmites (*Pragmites australis*), and Tartarian honeysuckle.

Wetland Series C (Wingwall 1a to flags C-1 to C-3) delineates the edge of a BVW to Willow Brook, on the northwestern side of Bridge 74.23, across the water from Wetland Series A. Dominant species included silky dogwood, water horsetail, goldenrod (*Solidago sp.*), and black willow (*Salix nigra*).

Wetland Series D (Wingwall 4 to flags D-1 to D-2) delineates the edge of a BVW to Willow Brook, on the northeastern side of Bridge 74.23. Dominant species included silky dogwood, American elm, sensitive fern (*Onoclea sensibilis*), and water horsetail (*Equisetum fluviatile*).

This work will not involve permanent impacts to BVW. Temporary impacts associated with dewatering of xx square feet. Additionally, there will be work in the 100-foot buffer zone to BVW, as described in further detail below under proposed work.

2.1.1.3 Land Under Water Bodies and Waterways

Land Under Water Bodies and Waterways (LUWW) are defined at 310 CMR 10.56 as the land beneath any creek, river, stream, pond, or lake. Said land may be composed of organic muck or peat, fine sediments, rocks, or bedrock. The boundary of Land under Water Bodies and Waterways is the mean annual low water level. There is a no Buffer Zone associated with LUWW.

This work will involve approximately 202 square feet of temporary impacts to LUWW, as described in further detail below.

2.2 Bridge 77.28 Washington Mountain Brook Crossing

Abutment repairs will occur along the railroad line at mile marker 77.28 in Lee, MA (see Figures 1 and 3 in Attachment B), near the intersection of Mill Street and Washington Mountain Road. Bridge 77.28 was built in 1904 and is a single span, open deck steel structure with timber decking with stone masonry abutments and wingwalls. It is 23-feet long and carries the single track Housatonic Rail line over the Washington Mountain Brook. The USGS-mapped perennial stream flows in a westerly direction beneath the bridge into the Housatonic River approximately 60 feet west of the bridge. Mill street is located directly east of the bridge. Riprap is present up and downstream of the stone abutment walls.

Bridge inspections have found that the abutments are experiencing significant deterioration and spalling and cracks in the concrete apron, with cracked and failed pointing (see the photos in Attachment C).

According to the 15th Edition Natural Heritage Atlas (effective August 01, 2021), the bridge site is not located within mapped Priority Habitat or Estimated Habitat of Rare Wildlife. There are no Potential Vernal Pools or Certified Vernal Pools present in the project area.

According to FEMA Firm panel 2500280006B, the bridge site is located within a FEMA-mapped flood zone AO, elevation924-925 (see Attachment B, Figure 4).

On July 2nd and October 3rd, 2018, wetland scientists from Epsilon delineated wetland resource areas within the vicinity of the project site. Inland Bank and Bordering Vegetated Wetlands (BVW) associated with a perennial stream, Willow Brook, were identified and delineated within the Project Area as well as within neighboring parcels immediately east and west of the Project Area, as marked on the plans in Attachment D.

Wetlands were delineated in accordance with the U.S. Army Corps of Engineer's "1987 Wetland Delineation Manual" (USACE, 1987) and the "Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region" (USACE, 2012); the Act and Regulations (310 CMR 10.00); and the MassDEP handbook entitled "Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act" (MassDEP, 2022).

Refer to the Wetland Delineation Figure in in Attachment B and the permit drawings provided in Attachment D for the location of wetland resource areas and related buffer zones. Resource areas in and adjacent to the Project Area are described below.

2.2.1 Wetland Resource Areas

On July 30th, 2024, wetland scientists from Epsilon delineated wetland resource areas within the vicinity of the bridge site. Inland Bank associated with Washington Mountain Brook was identified and delineated within the Project Area as well as within neighboring parcels immediately east and west of the bridge, as shown on Figure 4B and marked on the plans in Attachment D.

There were no BVW identified proximate to the bridge.

Refer to the Wetland Delineation Figure in in Attachment B and the permit drawings provided in Attachment D for the location of wetland resource areas and related buffer zones. Resource areas in and adjacent to the Project Area are described below.

2.2.1.1 Inland Bank and Land Under Water

Flags C1 to C6 and D1 to D7 to define the north and south bank, respectively, of Washington Mountain Brook from Mill Road to the River. By the bridge, bank is coincident with the vertical stone abutments and wingwalls. Bank is not vegetated in this location. In particular, a concrete wall extends from the Mill Road bridge to Bridge 77.28 on the north side. Portions of the stream bottom are armored with granite blocks and large stones. A gravel and cobble shelf has

accumulated in the northwest and southeast quadrants beneath the bridge. Bank vegetation east and west of the abutments consists primarily of invasive species such as Japanese knotweed (*Reynoutria japonica*), oriental bittersweet (*Celastrus orbiculatus*) and multiflora rose (*Rosa multiflora*).

These flag series have a 200 foot Riverfront Area and 100 foot buffer zone. Approximately 965 sf of temporary impacts to LUW will result from the dewatering of the work area.

3.0 Description of Proposed Work

3.1 Bridge 74.17 Willow Brook Crossing Bridge Replacement

Due to existing site constraints such as the overhead transmission line and wetland resource areas, the limited right-of-way as well as operational constraints requiring very limited shutdowns to complete the work, the Applicant is proposing to replace the timber deck bridge and stone abutments with a pre-cast concrete culvert. The proposed replacement culvert will match the existing cross section. Stone walls east and west of the culvert will remain and thus will continue to contain Willow Brook up and downstream. As described, the majority of the work footprint will occur within the previously disturbed areas of railroad and embankment.

As detailed in the construction sequence (Section 3.1), proposed work will involve the installation of perimeter erosion controls, followed by construction of the gravel-lined flow diversion bedding. Upstream and downstream sandbag dams will then be erected, and the pump diversion will begin to divert the stream so the sheet piling can be installed and track demolition can begin.

To perform the bridge replacement and culvert installation work, a small section of railroad track (approximately 100' long) will be temporarily removed. The existing deteriorating timber bridge and granite abutments will then be replaced with a 24-foot long precast split box culvert (dimensions of 8'6" x 7'7" feet), embedded two feet with natural stream substrate, maintaining existing inverts. A low flow channel through the culvert will be constructed. The new culvert will be underlain by 12 inches of crushed stone wrapped in geotextile fabric. A cast in place concrete wall, up and downstream of the culvert of approximately 3-feet will be installed.

Precast concrete culvert sections will be transported via hi-rail equipment and then staged on the south side of the bridge, on either side of the railroad bed, in the area below the transmission line, within the 100-foot buffer zone and the 200-foot RFA. Minor vegetation trimming in this previously disturbed area may be necessary to stage these culvert sections. The culvert will be installed via equipment staged on the track.

Replacement of the track will involve the addition of a ballast mat over 6-inches of subballast north and south of the culvert installation.

3.1.1 Construction Sequence

The following is a suggested staged construction sequence. The contractor shall submit a construction sequencing plan for review and approval prior to the start of work. Work will occur during three track closure weekends, during low flow conditions to the extent feasible.

Stage 1 (Work performed during non-operation hours)

1) Install cofferdam.
2) Deenergize overhead powerline.
3) Deliver precast U-sections and culvert roofs to site then relocate precast units to final locations for installation
4) Reenergize overhead powerline.

Stage 2 (Work performed during 1st weekend track closure)

1) Deenergize overhead powerline and dewater.
2) Temporarily remove existing track in construction zone.
3) Demolish existing timber bridge superstructure and existing stone masonry abutments and wing walls.
4) Excavate and place 12" crushed stone at bottom of excavation.
5) Erect precast U-sections to final locations.
6) Erect culvert roof onto U-sections.
7) Install membrane waterproofing strips at joints of box sections.
8) Backfill and install temporary timber mat on top of box sections.
9) Install track and open bridge to train service.
10) Reenergize powerline.

Stage 3 (Work performed during 2nd weekend track closure)

1) Construct cast-in-place concrete retaining walls at four corners and backfill.

Stage 4 (Work performed during 3rd weekend track closure)

1) Remove temporary timber mat and rails on bridge.

2) Perform track work at bridge approaches.

3) Install approaches.

4) Install ballast mat, ballast, crossties, and rails.

5) Open Bridge to train service.

6) Upon completion of the need for the temporary flow diversion, it shall be removed in its entirety, and the site, bank and channel areas restored to their original conditions, all as approved by the engineer.

The site will be restored to pre-existing conditions to the maximum extent feasible. Any disturbed areas of exposed soil will be loamed and seeded.

Box culvert details are included as part of the Permit Plans located in Attachment D.

3.2 Bridge 77.28 Washington Brook Crossing Abutment Repairs

The proposed repairs will be conducted on both the north and south abutment and wingwalls of the bridge. In order to complete these repairs, a sandbag coffer dam will be installed to conduct the work in the dry. A water diversion pipe will be installed to enable stream flow to continue. Water will be pumped out of the coffer dam to enable access to the concrete apron. his temporary work area is approximately 965 sf.

Portions of the existing stone wall and concrete apron at the south abutment will be demolished and material removed from the site. On the south abutment and southeast wing wall, a reinforced concrete slab (approximately 37.5 feet long and 5.5 feet high will be installed above the mudline. Three (3) soil tieback anchors will be installed above the waterline, at approximately 5.5 feet above the mudline. Above the waterline repairs include repointing of stones and filling of voids with grout as well as a concreate cap on the top of the abutment. See Permit drawings in Attachment D.

3.2.1 Construction Sequence

1. Mobilization
2. Clean vegetation and debris on bridge seats and bottom flanges of girdles at the bridge seat areas.
3. Clean surfaces and repoint stone joints.

4. Install sandbag coffer dam and dewater. Demolish existing concrete section on the footing and remove existing stone at the northeast corner of the wingwall. Material to be removed to offsite disposal area.
5. Install concrete apron at south abutment and concrete cap at southeast corner of the wingwall.
6. Install soil anchors.
7. Demobilize.

4.0 Project Impacts

This project will involve both temporary and permanent impacts to LUW, Inland Bank, RFA, and BVW. Temporary impacts at Bridge 74.17 will result from site access, equipment and material stockpiling, excavation and grading relative to the bridge replacement and culvert installation work, and the installation of the coffer dam, dewatering, and temporary flow diversion. All work will be conducted within the railroad right-of-way. Permanent impacts are associated with the installation of the box culvert totaling 204 square feet of LUW and 12 feet of Inland Bank. The box culvert will be set at a lower position and in-filled with two feet of natural stream bed material. Inland Bank in this location is the stone abutment walls. All temporary impacts will be restored in kind via grading to pre-existing contours and revegetation.

Temporary impacts at Bridge 77.28 result from the installation of the coffer dam, dewatering, and temporary flow diversion. Permanent impacts are *de-minimis* as the concrete apron width will approximately match the existing with an allowance of 2".

In that the proposed permanent impacts will result from work that will improve the stability of LUW, Bank, and RFA, mitigation for these impacts is not being proposed at this time.

Table 4-1 Summary of Permanent Wetland Resource Area Impacts

Bridge ID	LUW Impacts (square feet)	BVW Impacts (square feet)	Inland Bank Impacts (linear feet)	RFA Impacts (square feet)	Proposed Work Component(s)
74.17	204	0	0	0	Excavation and grading for the removal of the existing culvert, installation of new culvert and natural stream substrate

Table 4-2 Summary of Temporary Wetland Resource Area Impacts

Bridge ID	LUW Impacts (square feet)	BVW Impacts (square feet)	Inland Bank Impacts (linear feet)	RFA Impacts (square feet)	Proposed Work Component(s)
74.17	202	37	36	3,908	Coffer dam placement, installation of temporary flow diversion, dewatering for culvert installation, replacement of stone masonry walls with concrete wall transition and culvert (i.e. bank) staging areas and access to work area.
77.28	965	0	37	0	Coffer dam placement, installation of temporary flow diversion and dewatering for abutment repair, apron replacement

5.0 Compliance with General Performance Standards

The following sections provide information on the WPA performance standards for each of the wetland resource types affected by the Project. However, since the Project qualifies under the Limited Project provisions (310 CMR 10.53) of the WPA (see below) the normal performance standards (for Bank, LUW, BLSF, and RFA) are not required to be met in full and the issuing authority may issue an Order of Conditions along with "such conditions as will contribute to the interests identified in M.G.L. c. 131, § 40." Nevertheless, Project planning, design and implementation have been directed towards meeting the WPA performance standards to the maximum extent feasible.

5.1 Inland Bank

Approximately 36 linear feet of Inland Bank at Willow Brook and 37 linear feet at Washington Mountain will be temporarily impacted by the project. In these locations, the stone wall abutments are inland bank and they are not naturally vegetated or contoured. The work will be conducted in accordance with the general performance standards for Inland Bank, outlined in 310 CMR 10.54(4), and as described in further detail below.

(a) Any proposed work on a Bank shall not impair the following:

1. The physical stability of the bank;

The physical stability of the bank associated with these repair projects will not change. The stream banks are artificial structures consisting of stone abutments and walls.

2. *The water carrying capacity of the existing channel within the Bank;*

The Project will not significantly alter the water carrying capacity of the existing channel. Impacts to the stream bottom will result from the placement of the culvert at Bridge 74.17. The box culvert will be set at a lower position and in-filled with two feet of natural material. Ultimately, the proposed box culvert will carry the same volume and flow of water. There will be no changes at Bridge 77.28.

3. *Ground water and surface water quality;*

The proposed project will not impair water quality. During construction, erosion and sediment control measures will be implemented to ensure that surface water quality is not impaired. A temporary cofferdam and diversion pipe will be used to dewater the work area. See also, 310 CMR 10.54(4)(b) below.

4. *The capacity of the Bank to provide breeding habitat, escape cover and food for fisheries;*

In its current condition, the bank does not provide these functions.

5. *The capacity of the Bank to provide important wildlife habitat functions;*

In its current condition, the bank does not provide these functions.

During construction, erosion and sediment control measures and proper dewatering practices will be implemented to ensure that ground and surface water quality is not impaired.

See also, 310 CMR 10.54(4)(b) below.

6. *Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.54(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards …*

Although designed to meet the Massachusetts Stream Crossing Standards to the maximum extent practicable, this project is being proposed as a limited project under 310 CMR 10.53(3)(i).

Below in Section 5.1.1 is a summary of how the culvert replacement meets the general Stream Crossing Standards to the maximum extent practicable. These include culvert embedment, crossing span, substrate, and water depth and velocity.

(b) Notwithstanding the provisions of 310 CMR 10.54(4)(a), structures may be permitted in or on a Bank when required to prevent flood damage to facilities, buildings and roads constructed prior to the effective date of 310 CMR 10.51 through 10.60 or constructed pursuant to a Notice

of Intent filed prior to the effective date of 310 CMR 10.51 through 10.60 (April 1, 1983), including the renovation or reconstruction (but not substantial enlargement) of such facilities, buildings and roads, provided that the following requirements are met:

1. *The proposed protective structure, renovation or reconstruction is designed and constructed using best practical measures so as to minimize adverse effects on the characteristics and functions of the resource area;*

2. *The applicant demonstrates that there is no reasonable method of protecting, renovating or rebuilding the facility in question other than the one proposed.*

The purpose of the culvert replacement proposed by MassDOT is to mitigate an existing structural problem that has the potential to jeopardize the integrity of the railroad facility and infrastructure, resulting in potential safety concerns related to the passage of people, material, and goods.

(c) Notwithstanding the provisions of 310 CMR 10.54(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species, as identified by procedures established under 310 CMR 10.59.

Not applicable.

5.1.1 Compliance with Massachusetts Stream Crossing Standards

Spans that preserve the natural stream channel are strongly preferred.

A replacement span is infeasible in this location due to the site constraints described above under Section 3.0.

Crossing Span – Minimum 1.2 times bankfull width.

The bridge replacement and culvert installation at Bridge 74.17 is being proposed to meet the Stream Crossing Standards to the maximum extent practicable, but it is not proposed to expand the crossing width to meet the 1.2 time bankfull width requirement. A crossing of 10.3 feet wide in order to meet the 1.2 times bankfull width standard is not feasible in this location without significant additional work to raise the track bed to provide the depth for installation as well as significant instream work up and downstream of the bridge to remove the existing stone wall. Therefore, relief from this performance standard is being requested under the limited projects provisions.

There are no proposed alterations to the crossing span at Bridge 77.28.

Substrate – natural bottom substrate within the structure.

The box culvert will be embedded two feet with natural bottom substrate. Natural bottom substrate will be stockpiled from the existing stream bed and replaced within the culvert bottom. A natural low stream channel will be constructed within the culvert.

There are no proposed alterations to existing bottom substrate at Bridge 77.28.

Water Depth and Velocity – Designed with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows.

Water depths and velocities within the new culvert will be comparable to those in the existing crossing.

There are no proposed alterations at Bridge 77.28.

Openness > 0.82 feet (0.25 meters)

The proposed culvert has an openness value of 2.6 feet (including the 2-foot embedment), which is significantly greater than 0.82 feet.

There are no proposed alterations at Bridge 77.28.

Banks should be present on each side of the stream matching the horizontal profile of the existing stream and banks.

No modification to the banks up and downstream of the proposed bridge replacement is proposed as part of this project. The existing stone walls will remain.

There are no proposed alterations at Bridge 77.28.

5.2 Riverfront Area (Bridge 74.17 only)

In accordance with 310 CMR 10.58(5), activities conducted within previously developed and degraded RFA will contribute to the protection of the interests identified in the Wetlands Protection Act by complying with the following general performance standards:

> *(a) At a minimum, proposed work shall result in an improvement over existing conditions of the capacity of the riverfront area to protect the interests identified in M.G.L. c. 131 § 40. When a lot is previously developed but no portion of the riverfront area is degraded, the requirements of 310 CMR 10.58(4) shall be met.*

The bridge replacement, culvert installation, and railroad embankment stabilization work will be performed to increase the operational safety of the railroad.

(b) Stormwater management is provided according to standards established by the Department.

Apart from certain sedimentation and erosion control measures that will be implemented as necessary during the project (i.e. Standard 8), the balance of stormwater standards are not applicable to the project as there is no increase in impervious surface.

(c) Within 200-foot riverfront areas, proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less, or not closer than existing conditions within 25-foot riverfront areas, except in accordance with 310 CMR 10.58(5)(f) or (g).

Proposed work will not be closer than current conditions.

(d) Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river, except in accordance with 310 CMR 10.58(5)(f) or (g).

The proposed bridge replacement and embankment stabilization will result in 3,900 sf of temporary additional impacts to existing conditions outside of the rail bed. These temporary impacts are within existing disturbed right of way and are for the staging of the culvert and streambed materials.

(e) The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area, except in accordance with 310 CMR 10.58(5)(f) or (g).

There are not any proposed permanent impacts to RFA.

(f) When an applicant proposes restoration on-site of degraded riverfront area, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), and (e) at a ratio in square feet of at least 1:1 of restored area to area of alteration not conforming to the criteria. Areas immediately along the river shall be selected for restoration. Alteration not conforming to the criteria shall begin at the riverfront area boundary. Restoration shall include:

1. *removal of all debris, but retaining any trees or other mature vegetation;*
2. *grading to a topography which reduces runoff and increases infiltration;*
3. *coverage by topsoil at a depth consistent with natural conditions at the site; and*
4. *seeding and planting with an erosion control seed mixture, followed by plantings of herbaceous and woody species appropriate to the site;*

This standard is not applicable. The project conforms to 310 CMR 10.58(5)(c), (d), and (e), as noted above.

> *(g) When an applicant proposes mitigation either on-site or in the riverfront area within the same general area of the river basin, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), or (e) at a ratio in square feet of at least 2:1 of mitigation area to area of alteration not conforming to the criteria or an equivalent level of environmental protection where square footage is not a relevant measure. Alteration not conforming to the criteria shall begin at the riverfront area boundary. Mitigation may include off-site restoration of riverfront areas, conservation restrictions under M.G.L. c. 184, §§ 31 through 33 to preserve undisturbed riverfront areas that could be otherwise altered under 310 CMR 10.00, the purchase of development rights within the riverfront area, the restoration of bordering vegetated wetland, projects to remedy an existing adverse impact on the interests identified in M.G.L. c. 131, § 40 for which the applicant is not legally responsible, or similar activities undertaken voluntarily by the applicant which will support a determination by the issuing authority of no significant adverse impact. Preference shall be given to potential mitigation projects, if any, identified in a River Basin Plan approved by the Secretary of the Executive Office of Energy and Environmental Affairs.*

This standard is not applicable. The project conforms to 310 CMR 10.58(5)(c), (d), and (e), as noted above.

> *(h) The issuing authority shall include a continuing condition in the Certificate of Compliance for projects under 310 CMR 10.58(5)(f) or (g) prohibiting further alteration within the restoration or mitigation area, except as may be required to maintain the area in its restored or mitigated condition. Prior to requesting the issuance of the Certificate of Compliance, the applicant shall demonstrate the restoration or mitigation has been successfully completed for at least two growing seasons.*

This standard is not applicable. The project conforms to 310 CMR 10.58(5)(c), (d), and (e), as noted above.

5.3 Land Under Water Bodies and Waterways

Approximately 406 s.f. (40 cy) will be permanently altered by the project. The work will be conducted in accordance with the general performance standards for LUW, outlined in 310 CMR 10.56(4), and as described in further detail below.

(a) Any proposed work within Land under Water Bodies and Waterways shall not impair the following:

1. *The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;*

See Inland Bank discussion above.

Ground and surface water quality;

The railroad embankment stabilization and culvert replacement work should improve water quality within LUW because the transport of sediment from the eroding embankment has been mitigated through the placement of stone.

2. *The capacity of said land to provide breeding habitat, escape cover and food for fisheries; and*

The proposed work should not adversely affect the capacity of LUW to provide breeding habitat, escape cover or food for fisheries. The culvert will maintain a natural bottom stream substrate.

3. *The capacity of said land to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1, 1987, that (cumulatively) alters up to 10% or 5,000 s.f. (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by the procedures established under 310 CMR 10.70.*

Approximately 204 s.f. of LUW total will be permanently altered by the project at Bridge 74.17. The remainder of impacts are temporary due to the installation of the coffer dam and dewatering of the work areas. Regardless, the amount of impacted LUW is below the 5,000 s.f. threshold referenced in the standard and thus the work will not impair the capacity of LUW to provide important wildlife habitat functions.

4. *Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.56(4)(a)…*

This bridge replacement project is being proposed to meet the Stream Crossing Standards to the maximum extent practicable, but it is not proposed to expand the crossing width to meet the 1.2 time bankfull width requirement. Therefore, relief from this performance standard is being requested under the limited projects provisions.

(b) Notwithstanding the provisions of 310 CMR 10.56(4)(a), the issuing authority may issue an Order in accordance with M.G.L. c. 131, § 40 to maintain or improve boat channels within Land under Water Bodies and Waterways when said work is designed and carried out using the best practical measures so as to minimize adverse effects such as the suspension or transport of pollutants, increases in turbidity, the smothering of bottom organisms, the accumulation of pollutants by organisms or the destruction of fisheries habitat or nutrient source areas.

Not applicable.

(c) Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

The proposed Project is not located in Estimated Habitat for Rare Wildlife or Priority Habitat of Rare Species.

6.0 Mitigation Measures

The Project incorporates various mitigation strategies that will ensure that wetland resource areas are adequately protected during construction. These measures include erosion and sedimentation controls and spill prevention as described below.

6.1 Sedimentation and Erosion Controls

At Bridge 74.17, temporary erosion and sedimentation controls will be installed around the entire proposed limits of disturbance. Compost filter socks are proposed for this location, and serve the dual function of containing disturbed sediments and also providing visual definition of the Project work limits for the construction crew.

6.2 Spill Prevention and Response Plan

During construction, a spill containment kit will be kept on site at all times. Equipment will be serviced or maintained offsite and kept in a condition that prevents leakage or discharge of pollutants. In the event that there is an accidental release of petroleum product within 100 feet of wetlands, the Lee Conservation Commission will be notified along with appropriate emergency response agencies.

6.3 Water Diversion Pipe

During construction, it will be necessary to divert the stream flow around the work areas. This will be accomplished by the use of the proposed sandbag coffer dam, and a flow diversion pipe system which will divert the stream around the work-area downstream of the bridge as shown on the plans.

6.4 Dewatering Measures

Dewatering will be required for the culvert replacement. A temporary sandbag cofferdam will be used as described above under construction sequencing. The sandbag system (or sheet piles, as necessary) will be installed at the locations shown on the Permit Plans in Attachment D. Groundwater will likely be pumped directly into temporary settling basins, sized accordingly, and located in upland areas, which will act as sediment traps during construction. Alternatively, groundwater will be pumped into a filter bag or a small frac tank. Groundwater discharge points

will be setback from the BVW, and stream edge and will be monitored for turbidity by qualified personnel. All discharges shall be free from visible floating, suspended and settleable solids that would impair the functions of BVW, Bank and LUW.

6.5 Soil and Construction Material Stockpile Locations

Soil and construction material stockpile locations will be located as far from the stream bank and wetlands as feasible along the Project corridor in designated areas as shown on the plans. These areas will be demarcated with compost filter tube near the stream banks at Willow Brook and orange construction fencing in upland areas. There will be no storage of soil, gravel, or construction debris within BVW. Storage area is minimal and the contractor will be advised to utilize an offsite staging area.

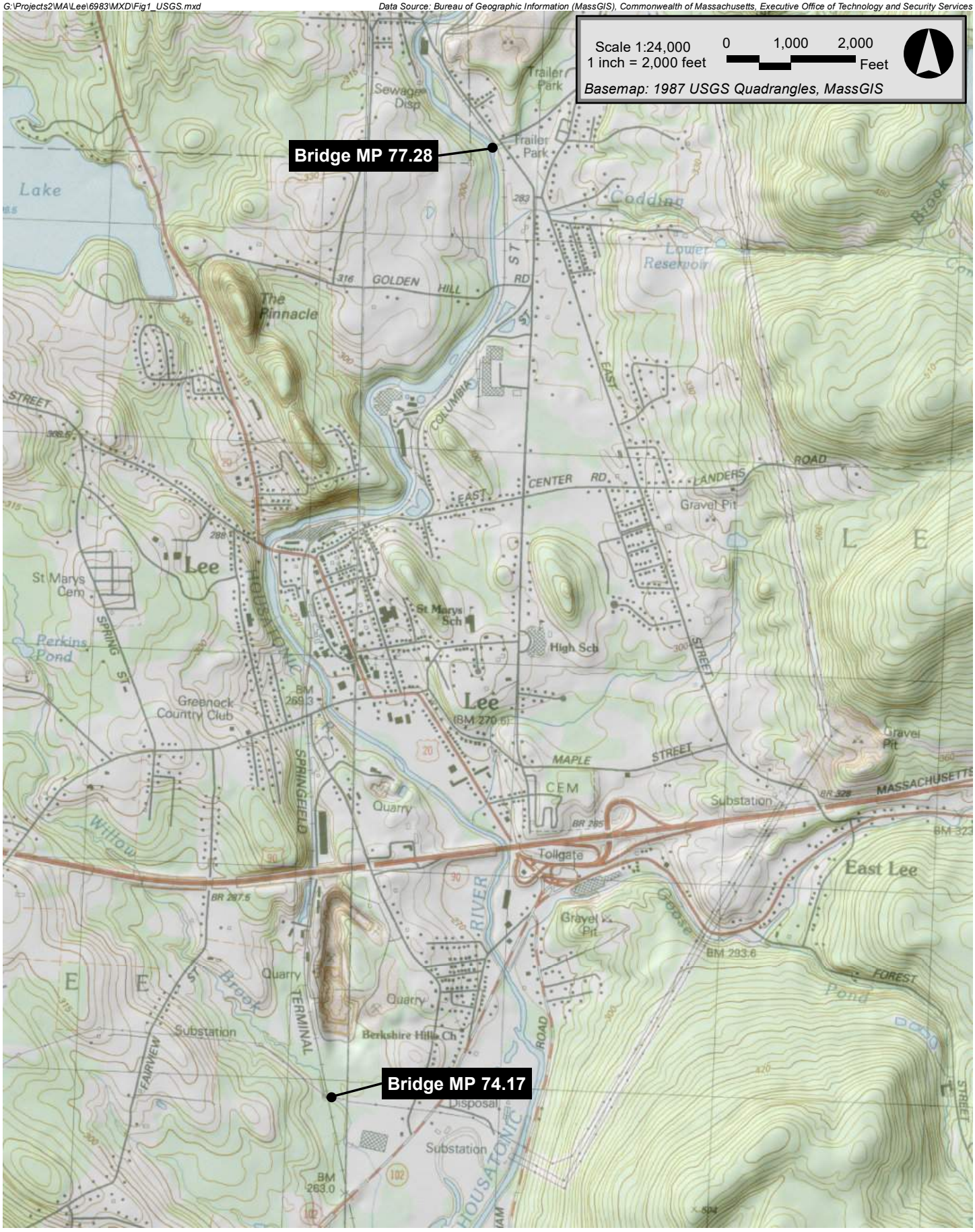
7.0 Conclusions

The information contained in this NOI and the accompanying plans describes the site, proposed work, and the effect of said work on the interests identified in the Act. The proposed work will contribute to the protection of the interests of the Act by complying with the general performance standards established in the Regulations. The Applicant therefore respectfully requests that the Commission issue an Order of Conditions approving the Project with appropriate conditions to protect the interests identified in M.G.L. c. 131 §40.

Attachment B

Figures

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

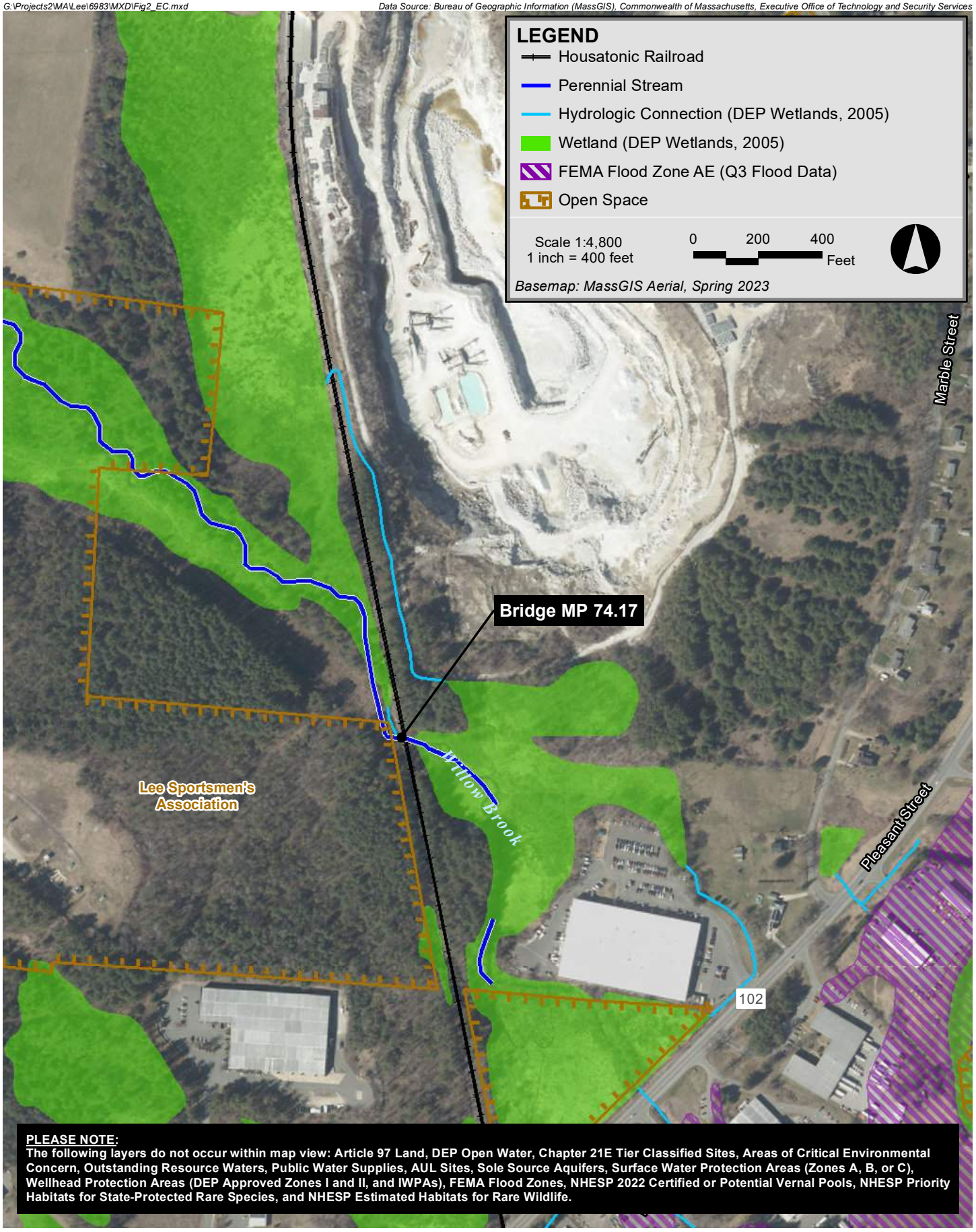


Bridges 74.17 and 77.28 Lee, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1
USGS Locus Map

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



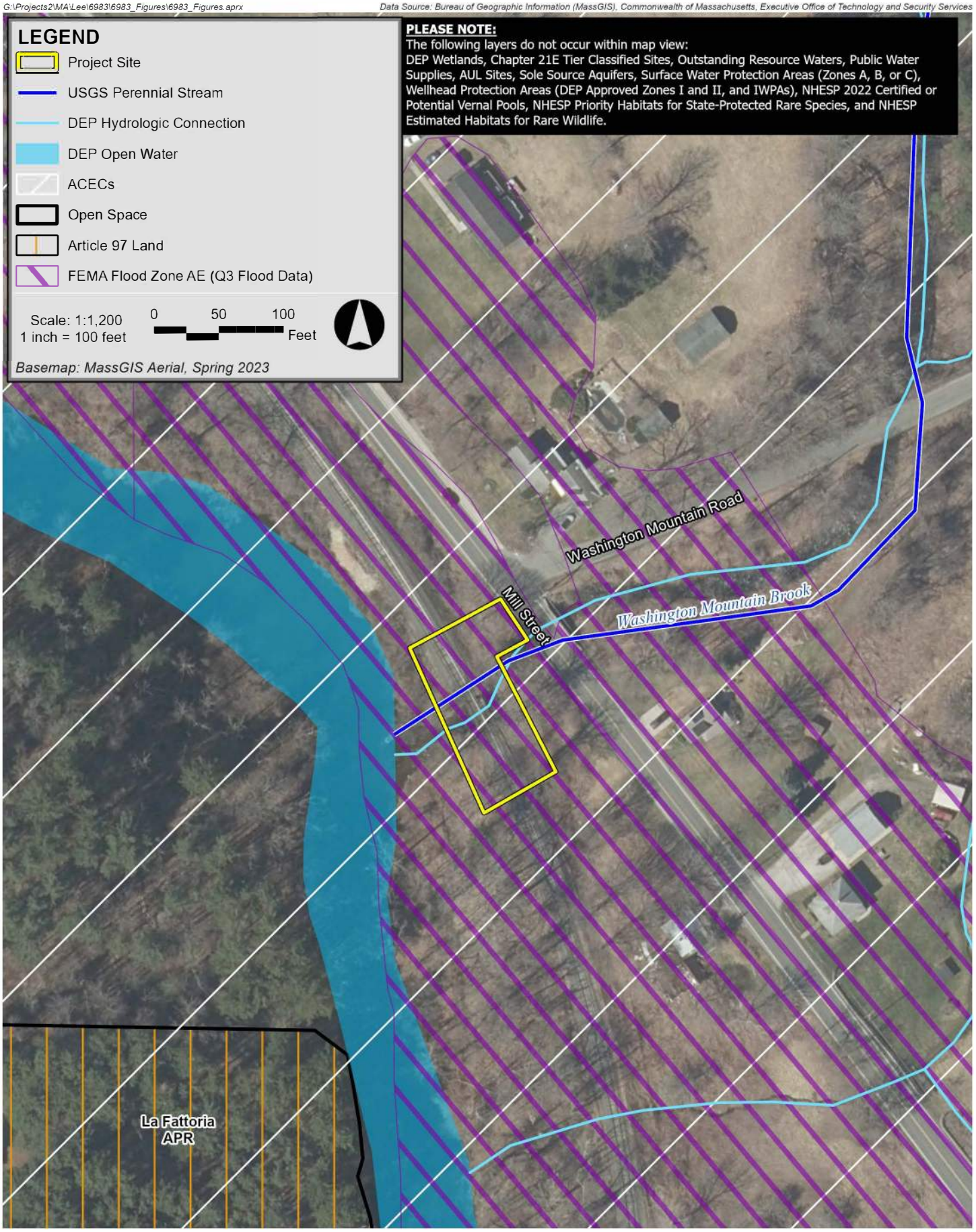
Bridges 74.17 and 77.28 Lee, Massachusetts

Epsilon Associates Inc.

Figure 2

Bridge 74.17: Environmental Constraints Map

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

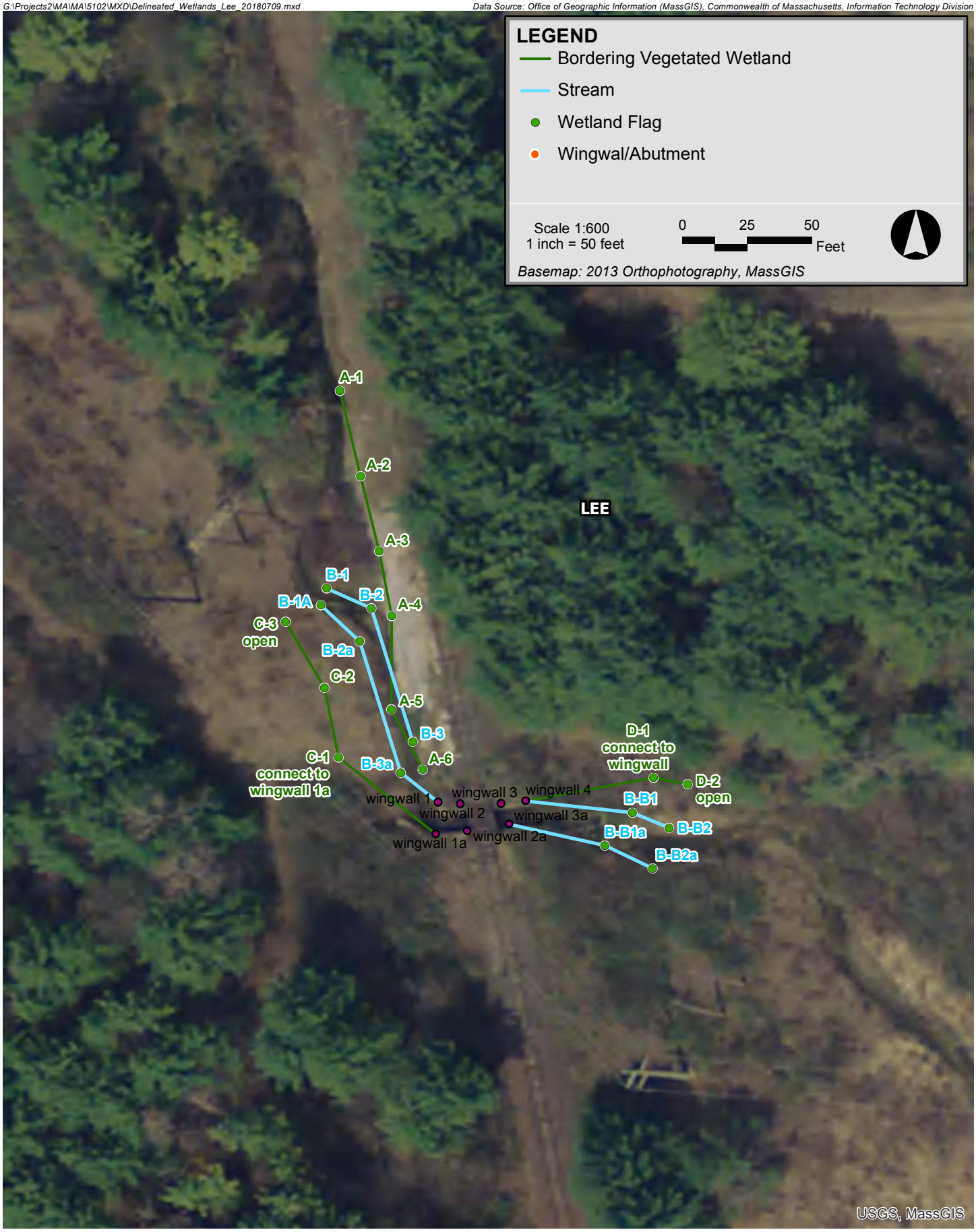


Bridges 74.17 and 77.28 Lee, Massachusetts

Epsilon Associates Inc.

Figure 3

Bridge 77.28: Environmental Constraints Map



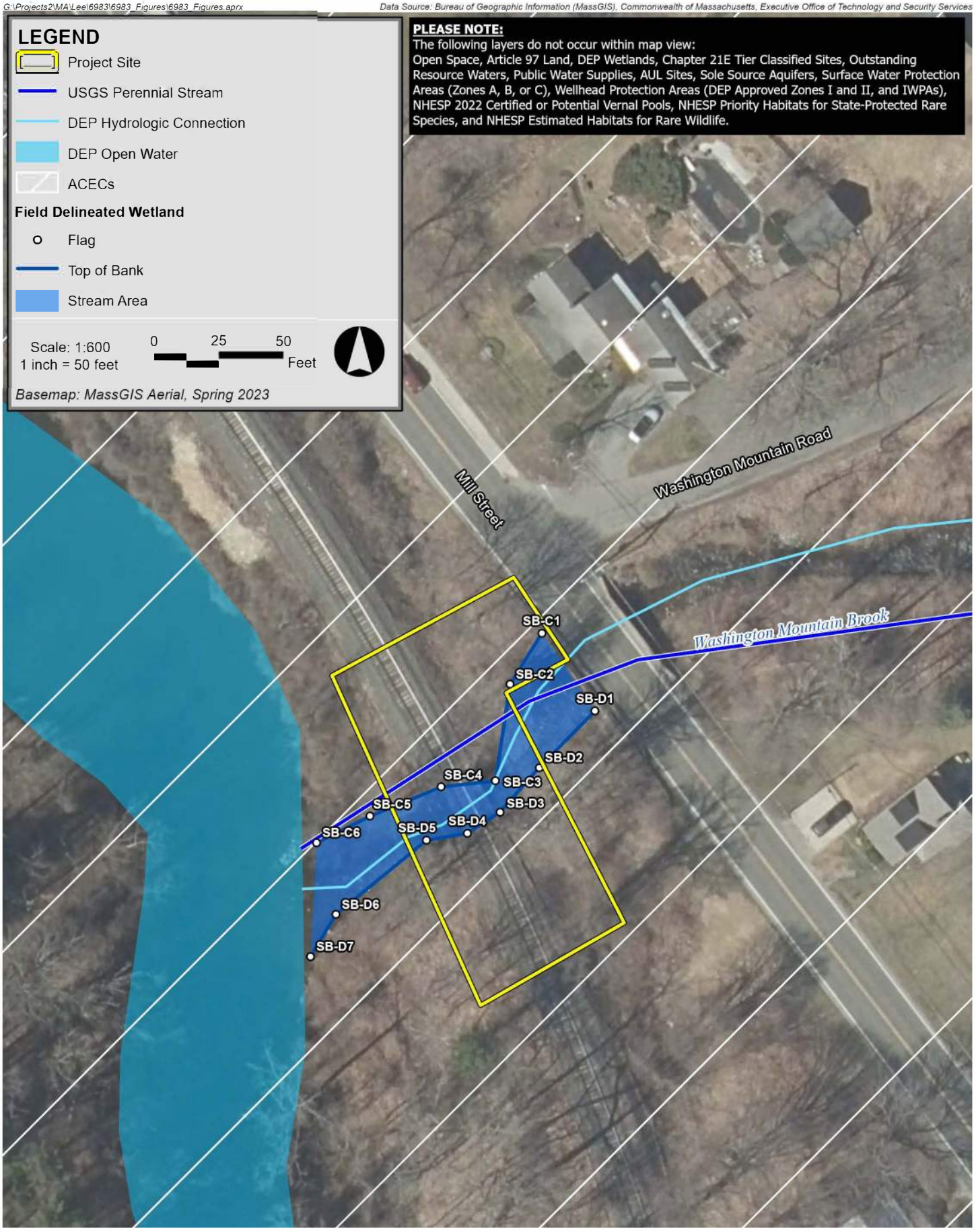
Bridges 74.17 and 77.28, Lee, MA

Epsilon Associates Inc.

Figure 4A

Bridge 74.17 Delineated Wetlands

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Bridges 74.17 and 77.28 Lee, Massachusetts

Epsilon Associates Inc.

Figure 4B

Wetland Delineation at Bridge 77.28

Attachment C

Site Photographs

Photo 1: View of bridge MP 74.17 over Willow Brook, looking west.

Photo 2: View of Willow Brook stream channel by flag B-B2, looking east. Wetland Series D extends to the left of the picture, north of the stream channel.

Photo 3: View of Willow Brook, looking north towards flag B-2a. Wetland Series C is to the left of the stream in this photograph, and Series A extends to the right of the stream along the toe of slope of the rail lines.

Photo 4: View of Wetland Series C associated with Willow Brook, looking southeast from Flag C-1 towards Bridge 74.23 and flag A-6.

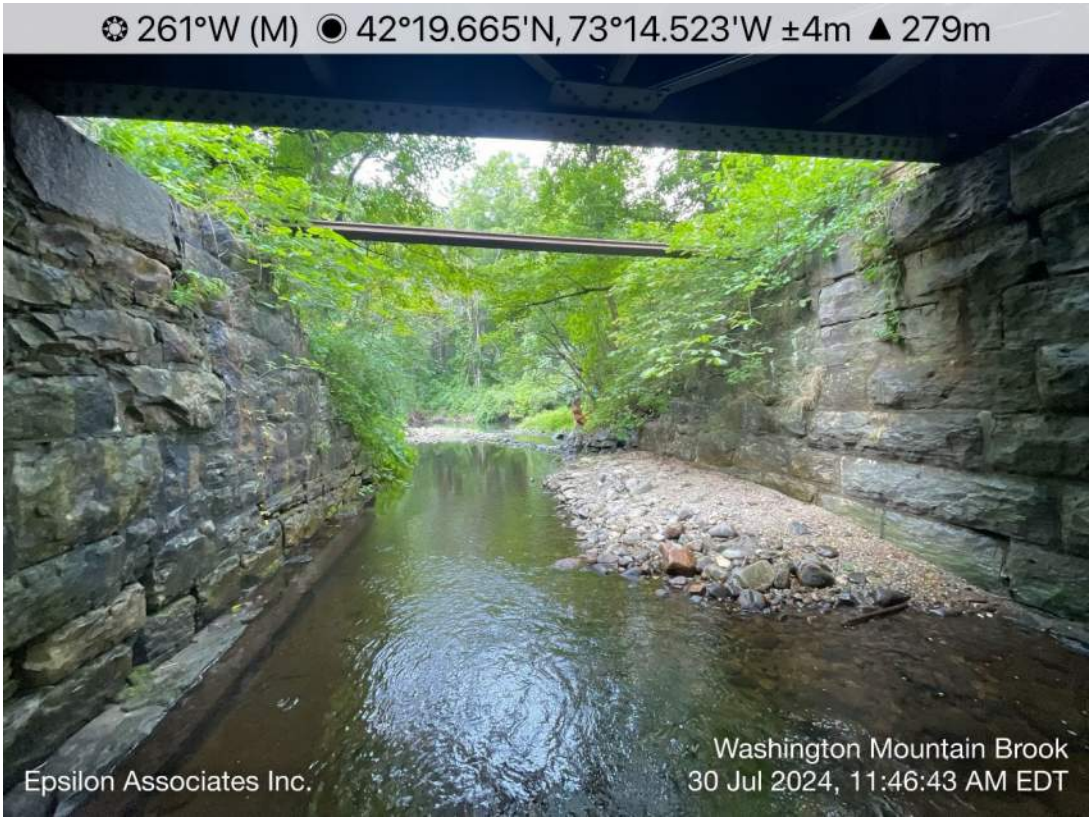


Photo 5: View of Mouth Washington Brook underneath Bridge 77.28 looking west.

Photo 6: View of looking west underneath Bridge 77.21 at the southeast wall proposed for repairs..

Photo 7: View of concrete apron at north abutment..

Photo 8: Concrete wall near Mill Street bridge

Attachment D

Permit Drawings

(Prepared by HDR)

FABRICATION

CONCRETE

1. PRODUCTION PROCEDURES AND DIMENSIONAL TOLERANCES FOR THE MANUFACTURE OF PRECAST. PRESTRESSED GIRDERS SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL FOR RAILWAY ENGINEERING AND THE PRESTRESSED CONCRETE INSTITUTES CURRENT MANUALL MNL –116 FOR QUALITY CONTROL.
2. TOLERANCE FOR LOCATION OF LIFTING LOOPS SHALL BE ± 1/2".
3. THE ENDS OF THE STRANDS SHALL BE CUT OFF FLUSH WITH THE END OF THE BEAM AND PAINTED. RECESSES AND MINOR SPALLS MUST BE FILLED AND FINISHED TO THE PLAN DIMENSIONS USING AN EPOXY BONDING COMPOUND AND GROUT.
4. CONCRETE CURB SHALL BE CAST AFTER THE GIRDER IS REMOVED FROM THE FORM.
5. CONCRETE BONDING AGENT: REFER TO SPECIFICATIONS.
6. SURFACES SHALL BE FORMED IN A MANNER WHICH WILL PRODUCE A SMOOTH AND UNIFORM APPEARANCE WITHOUT RUBBING OR PLASTERING. UNLESS OTHERWISE NOTED, EXPOSED EDGES OF 90–DEGREES OR LESS ARE TO BE CHAFFERED 3/4" X 3/4". UNFORMED SURFACES SHALL HAVE A SMOOTH FINISH FREE OF ALL FLOAT AND TROWEL MARKS.
7. THE FABRICATOR SHALL STENCIL THE FABRICATOR'S NAME, DATE OF FABRICATION PLACE MARK AND LIFTING WEIGHT ON EACH PIECE.
8. FABRICATOR IS RESPONSIBLE FOR ADEQUACY OF LIFTING DEVICES.
9. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
10. ALL BAR–BENDING AND STANDARD HOOK DIMENSIONS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE" AS PUBLISHED BY THE CONCRETE REINFORCING STEEL INSTITUTE UNLESS OTHERWISE SHOWN OR NOTED.

CONSTRUCTION

GENERAL

1. THE CONTRACTORS'S ATTENTION IS CALLED TO THE FACT THAT CONTINUOUS COORDINATION WITH THE OPERATOR, HOUSATONIC RAILROAD COMPANY (HRRC), WILL BE REQUIRED THROUGHOUT CONSTRUCTION. HRRC WILL PROVIDE THE CONTRACTOR WITH FLAGGERS FOR PROTECTION FROM RAILROAD TRAFFIC WHILE WORK IS BEING PERFORMED ON THE RAILROAD RIGHT–OF–WAY (R.O.W.). THE CONTRACTOR SHALL NOT ENTER THE R.O.W. AT ANYTIME WITHOUT HRRC AUTHORIZATION. THE CONTRACTOR WILL ALSO BE REQUIRED TO OBTAIN R.O.W. TRAINING PRIOR TO WORKING IN THE R.O.W.
2. ALL WORK SHALL BE PERFORMED DURING A SERIES OF SHUTDOWNS OF RAILROAD TRAFFIC. THE CONTRACTOR SHALL COORDINATE ALL SHUTDOWNS WITH HRRC. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION REGARDING SPECIFIC DATES, LENGTH OF SHUTDOWNS, AND LIQUIDATED DAMAGE PENALTIES FOR EXCEEDING AUTHORIZED TIME LIMITS.
3. ALL CONSTRUCTION AND ACCESS SHALL BE WITHIN THE R.O.W. UNLESS OTHERWISE APPROVED BY THE PROPERTY OWNER(S) AND MASSDOT. THE CONTRACTOR SHALL COORDINATE DIRECTLY WITH THE PROPERTY OWNER(S) TO OBTAIN WRITTEN APPROVAL OF LAND USE OUTSIDE THE R.O.W. THE CONTRACTOR SHALL SUBMIT COPIES OF WRITTEN PROPERTY AGREEMENTS TO THE RESIDENT ENGINEER.
4. ANY DAMAGE TO REMAINING EXISTING COMPONENTS THAT IS CAUSED BY THE CONTRACTOR'S ACTIVITY SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AS DIRECTED AND APPROVED BY THE ENGINEER, AT NO ADDITIONAL EXPENSE TO THE BRIDGE OWNER OR RAILROAD OPERATOR.
5. THE CONTRACTOR SHALL PROVIDE SAFE ACCESS TO ALL AREAS OF WORK ON THE BRIDGE FOR THE ENGINEER'S INSPECTIONS. COSTS SHALL BE INCLUDED IN MOBILIZATION.
6. ALL EXISTING MATERIALS NOT REUSED OR RESET AS PART OF THIS PROJECT SHALL BE CONSIDERED WASTE MATERIAL. ALL WASTE MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF. ALL TREATED TIMBER SHALL BE DISPOSED OF ONLY AT AN APPROVED FACILITY.
7. COORDINATE RAIL TRAFFIC SHUTDOWNS AND THE USE OF TEMPORARY STAGING AREA DURING THE SHUTDOWN WITH THE RAILROAD.

ENVIRONMENTAL:

1. THE CONTRACTOR SHALL PREVENT ANY CONSTRUCTION DEBRIS FROM ENTERING THE WATERWAYS, PUBLIC OR PRIVATE PROPERTY, OR TRAVELED WAYS DURING CONSTRUCTION. ALL WASTE MATERIAL GENERATED AS PART OF THIS PROJECT SHALL BE DISPOSED OF OFF SITE.
2. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE STATUES AND REGULATIONS RELATING TO THE PREVENTION AND ABATEMENT OF ALL POLLUTION.
3. SEE SPECIFICATIONS FOR REQUIREMENTS FOR WORKING AT PROJECT SITE.

ABBREVIATIONS:

B.F.	BACK FACE
BOT.	BOTTOM
E.F.	EACH FACE
EL. OR ELEV.	ELEVATION
EQ. SP.	EQUALLY SPACED
F.F.	FRONT FACE
R/F	REINFORCEMENT
TYP.	TYPICAL
W.P.	WORKING POINT

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

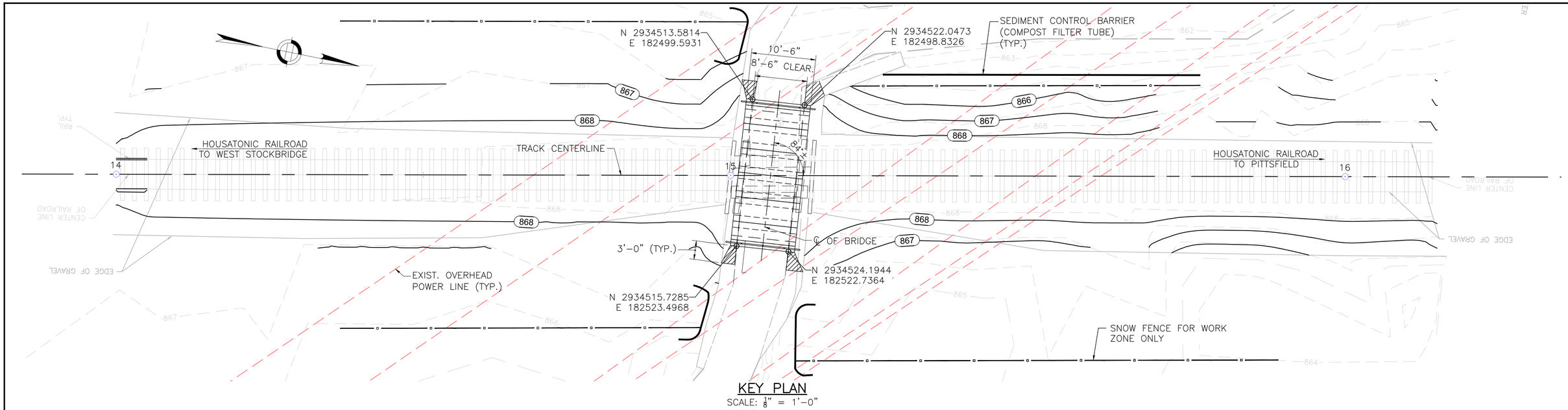
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK STRUCTURAL GENERAL NOTES

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

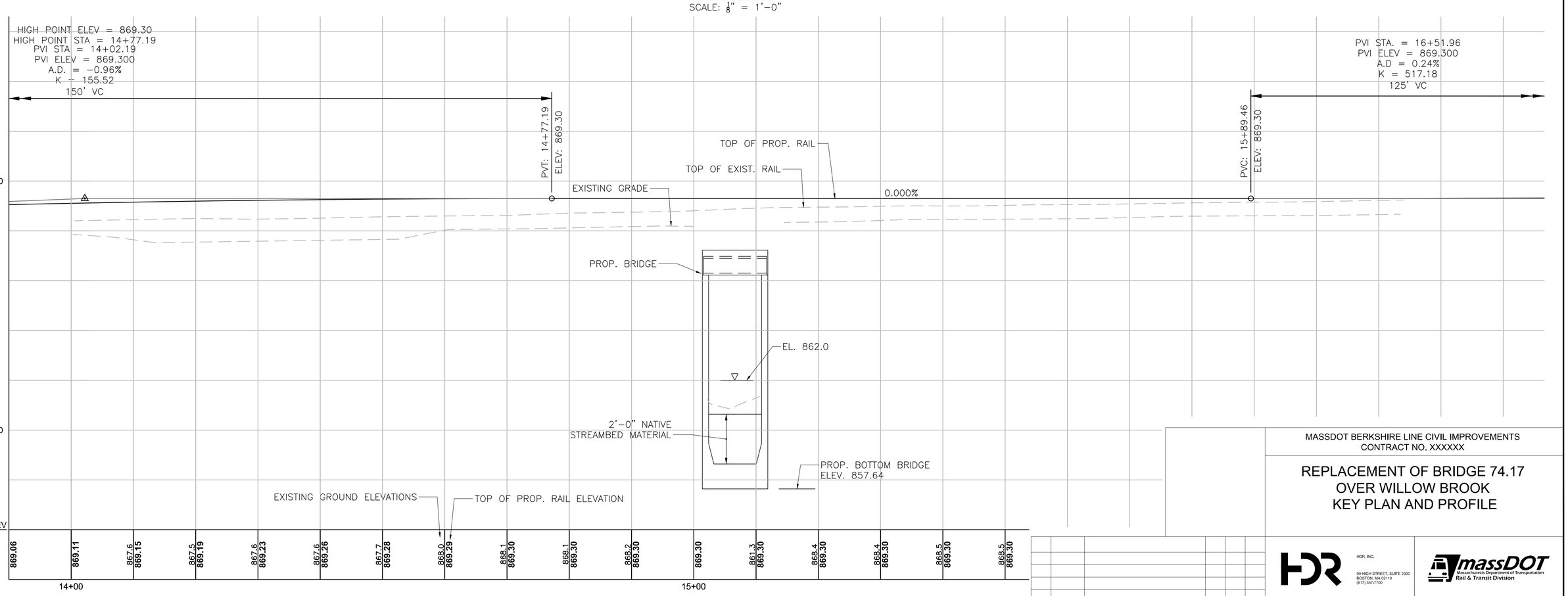
massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S–201	



KEY PLAN

SCALE: 1/8" = 1'-0"



PROFILE ALONG TRACK CENTERLINE

HORIZONTAL SCALE: 1" = 8'-0"
VERTICAL SCALE: 1" = 2-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

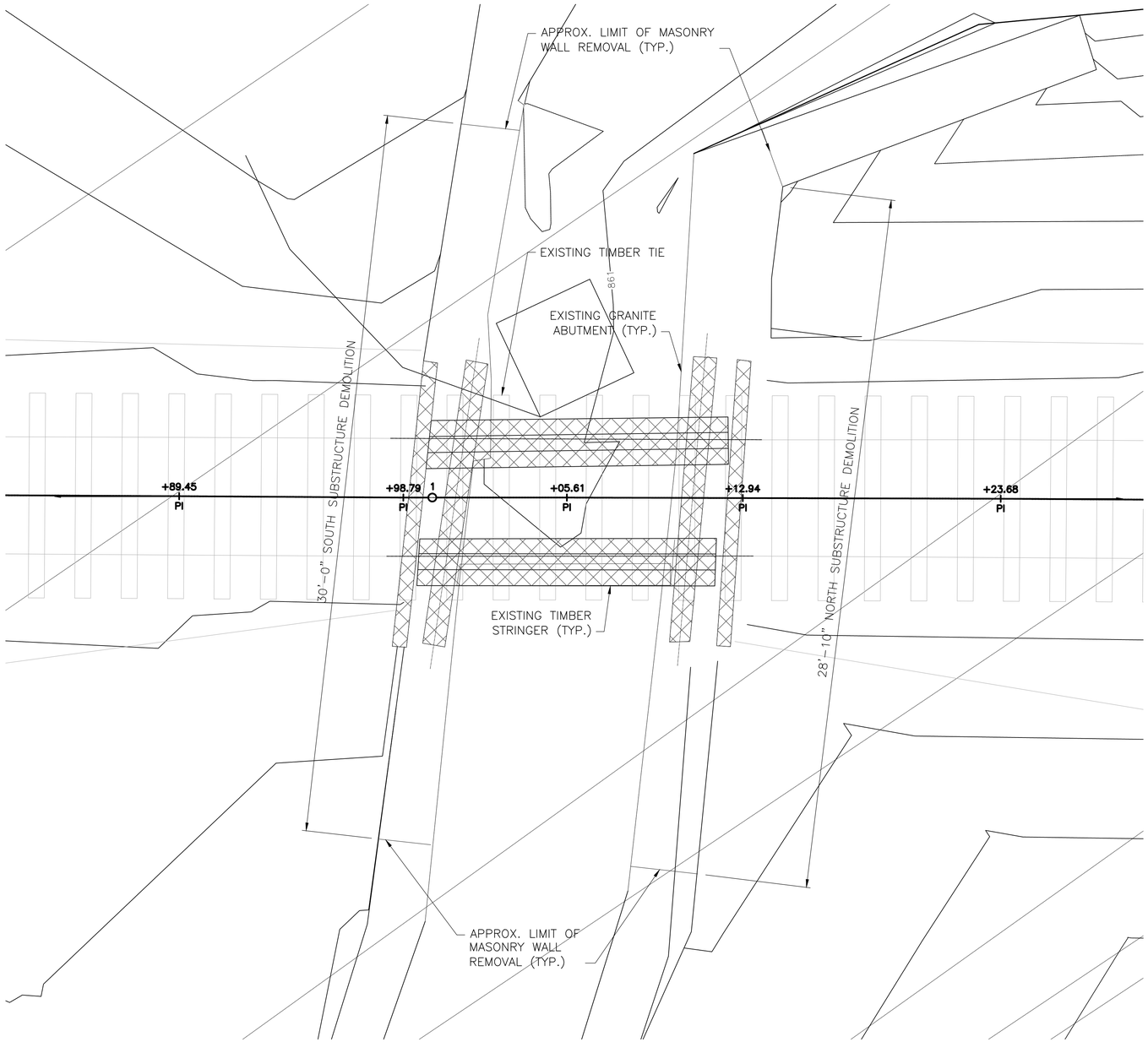
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK KEY PLAN AND PROFILE

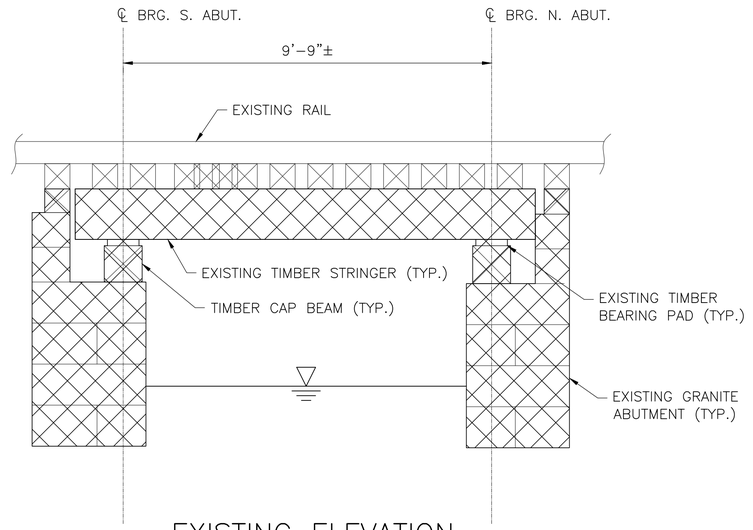
ISSUE	DATE	DESCRIPTION	BY	CH'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

MassDOT Massachusetts Department of Transportation Rail & Transit Division

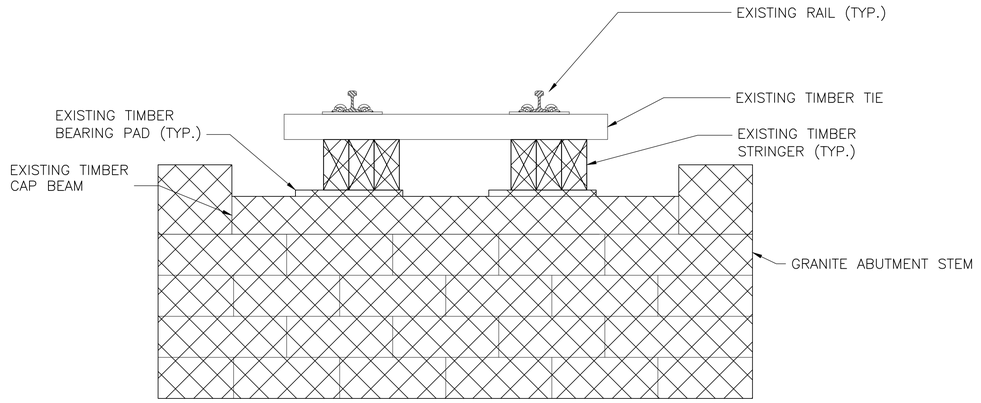
SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S-202	





EXISTING ELEVATION

SCALE: $\frac{1}{2}$" = 1'-0"



EXISTING – TYPICAL ABUTMENT ELEVATION

SCALE: $\frac{1}{2}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

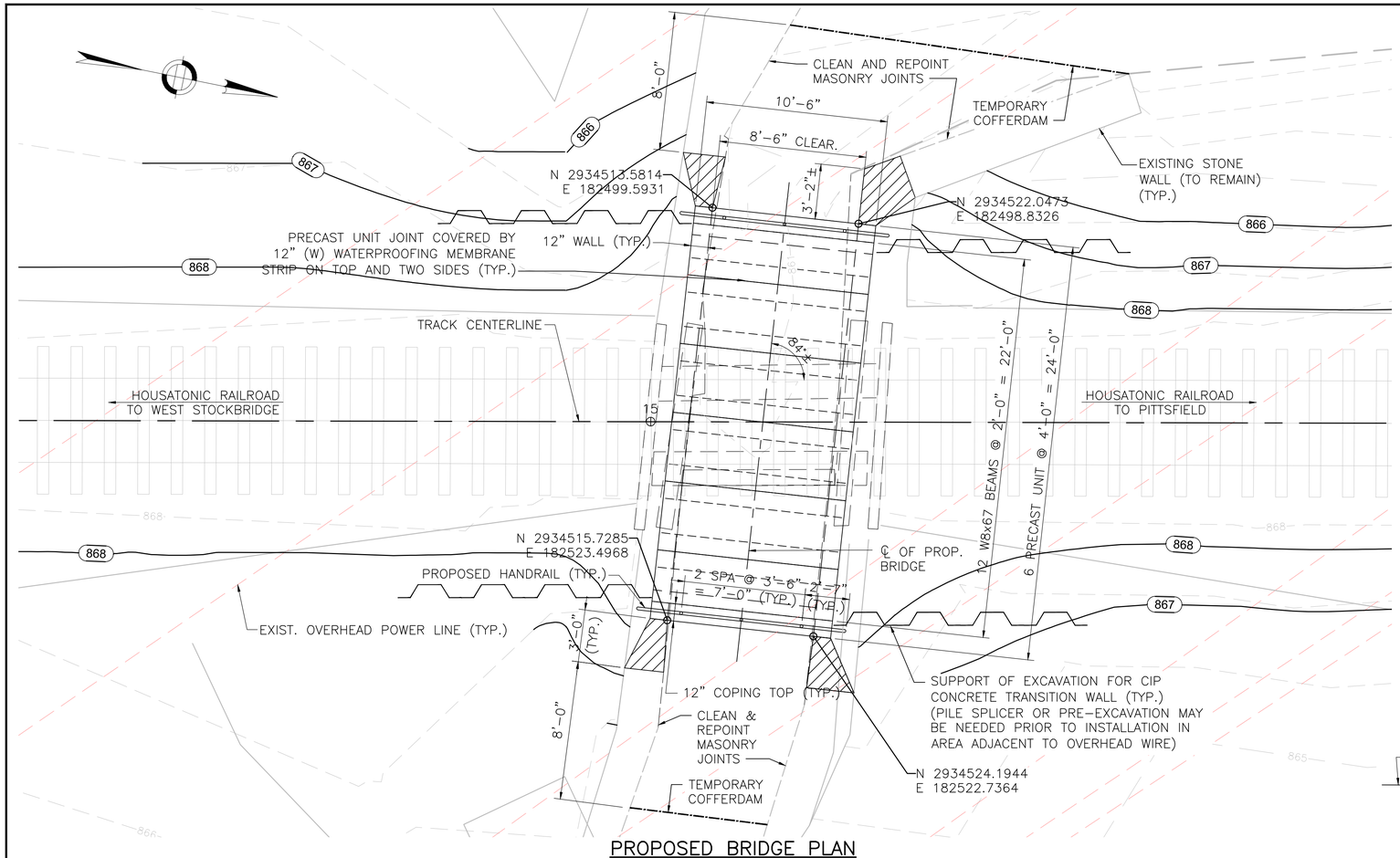
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK EXISTING PLAN AND DEMOLITION

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

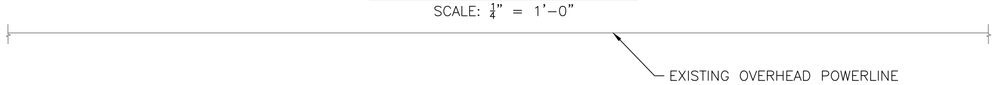
massDOT Massachusetts Department of Transportation Rail & Transit Division

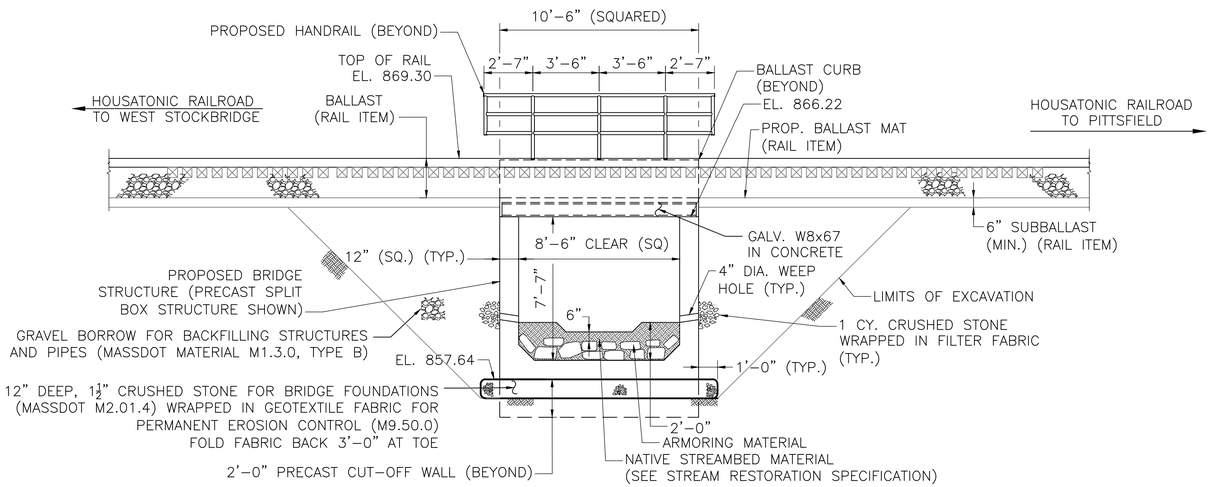
SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S-203	



PROPOSED BRIDGE PLAN

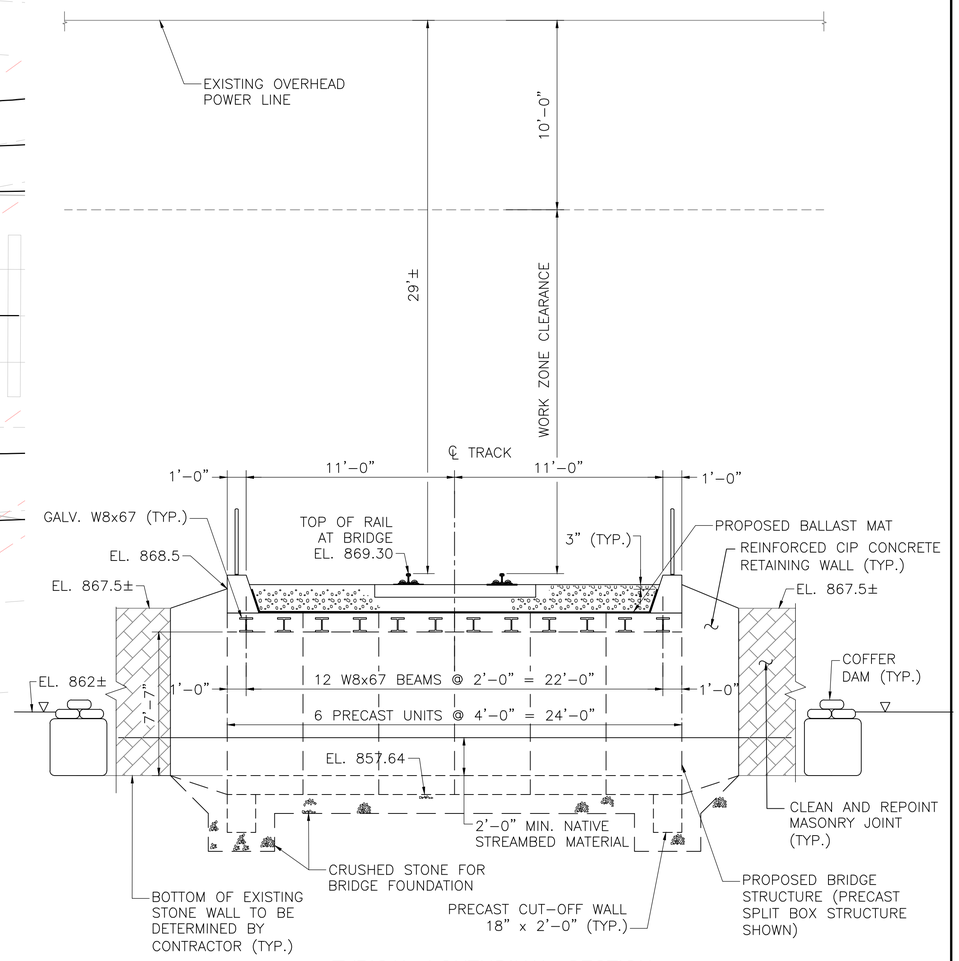
SCALE: $\frac{1}{4}$" = 1'-0"





PROPOSED BRIDGE SECTION

SCALE: $\frac{1}{4}$" = 1'-0"



TYPICAL LONTUDINAL SECTION

SCALE: $\frac{1}{4}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

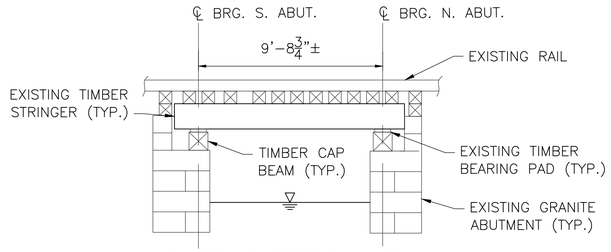
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK
PROPOSED BRIDGE PLAN AND SECTIONS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

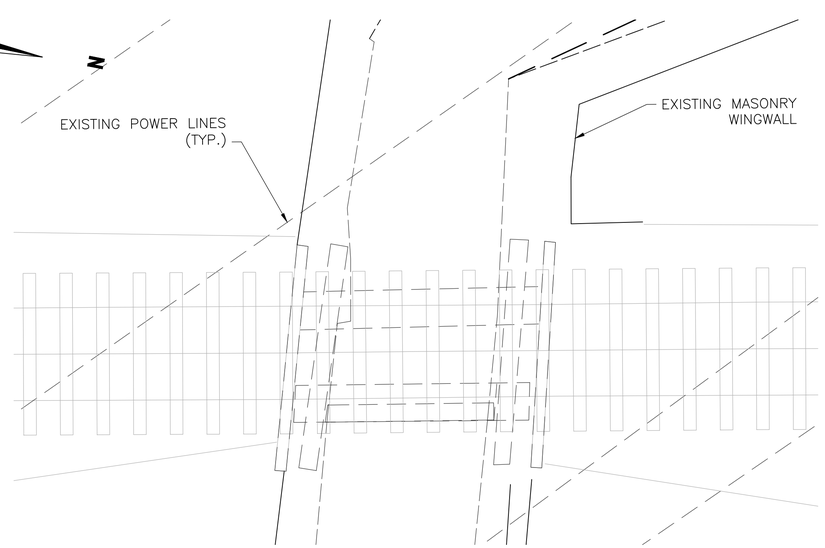
MassDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S-204	



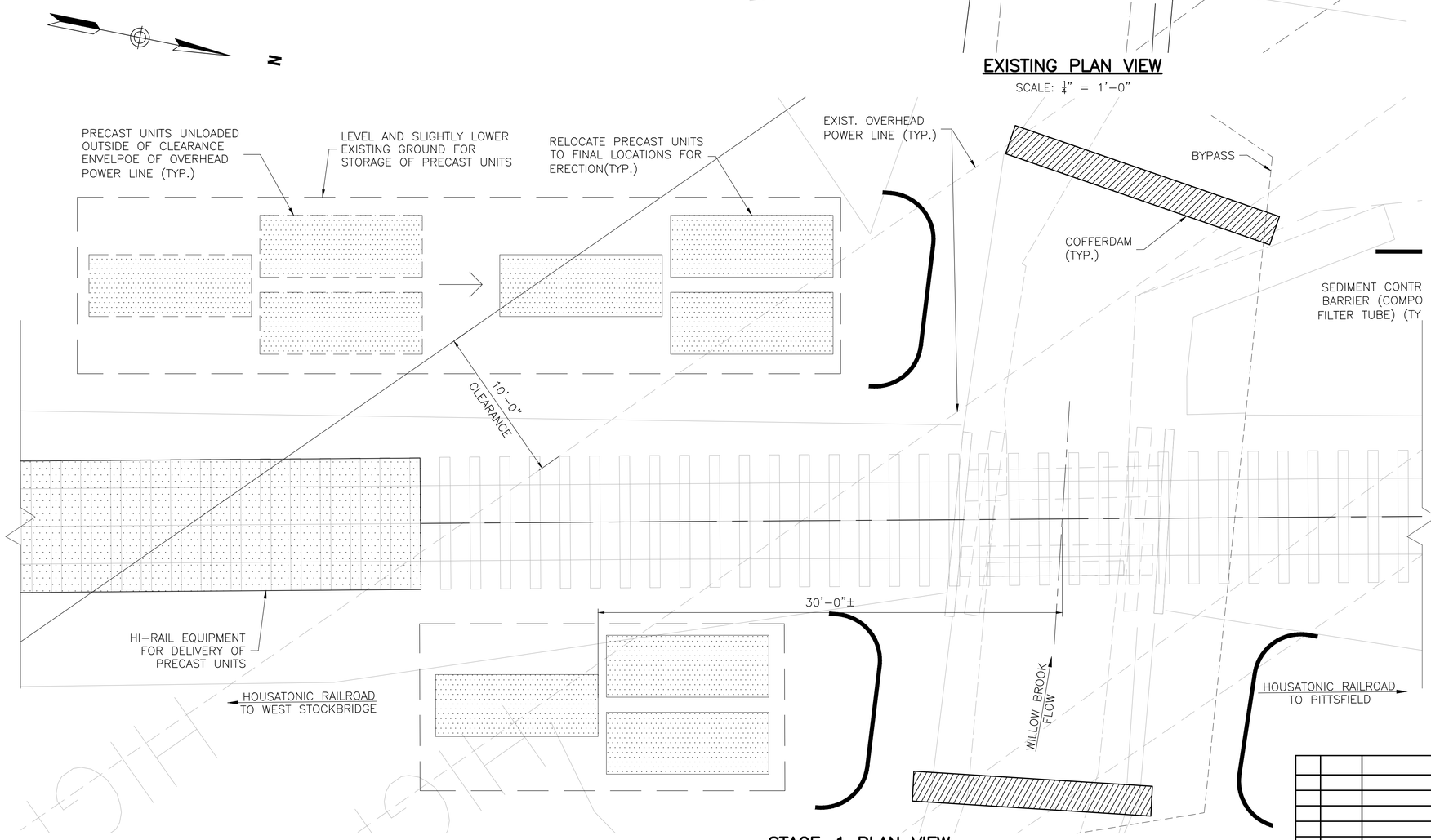
EXISTING SECTION VIEW

SCALE: ¼" = 1'–0"



EXISTING PLAN VIEW

SCALE: ¼" = 1'–0"



STAGE–1 PLAN VIEW

SCALE: ¼" = 1'–0"

SUGGESTED CONSTRUCTION SEQUENCING FOR BR. 74.17:

STAGE 1 – WORK WILL BE PERFORMED DURING NON–OPERATION HOURS

1. INSTALL COFFERDAM.
2. COORDINATE WITH EVERSOURCE FOR DEENERGIZE THE OVERHEAD POWERLINE DURING CONSTRUCTION.
3. DEENERGIZE THE OVERHEAD POWER LINE.
4. USE HI–RAIL EQUIPMENT TO DELIVER PRECAST U–SECTIONS AND CULVERT ROOFS TO THE SITE AND USE EXCAVATOR TO OFFLOAD THE SECTIONS OUTSIDE OF CLEARANCE ENVELOPE OF OVERHEAD POWER LINE FIRST, THEN RELOCATE PRECAST UNITS TO FINAL LOCATIONS FOR ERECTIONS.
5. REENERGIZE THE OVERHEAD POWER LINE.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

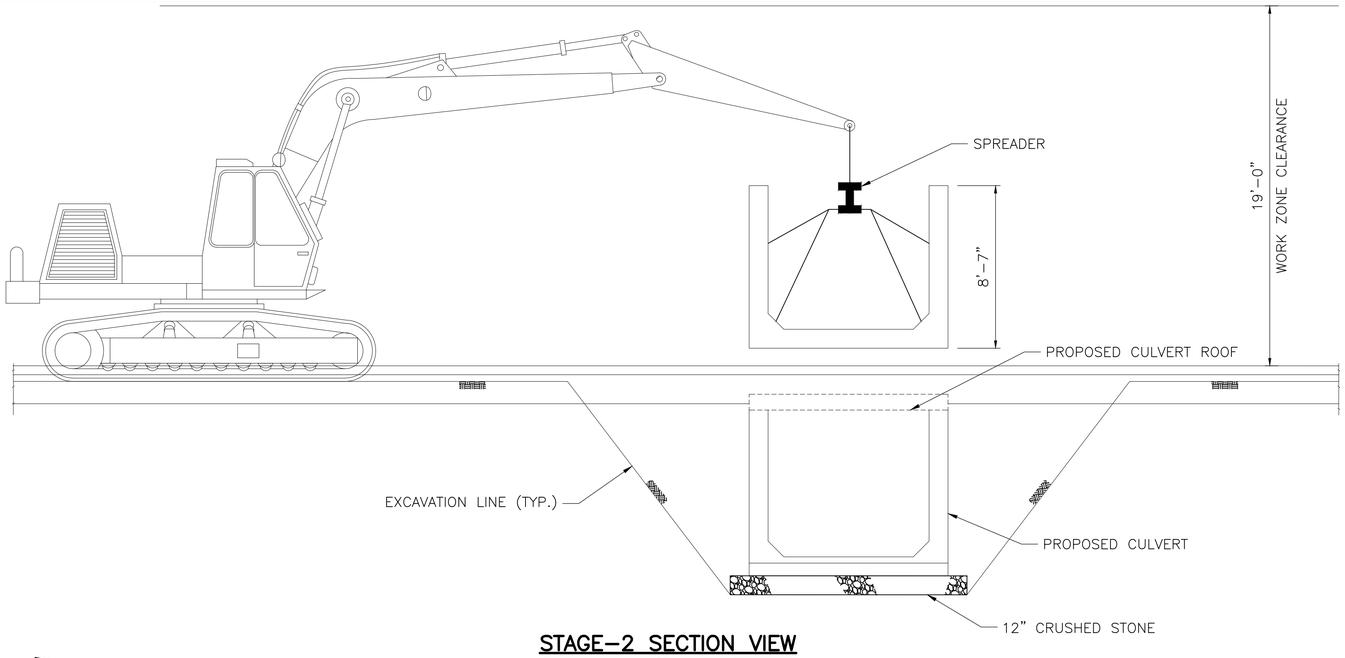
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK CONSTRUCTION STAGING 1 OF 2

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

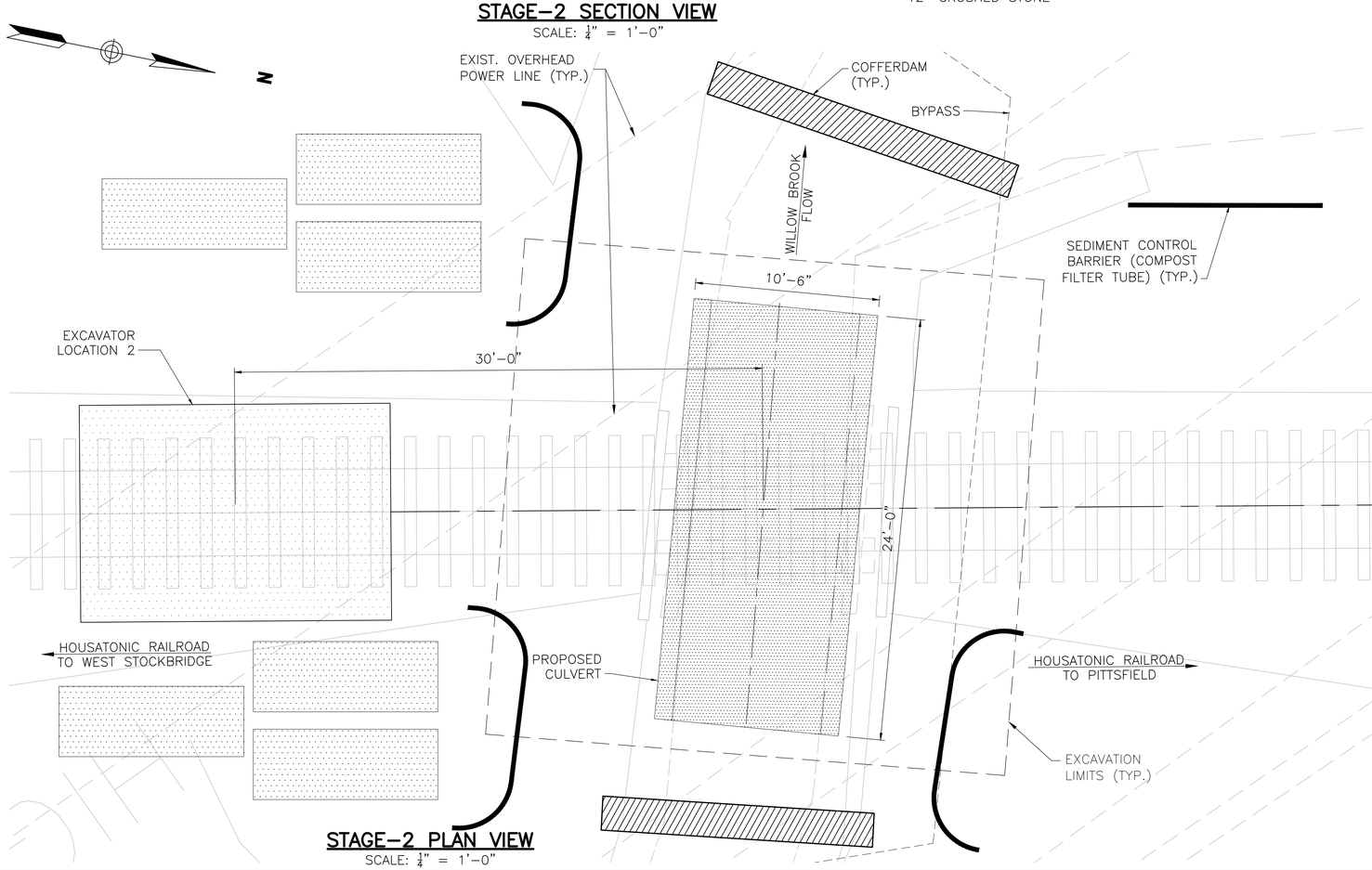
MassDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S–205	



STAGE-2 SECTION VIEW

SCALE: $\frac{1}{4}$" = 1'-0"



STAGE-2 PLAN VIEW

SCALE: $\frac{1}{4}$" = 1'-0"

STAGE 2 – WORK WILL BE PERFORMED DURING 1ST WEEKEND TRACK CLOSURE

1. DEENERGIZE THE OVERHEAD POWER LINE AND DEWATER.
2. TEMPORARILY REMOVE EXISTING TRACK IN THE CONSTRUCTION ZONE.
3. DEMOLISH EXISTING TIMBER BRIDGE SUPERSTRUCTURE AND EXISTING STONE MASONRY ABUTMENTS AND WINGWALLS AS SHOWN ON PLANS.
4. EXCAVATE AND PLACE 12" CRUSHED STONE AT BOTTOM OF EXCAVATION AS SHOWN ON SECTION.
5. USE EXCAVATOR TO ERECT PRECAST U-SECTIONS TO THE FINAL LOCATIONS.
6. USE EXCAVATOR TO ERECT CULVERT ROOF ONTO U-SECTIONS.
7. INSTALL MEMBRANE WATERPROOFING STRIPS AT THE JOINTS OF BOX SECTIONS.
8. BACKFILL AND INSTALL TEMPORARY TIMBER MAT ON TOP OF BOX SECTIONS FOR SUPPORTING TRACK.
9. INSTALL TRACK ON OPEN BRIDGE TO TRAIN SERVICE.

STAGE 3 – WORK WILL BE PERFORMED DURING 2ND WEEKEND TRACK CLOSURE

1. CONSTRUCT CAST-IN-PLACE CONCRETE RETAINING WALLS AT FOUR CORNERS AND BACKFILL

STAGE 4 – WORK WILL BE PERFORMED DURING 3RD WEEKEND TRACK CLOSURE

1. REMOVE TEMPORARY TIMBER MAT AND RAILS ON BRIDGE.
2. PERFORM TRACK WORK AT BRIDGE APPROACHES.
3. INSTALL APPROACHES
4. INSTALL BALLAST MAT, BALLAST, CROSSTIES, AND RAILS.
5. OPEN BRIDGE TO TRAIN SERVICE.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

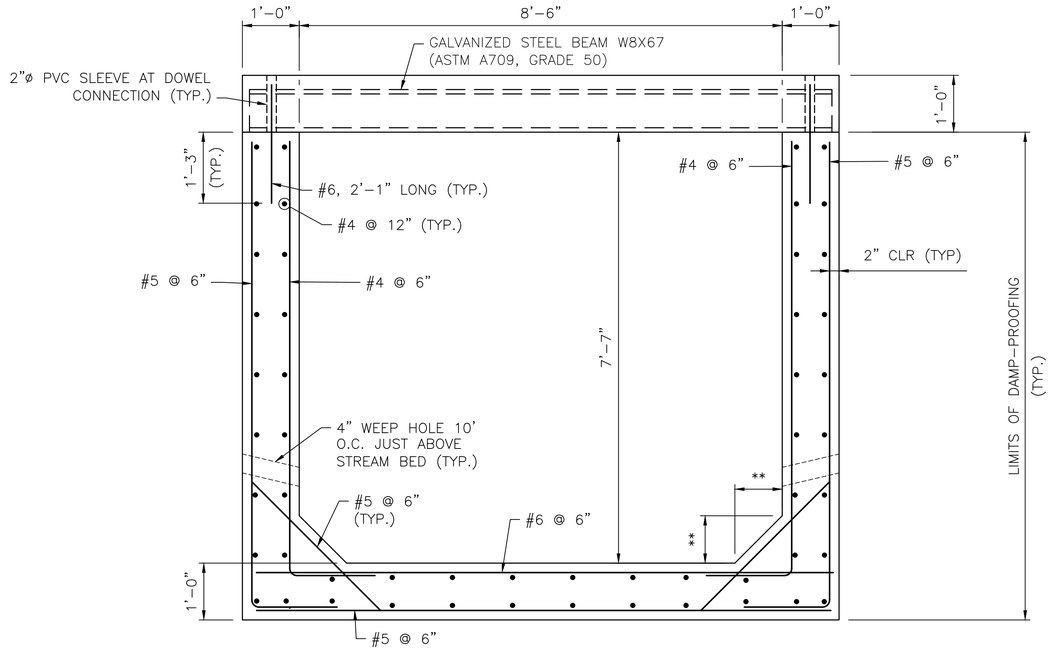
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK CONSTRUCTION STAGING SHEET 2 OF 2

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

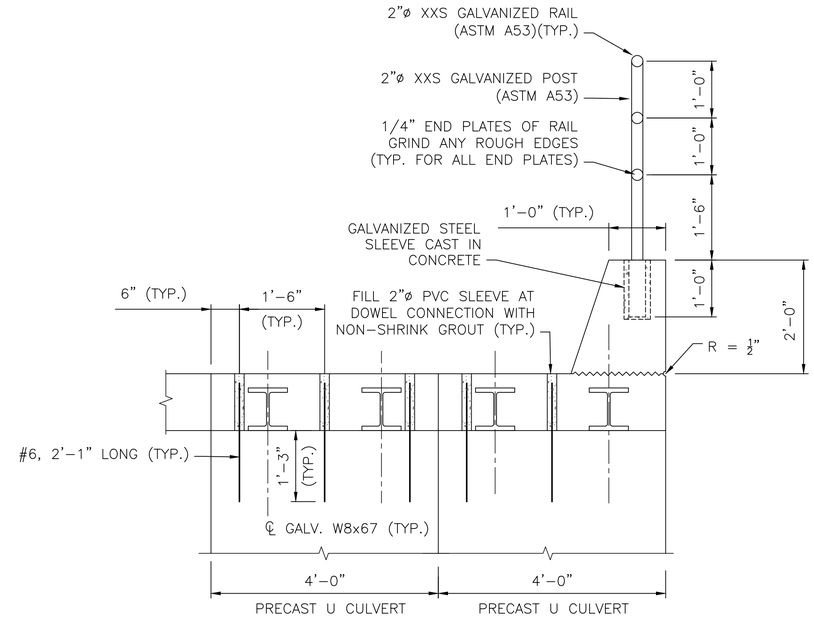
SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S-206	



** HAUNCH MAY VARY BY CONTRACTOR.

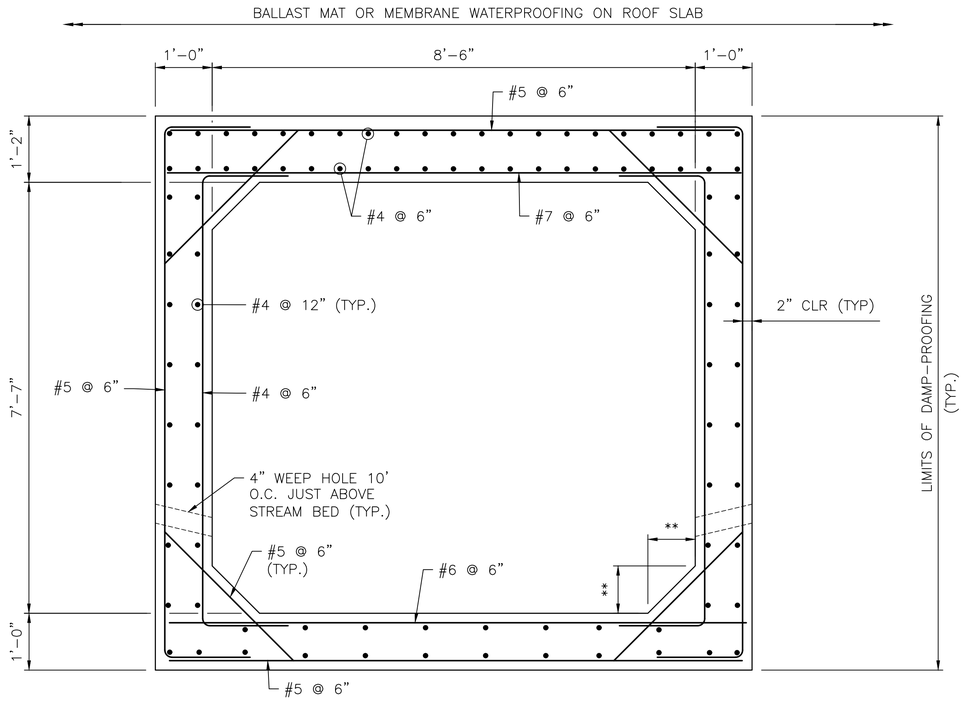
TYPICAL SECTION FOR PRECAST SPLIT BOX ALTERNATIVE

SCALE: $\frac{3}{4}$" = 1'-0"



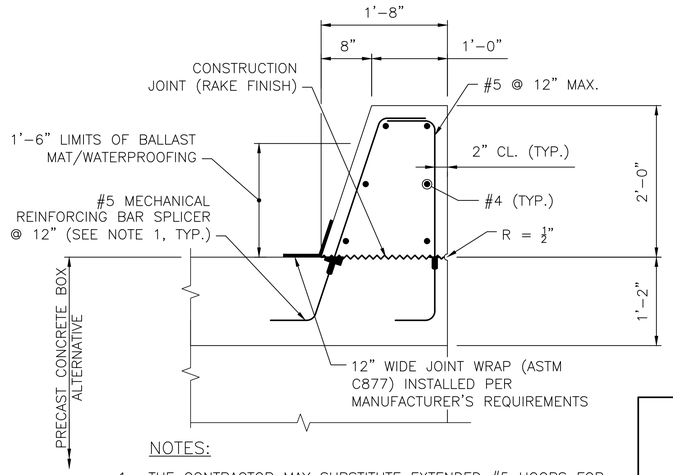
DETAILS

SCALE: $\frac{3}{4}$" = 1'-0"



TYPICAL SECTION FOR PRECAST CONCRETE BOX ALTERNATIVE

SCALE: $\frac{3}{4}$" = 1'-0"



NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE EXTENDED #5 HOOPS FOR THE MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS AS SHOWN.
2. CULVERT REINFORCEMENT AND HANDRAIL NOT SHOWN FOR CLARITY.

COPING DETAILS

SCALE: 1" = 1'-0"

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

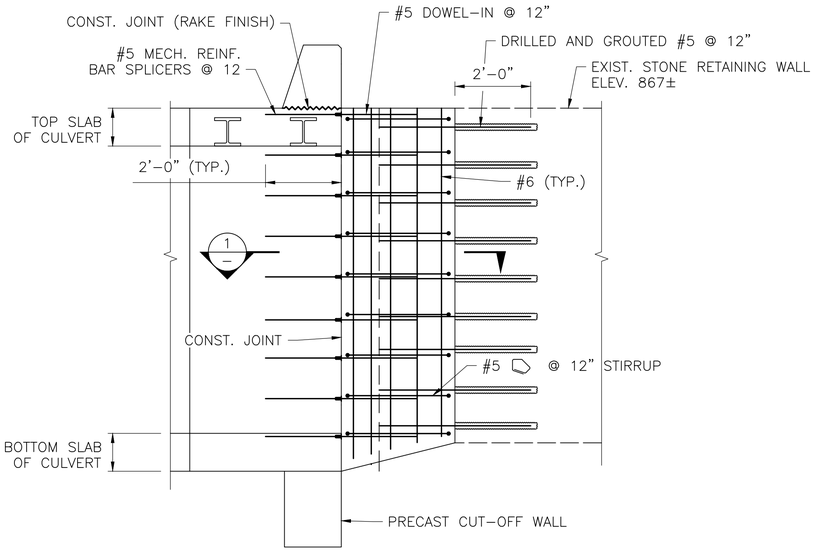
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK PRECAST CONCRETE BOX CULVERT DETAILS

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

MassDOT Massachusetts Department of Transportation Rail & Transit Division

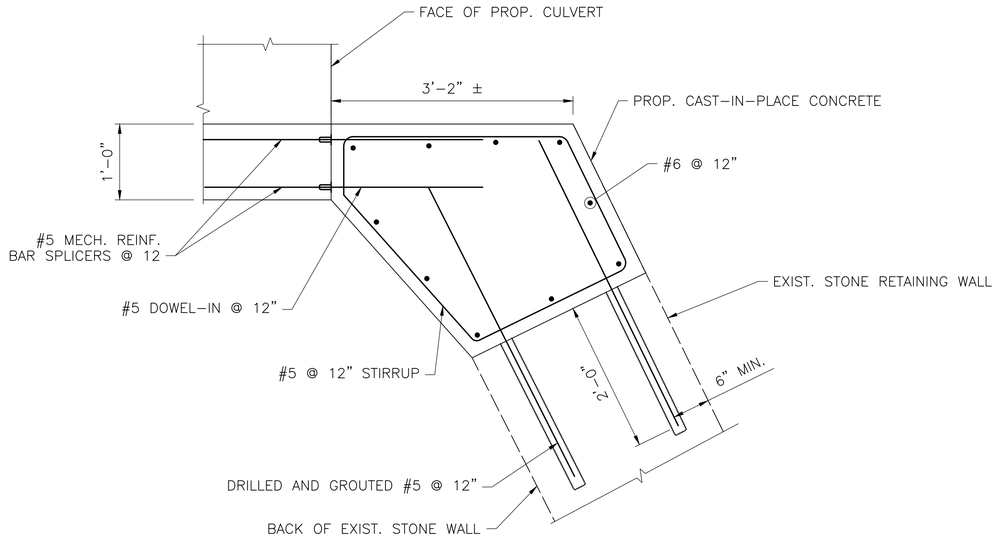
SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	SSL	SSL	JQW	SHEET: S-207	



NOTES:
NORTHWEST RETAINING WALL DETAIL SHOWN. OTHER WALLS SIMILAR
EXTERIOR PRECAST SPLIT BOX STRUCTURE SHOWN.
EXTERIOR PRECAST CLOSED BOX STRUCTURE SIMILAR.

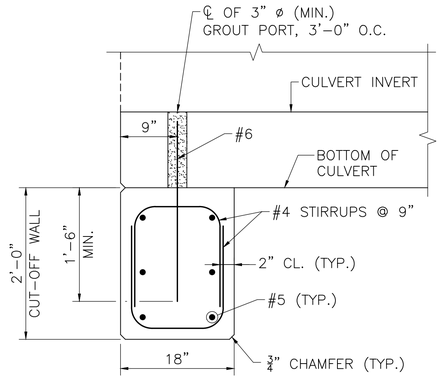
SECTION AT WINGWALL

SCALE: $\frac{1}{2}$" = 1'–0"



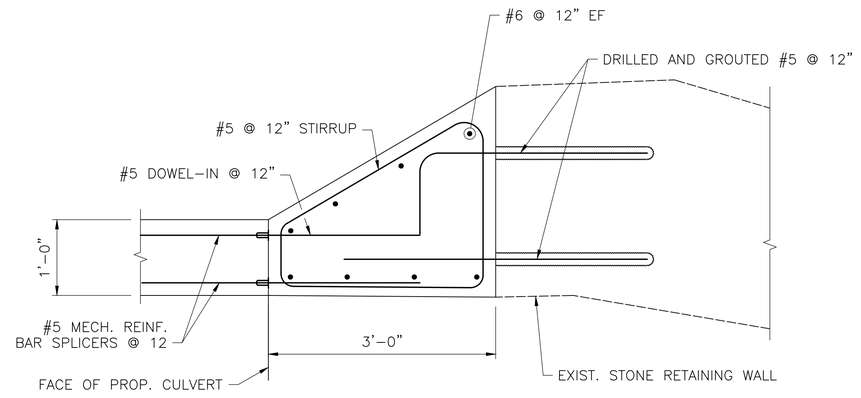
SECTION 1 (NW WALL TRANSITION)

SCALE: 1" = 1'–0"



CUT–OFF WALL CONNECTION DETAIL

SCALE: 1" = 1'–0"



SECTION 1

SCALE: 1" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

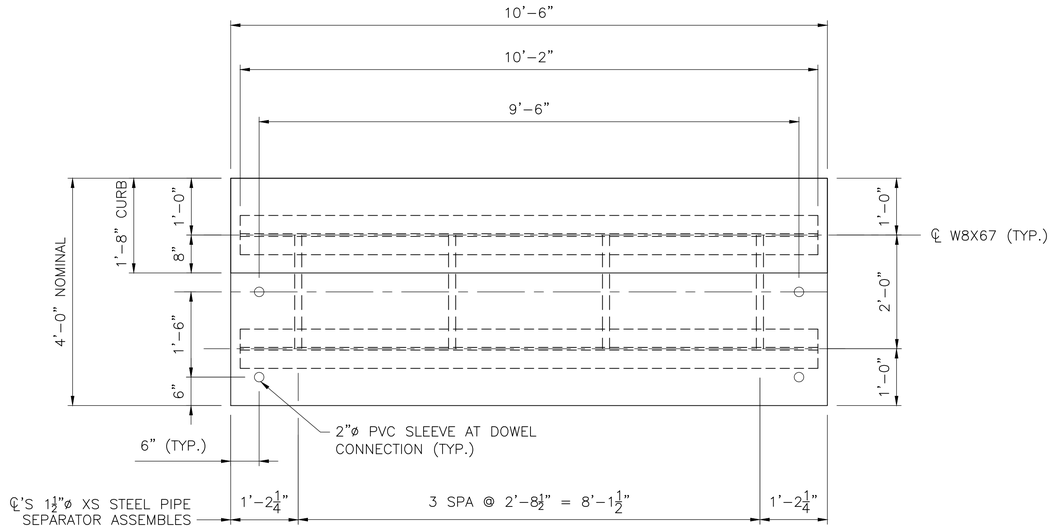
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK WINGWALL DETAILS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 307-7700

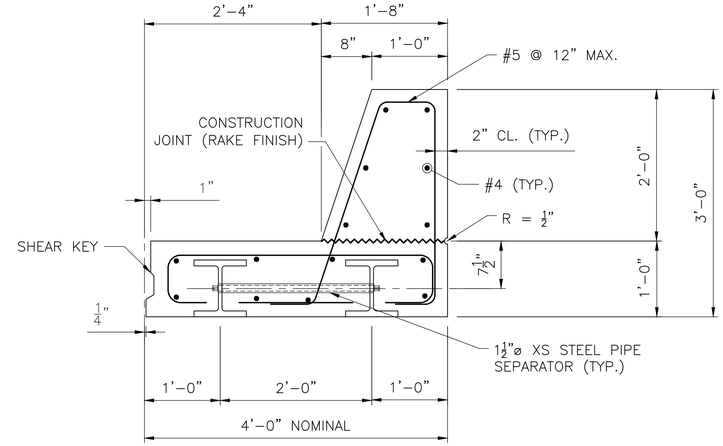
massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S–208	



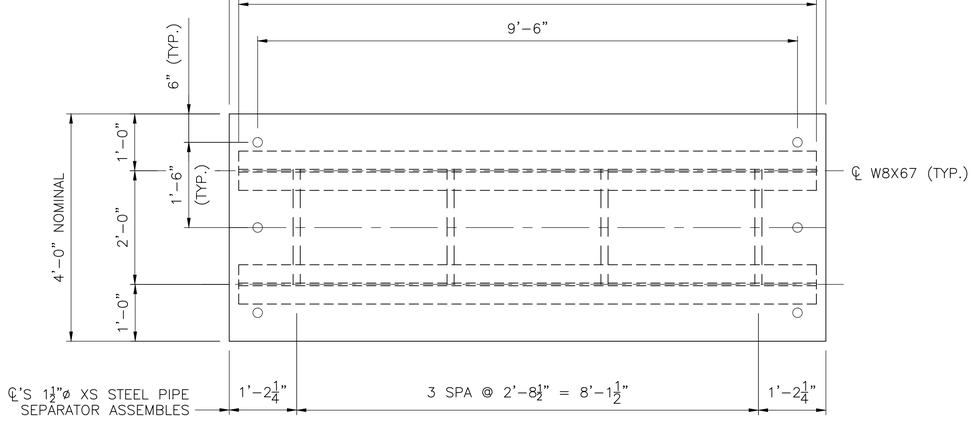
PLAN – EXTERIOR PRECAST PANEL

SCALE: ¾" = 1'–0"



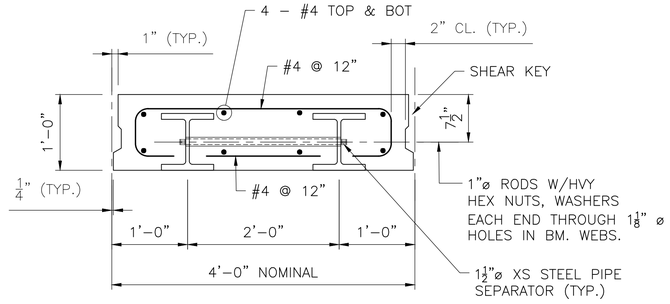
EXTERIOR PRECAST PANEL

SCALE: 1" = 1'–0"



PLAN – INTERIOR PRECAST PANEL

SCALE: ¾" = 1'–0"



INTERIOR PRECAST PANEL

SCALE: 1" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

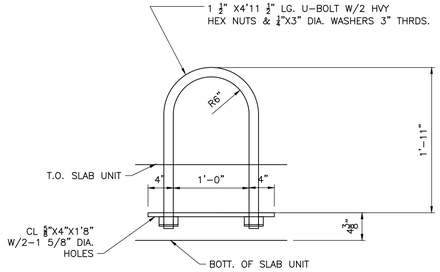
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK PROPOSED PRECAST PANEL 1

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S–209	

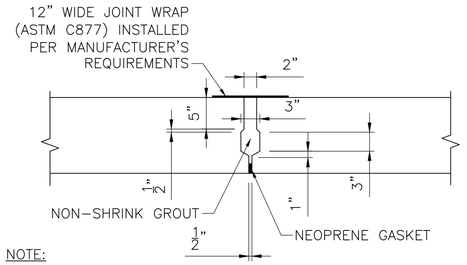


LIFTING LUG DETAIL

SCALE: 1" = 1'-0"

NOTE:

BURN LIFTING LUGS ½" BELOW TOP OF CONC. AFTER PLACEMENT & FILL AND SMOOTH WITH POLYMER MORTAR.

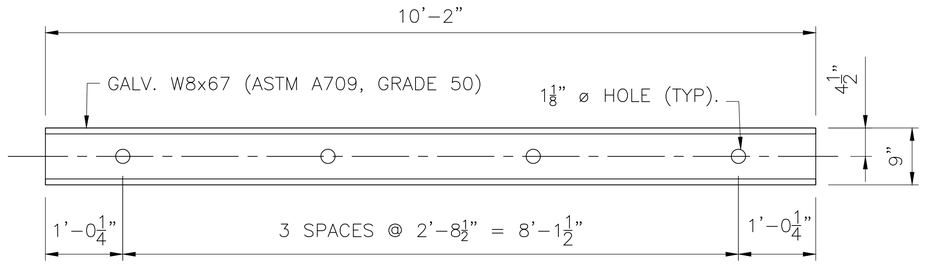


NOTE:

DETAILS AND DIMENSIONS ARE CONCEPTUAL AND MAY BE ALTERED BY THE FABRICATOR TO SUIT THEIR OPERATIONS, HOWEVER THE FUNCTION AND INTENT OF THE DETAIL MUST BE MET.

TOP SLAB SHEAR KEY

SCALE: 1" = 1'-0"



STEEL ENCASED BEAM DETAIL

SCALE: 1" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

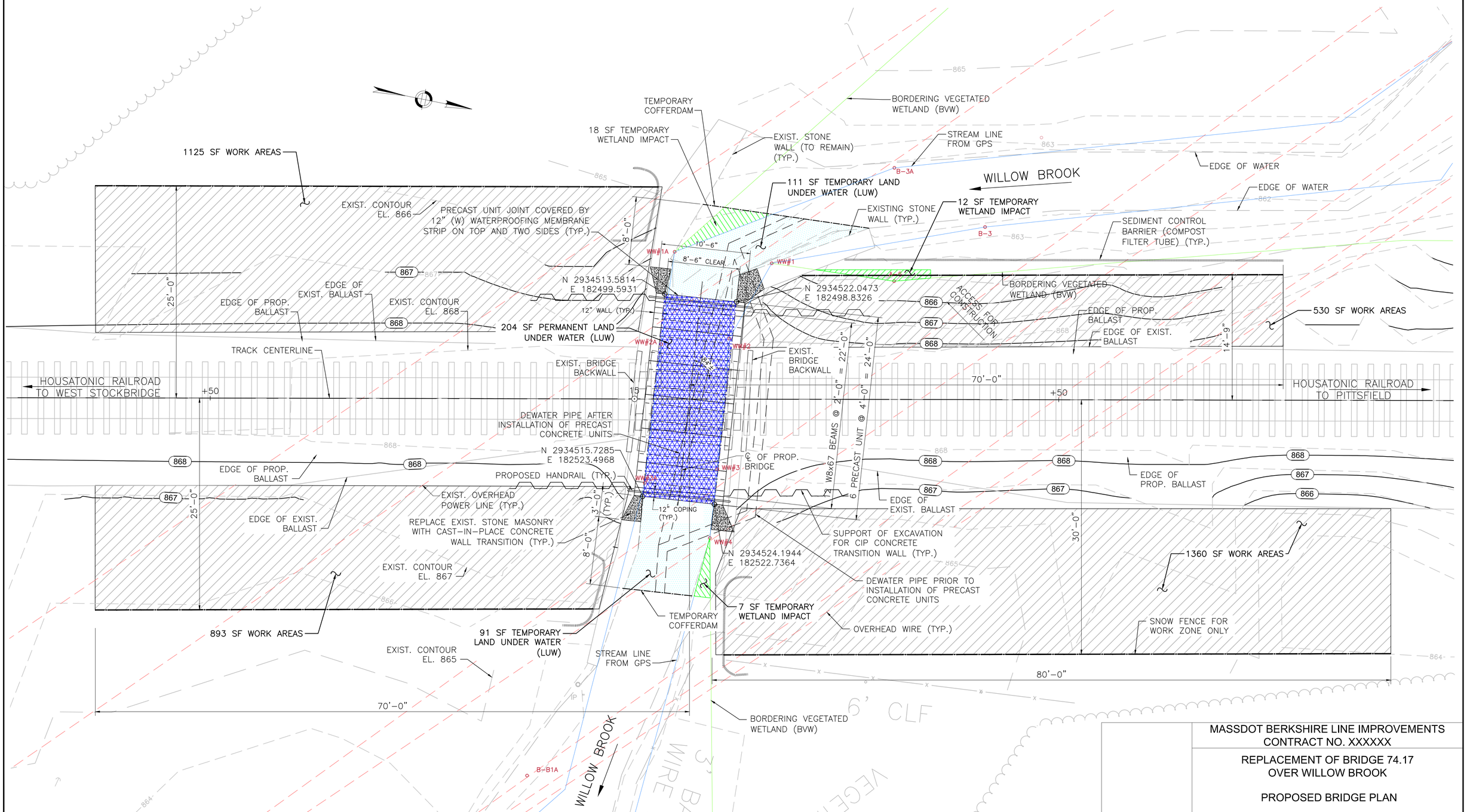
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK PROPOSED PRECAST PANEL 2

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S-210	



PROPOSED BRIDGE PLAN

SCALE: $\frac{3}{16}$" = 1'-0"

NOTE:

1. ALL ELEVATIONS ARE BASED ON NAVD 88.
2. ENTIRE WORK AREA IS WITHIN THE 100-FOOT BUFFER ZONE AND 200 FOOT RIVERFRONT AREA.

MASSDOT BERKSHIRE LINE IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17
OVER WILLOW BROOK

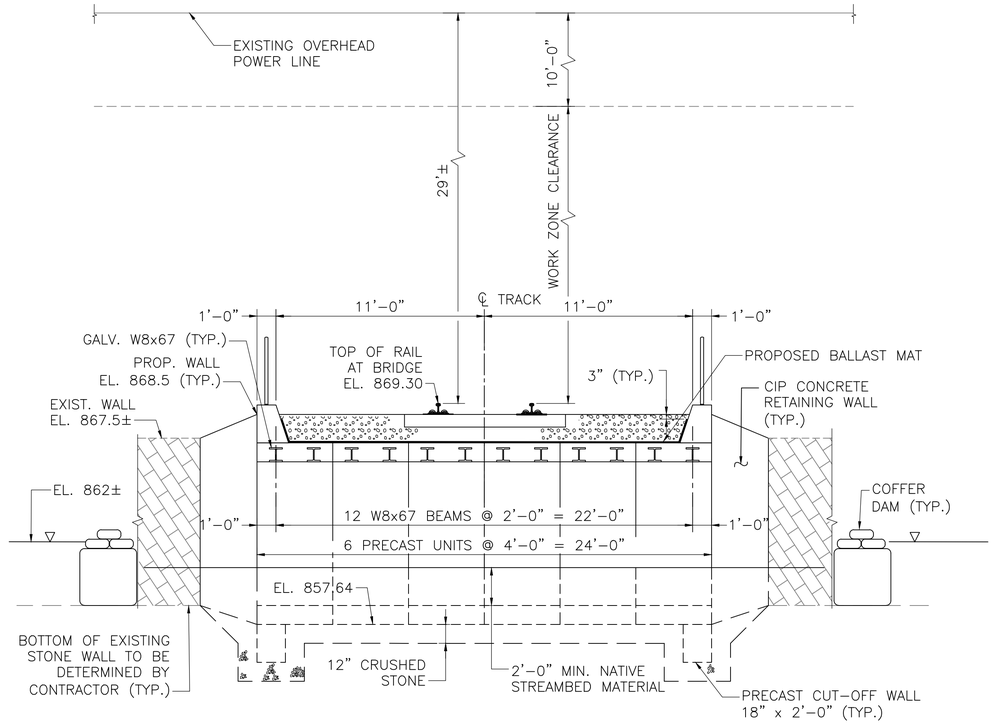
PROPOSED BRIDGE PLAN

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

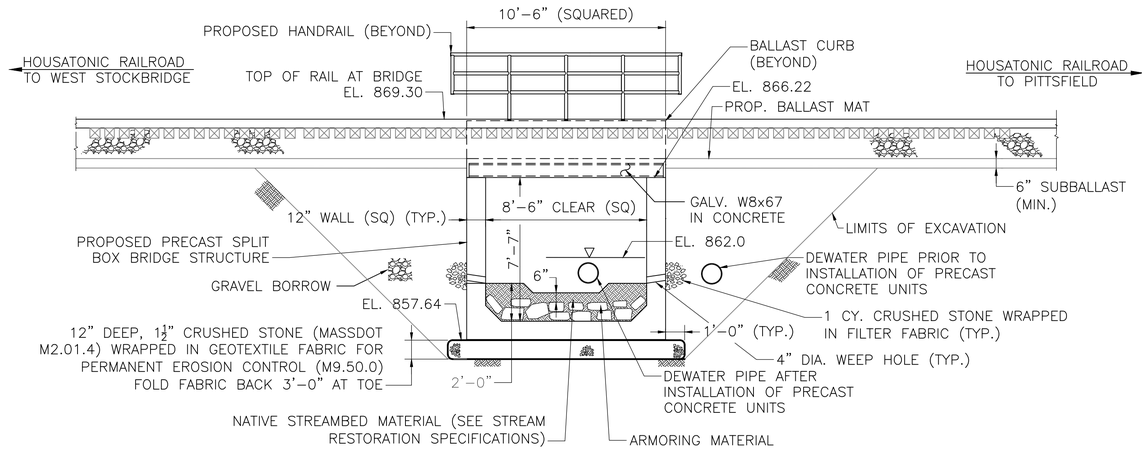
massDOT
Massachusetts Department of Transportation
Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE:				SHEET: E-1	



TYPICAL LONTUDINAL SECTION

SCALE: $\frac{1}{4}$" = 1'-0"



PROPOSED BRIDGE SECTION

SCALE: $\frac{1}{4}$" = 1'-0"

NOTES:

1. ALL ELEVATIONS ARE BASED ON NAVD 88.
2. THE STREAMBED RESTORATION SHALL REPLICATE THE EXISTING NATURAL CHANNEL BED FOUND OUTSIDE THE WORK AREA IN TERMS OF MATERIAL, ROUGHNESS, SHAPE, PROFILE, AND APPEARANCE.
3. EXISTING STREAMBED MATERIAL EXCAVATED FROM LOCATIONS OF PERMANENT WATERWAY IMPACTS SHALL BE STOCKPILED TO FACILITATED STREAMBED MATERIAL SHALL BE REUSED TO FILL THE VOIDS IN THE PROPOSED ARMORING MATERIAL.
4. ADDITIONAL STREAMBED MATERIAL SHALL BE LOCALLY SOURCED AND MATCH THE COMPOSITION OF THE EXISTING NATIVE RIVERBED.
5. THE PROPOSED CULVERT AND STREAMBED RESTORATION IS REQUIRED TO COMPLY WITH ALL ENVIRONMENTAL PERMITS ISSUED FOR THE PROJECT.

MASSDOT BERKSHIRE LINE IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17
OVER WILLOW BROOK

PROPOSED BRIDGE SECTIONS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE:				SHEET: E-2	

GENERAL NOTES:

DESIGN, CONSTRUCTION AND FABRICATION:

ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2024 MASSDOT STANDARD SPECIFICATIONS AND SUPPLEMENTALS, SPECIAL PROVISIONS PROVIDED IN THE CONTRACT DOCUMENTS, AND THE 2023 AMERICAN RAILWAY ENGINEERING AND MAINTENANCE–OF–WAY ASSOCIATION (AREMA) "MANUAL FOR RAILWAY ENGINEERING". IN THE EVENT OF DISCREPANCIES BETWEEN THE AREMA SPECIFICATIONS AND THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, THE MORE STRINGENT SPECIFICATION SHALL APPLY AS DETERMINED BY THE ENGINEER.

EXISTING CONDITIONS:

ALL DIMENSIONS AND ELEVATIONS SHOWN ON EXISTING STRUCTURE ARE APPROXIMATED FROM EXISTING DRAWINGS. ALL DIMENSIONS AND EXISTING DETAILS NECESSARY FOR THE COMPLETION OF WORK SHALL BE DETERMINED BY THE CONTRACTOR BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY OF THE ABOVE WORK, AND SHALL NOT ORDER ANY MATERIAL OR BEGIN FABRICATION OR CONSTRUCTION UNTIL THE ABOVE WORK IS COMPLETED AND THE EXTENT OF THE PROPOSED WORK IS APPROVED BY THE ENGINEER.

SCOPE OF WORK:

THE GENERAL SCOPE OF WORK AT THIS BRIDGE INCLUDES:

- CLEAN VEGETATION FROM THE STONE MASONRY JOINTS OF THE ABUTMENTS AND WINGWALLS.
- CLEAN DEBRIS FROM THE BRIDGE SEATS AND GIRDER BOTTOM FLANGES ABOVE THE BRIDGE SEAT AREAS.
- INSTALLING SANDBAG COFFERDAM AND DEWATERING. DEMOLITION OF EXISTING CONCRETE SECTION ON THE FOOTING.
- CLEAN SURFACES AND RE–POINT STONE JOINTS PRIOR TO PLACEMENT OF CONCRETE APRON AS DIRECTED BY THE ENGINEER.
- INSTALL NEW CONCRETE APRON AND SOIL ANCHORS.
- REMOVE EXISTING MASONRY STONE AT THE SOUTHEAST CORNER OF WINGWALL AND INSTALL NEW CONCRETE CAP.

REINFORCING STEEL:

REINFORCING STEEL SHALL BE ASTM A615 GRADE 60, EPOXY COATED.

CONCRETE:

ALL CAST–IN–PLACE CONCRETE SHALL BE IN ACCORDANCE THE SPECIFIED MINIMUM COMPRESSIVE STRENGTH (f'c) AND CONCRETE AT 28 DAYS:

f'c = 4000 PSI, $\frac{3}{4}$" MAX. AGGREGATE, 610 LBS CEMENT PER CUBIC YARD

THE CONTRACTOR SHALL PROVIDE THE CONCRETE MIX DATA SHEET FOR THE ENGINEER'S REVIEW AND APPROVAL. THE CONCRETE PRODUCT SHOULD BE ON THE MASSDOT PRE–APPROVED LIST AND BE SUITABLE FOR THIS SPECIFIC USE.

CONSTRUCTION WORK:

1. THERE IS NO CONSTRUCTION STAGING AREA AT THE JOB SITE DESIGNATED. AS NECESSARY TO PERFORM THE WORK, THE CONTRACTOR SHALL PROVIDE HIS/HER OWN OFF–SITE STAGING AREA.

2. THE CONTRACTORS'S ATTENTION IS CALLED TO THE FACT THAT CONTINUOUS COORDINATION WITH THE OPERATOR, HOUSATONIC RAILROAD COMPANY (HRRC), WILL BE REQUIRED THROUGHOUT CONSTRUCTION. HRRC WILL PROVIDE THE CONTRACTOR WITH FLAGGERS FOR PROTECTION FROM RAILROAD TRAFFIC WHILE WORK IS BEING PERFORMED ON THE RAILROAD RIGHT–OF–WAY (R.O.W.). THE CONTRACTOR SHALL NOT ENTER THE R.O.W. AT ANY TIME WITHOUT HRRC AUTHORIZATION.

3. ALL WORK SHALL BE PREFORMED DURING A SERIES OF SHUTDOWNS OF RAILROAD TRAFFIC. THE CONTRACTOR SHALL COORDINATE ALL SHUTDOWNS WITH HRRC. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION REGARDING SPECIFICS OF RAILROAD SCHEDULES AND SHUTDOWNS, AND LIQUIDATED DAMAGE PENALTIES FOR EXCEEDING AUTHORIZED TIME LIMITS.

4. ALL CONSTRUCTION AND ACCESS SHALL BE WITHIN THE R.O.W. UNLESS OTHERWISE APPROVED BY THE PROPERTY OWNER(S). THE CONTRACTOR SHALL COORDINATE DIRECTLY WITH THE PROPERTY OWNER(S) TO OBTAIN WRITTEN APPROVAL OF LAND USE OUTSIDE THE R.O.W. THE CONTRACTOR SHALL SUBMIT COPIES OF WRITTEN PROPERTY AGREEMENTS TO THE RESIDENT ENGINEER.

5. ANY DAMAGE TO REMAINING EXISTING COMPONENTS THAT IS CAUSED BY THE CONTRACTOR'S ACTIVITY SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AS DIRECTED AND APPROVED BY THE ENGINEER, AT NO ADDITIONAL EXPENSE TO THE BRIDGE OWNER OR RAILROAD OPERATOR.

6. THE CONTRACTOR SHALL PROVIDE SAFE ACCESS TO ALL AREAS OF WORK ON THE BRIDGES FOR THE ENGINEER'S INSPECTIONS. COSTS SHALL BE INCLUDED IN MOBILIZATION.

8. ALL EXISTING MATERIALS NOT REUSED OR RESET AS PART OF THIS PROJECT SHALL BE CONSIDERED WASTE MATERIAL. ALL WASTE MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF. ALL TREATED TIMBER SHALL BE DISPOSED OF ONLY AT AN APPROVED FACILITY.

9. DIMENSIONS AND ELEVATIONS SHOWN ON THESE PLANS HAVE BEEN OBTAINED FROM LIMITED FIELD INVESTIGATION AND EXISTING PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING FIELD MEASUREMENTS OF ALL EXISTING BRIDGE COMPONENTS AS NECESSARY FOR COMPLETION OF THE WORK AS SPECIFIED IN THE CONTRACT DOCUMENTS. ANY DISCREPANCIES IN DIMENSIONS, CHARACTER OR EXTENT OF THE EXISTING FEATURES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ADVANCING THE WORK.

SUGGESTED CONSTRUCTION SEQUENCE FOR SOUTH ABUTMENT CONCRETE REPAIR:

1. COORDINATE RAIL TRAFFIC SHUTDOWNS AND THE USE OF STAGING AREA WITH THE RAILROAD.

2. MOBILIZATION.

3. FIELD MEASURE EXISTING BRIDGE COMPONENTS IMPACTED BY THE NEW WORK TO ENSURE CONSISTENCY WITH PROPOSED WORK.

4. CLEAN THE VEGETATION AND DEBRIS ON THE BRIDGE SEATS AND BOTTOM FLANGES OF GIRDERS AT THE BRIDGE SEAT AREAS.

5. CLEAN SURFACES AND RE–POINT STONE JOINTS AS DIRECTED BY THE ENGINEER.

6. INSTALL SANDBAG COFFERDAM AND DEWATER. DEMOLISH EXISTING CONCRETE SECTION ON THE FOOTING AND REMOVE EXISTING STONE AT THE NORTHEAST CORNER OF THE WINGWALL.

7. INSTALL PROPOSED CONCRETE APRON AT THE SOUTH ABUTMENT AND CONCRETE CAP AT THE SOUTHEAST CORNER OF THE WINGWALL.

8. INSTALL SOIL ANCHORS.

9. DEMOBILIZE.

ENVIRONMENTAL CONTAINMENT:

1. THE CONTRACTOR SHALL PREVENT ANY CONSTRUCTION DEBRIS FROM ENTERING THE WATERWAYS, PUBLIC OR PRIVATE PROPERTY, OR TRAVELED WAYS DURING CONSTRUCTION.

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

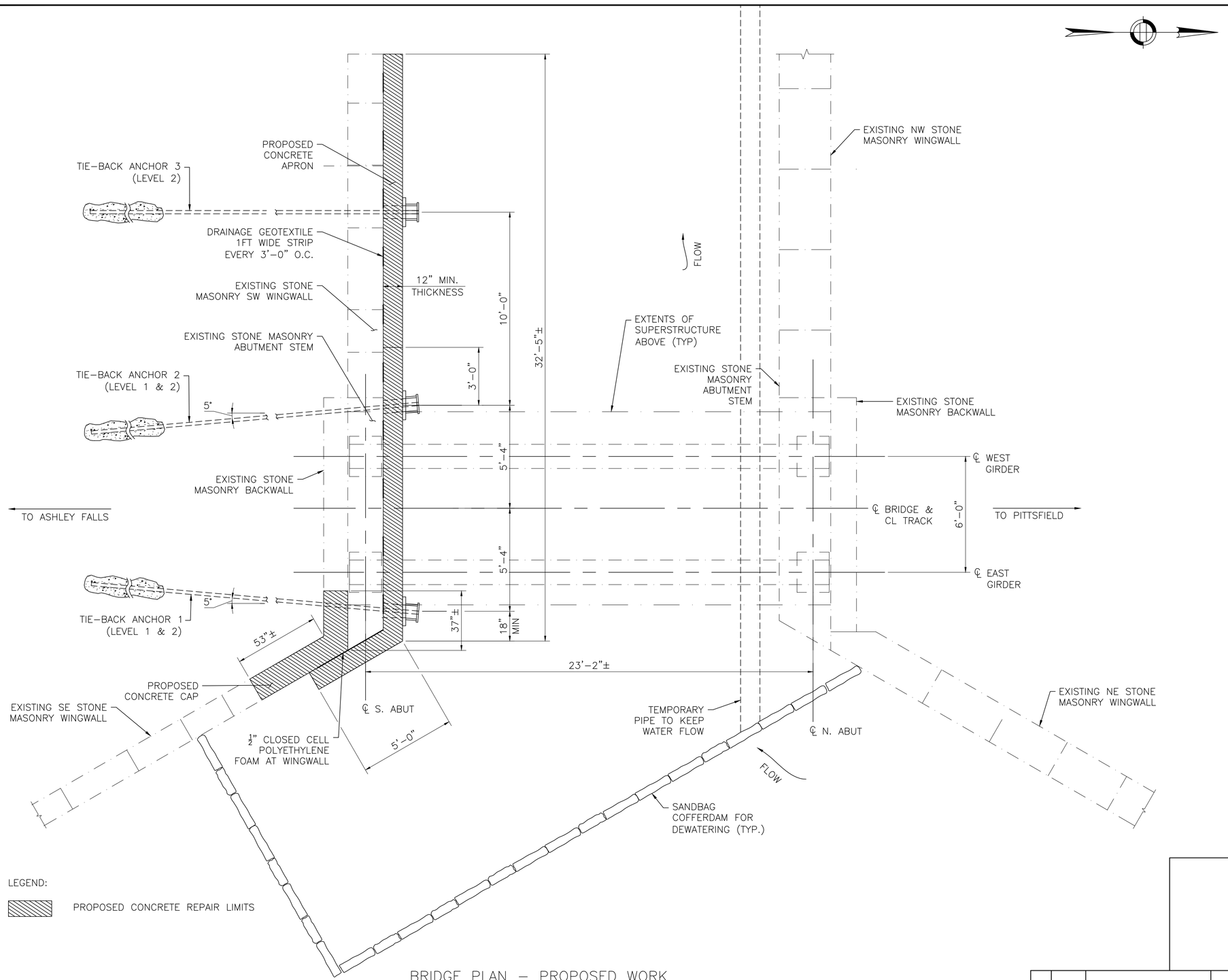
REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
GENERAL NOTES

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	BMH	BMH	JQW	SHEET: S–401	



LEGEND:

PROPOSED CONCRETE REPAIR LIMITS

BRIDGE PLAN – PROPOSED WORK

SCALE: ⅜" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

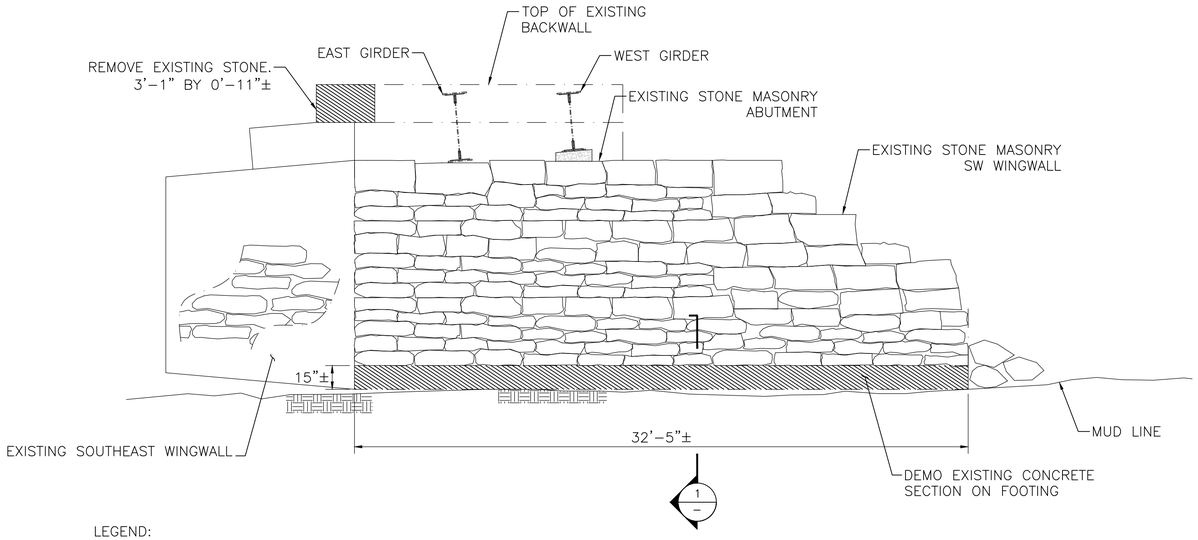
REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
KEY PLAN

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 307-7700

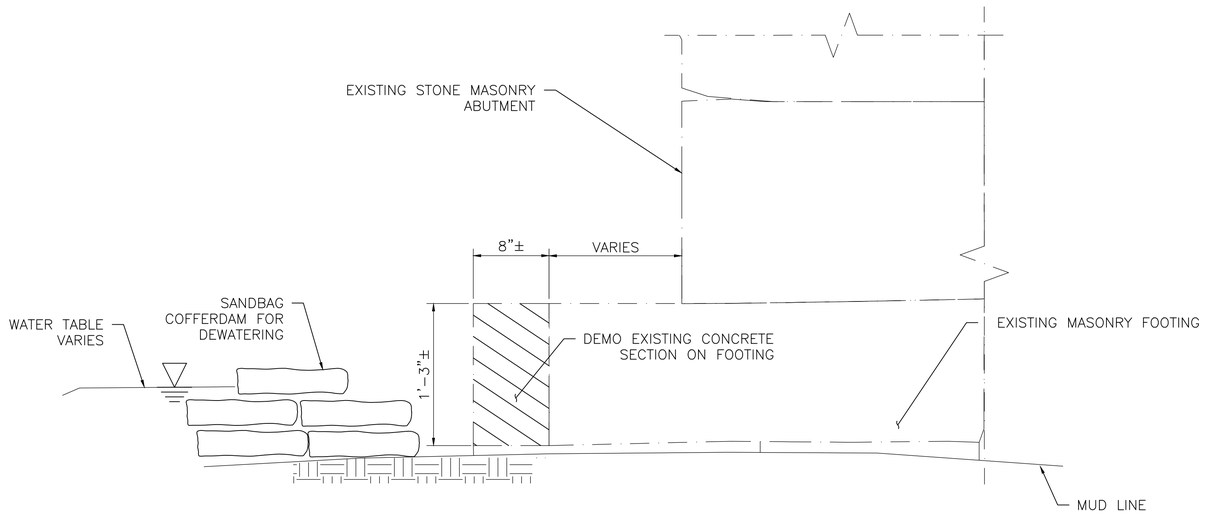
massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	BMH	BMH	JQW	SHEET: S–402	



SOUTH ABUTMENT ELEVATION – DEMOLITION LIMITS

SCALE: $\frac{1}{4}$" = 1'-0"



SECTION 1

SCALE: $1\frac{1}{2}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

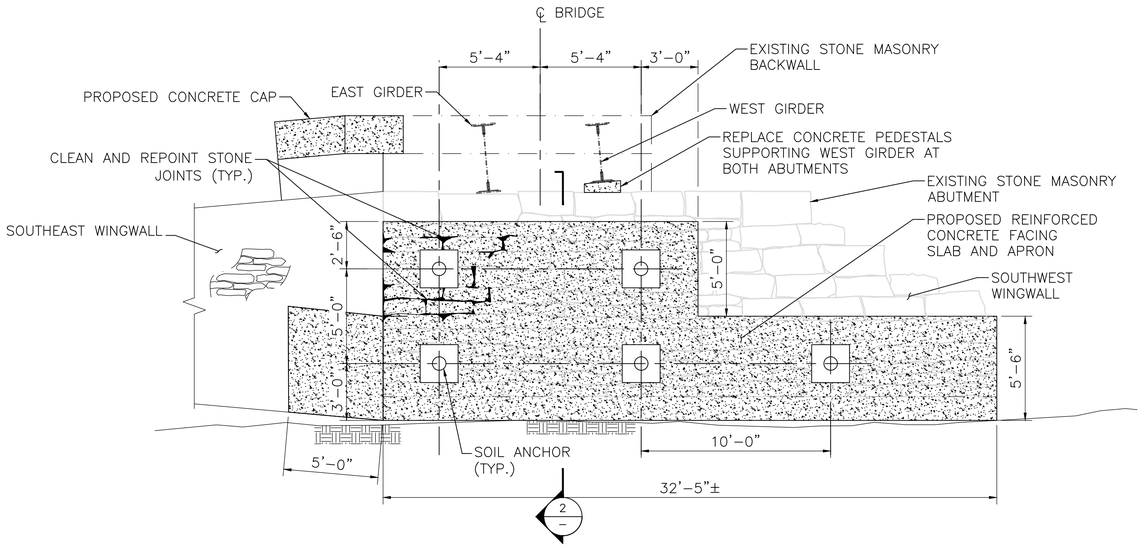
REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
DEMOLITION LIMITS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	BMH	BMH	JQW	SHEET: S-403	

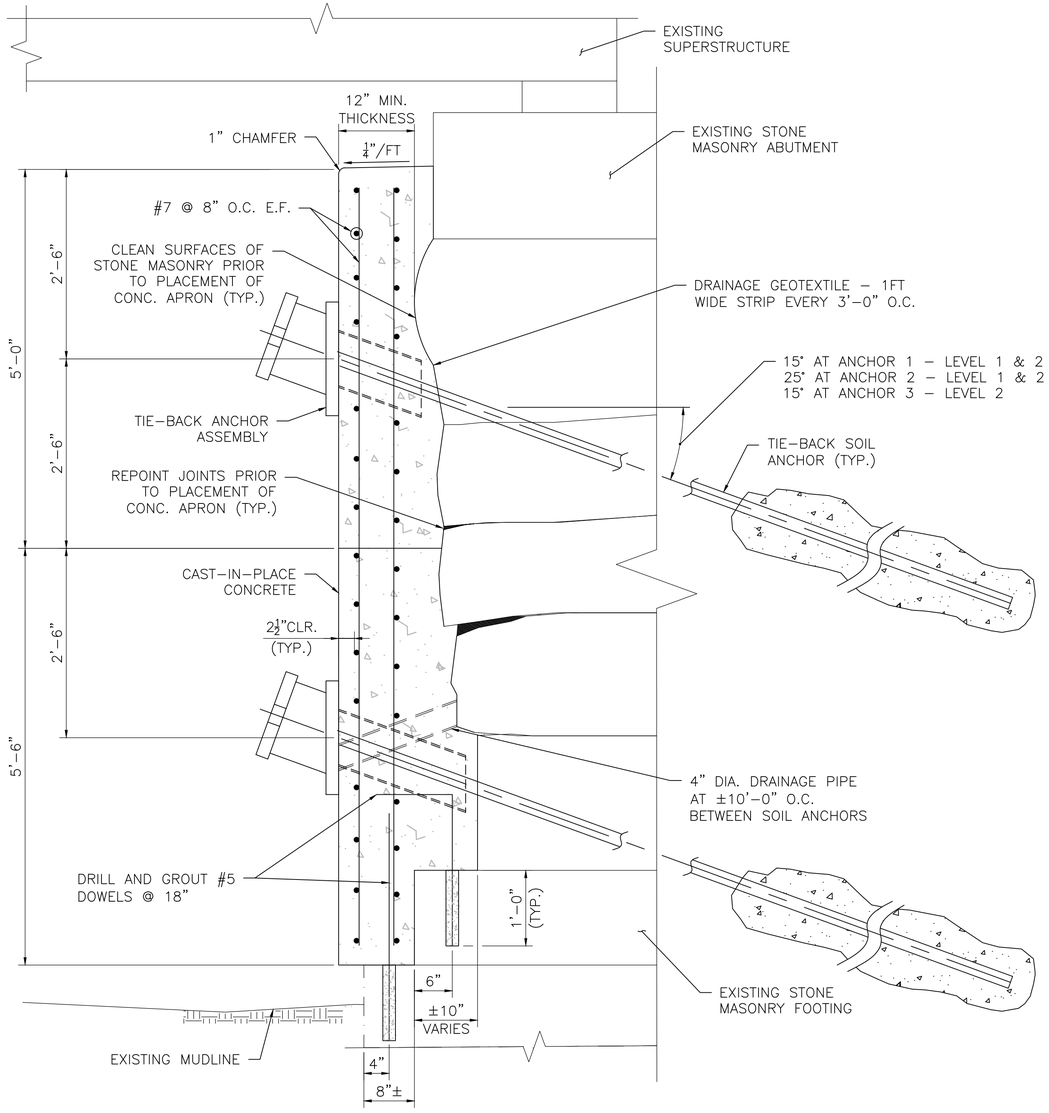


SOUTH ABUTMENT ELEVATION – PROPOSED REPAIRS

SCALE: $\frac{1}{4}$" = 1'–0"

NOTES:

1. TIE–BACK ANCHORS ARE TO BE DESIGNED BY CONTRACTOR. SEE ADDENDUM 1 SPECIAL PROVISIONS.
2. CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI.
3. REINFORCING BARS SHALL CONFIRM TO ASTM A615, GRADE 60, UNCOATED BARS.
4. THE CONTRACTOR SHALL PROVIDE ANCHORAGE TO SECURE THE CAST–IN–PLACE WALL TEMPORARILY DURING CONSTRUCTION, UNTIL ANCHOR PRESTRESS FORCES ARE LOCKED–OFF.
5. ANCHORHEAD ASSEMBLY SHALL BE GALVANIZED IN CONFORMANCE WITH ASTM A123. GALVANIZING SHALL BE REMOVED OR BLOCKED OUT AS NECESSARY TO ACCOMMODATE FIELD WELDS. FIELD WELDS AND ADJACENT AREAS SHALL BE TOUCHED–UP IN CONFORMANCE WITH ASTM A780.
6. WELDING ELECTRODES SHALL HAVE A MINIMUM YIELD STRESS OF 60 KSI.
7. STEEL HSS SECTIONS SHALL HAVE A MINIMUM YIELD STRESS OF 42 KSI AND SHALL CONFORM TO ASTM A500.
8. STRUCTURAL STEEL FOR THE MOUNTING BRACKETS, BEARING PLATES, AND SUB–BEARING PLATES SHALL HAVE A MINIMUM YIELD STRESS OF 36 KSI AND SHALL CONFORM TO ASTM A36.
9. DESIGN OF ALL STRUCTURAL STEEL NOT EXPLICITLY DIMENSIONED IS THE RESPONSIBILITY OF THE CONTRACTOR.
10. TIE BACKS SHALL BE ANCHORED INTO BEDROCK WITH A MINIMUM BONDED LENGTH OF 10 FEET.
11. THE CONTRACTOR SHALL EXCAVATE A TEST PIT TO IDENTIFY THE BEARING ELEVATION OF THE EXISTING STONE MASONRY WALL AND SHALL SUBMIT THIS INFORMATION TO THE ENGINEER.
12. SUBGRADE BENEATH THE WALL SHALL BE COMPACTED WITH A LEAST 4 PASSES OF A VIBRATORY PLATE COMPACTOR WEIGHING AT LEAST 200 POUNDS AND IMPARTING AN IMPACT LOAD OF AT LEAST 2.5 TONS.
13. ANCHORS SHALL BE PROOF TESTED TO 133% OF THE DESIGN LOAD.
14. ONE ANCHOR SHALL UNDERGO A PERFORMANCE TEST.
15. TIE–BACKS SHALL BE LOCKED OF AT 75% OF THE DESIGN LOAD.
16. TIE–BACK DESIGN LOADS SHALL BE, OR ANCHORS 1 AND 3, XXX KIPS, AND FOR ANCHOR 2, XXX KIPS.
17. ANCHOR 2 HAS BEEN POSITIONED TO ENABLE DRILLING OF THE ANCHOR FROM THE DECK OF THE BRIDGE ABOVE. THE LOCATION OF ANCHOR 2 MAY BE SHIFTED UP TO +/– 1'–0" HORIZONTALLY IN ORDER TO ACCOMMODATE DRILLING BETWEEN STRINGERS. LOCALIZED TEMPORARY REMOVAL AND REPLACEMENT OF THE TIMBER DECKING WILL BE REQUIRED FOR INSTALLATION FROM THE DECK LEVEL AND IS CONSIDERED INCIDENTAL TO THE ITEM FOR THIS WORK.
18. THE CONTRACTOR SHALL FIELD MEASURE AND VERIFY, PRIOR TO FABRICATION AND CONSTRUCTION OF ANY COMPONENT OF THE TIE–BACK WALL SYSTEM, THAT THE ANCHORS ARE CONSTRUCTIBLE GIVEN THE SPATIAL REQUIREMENTS OF THE CONTRACTORS EQUIPMENT, THE ANGLES AND ELEVATIONS SHOWN FOR INSTALLING THE ANCHORS, AND CONSTRAINTS CAUSED BY THE EXISTING SITE LAYOUT.



SECTION 2

SCALE: 1" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

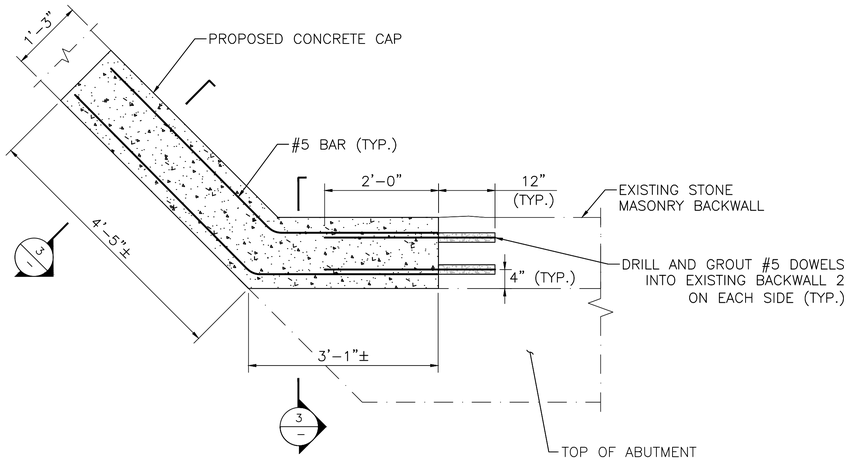
REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK PROPOSED CONRETE REPAIR

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

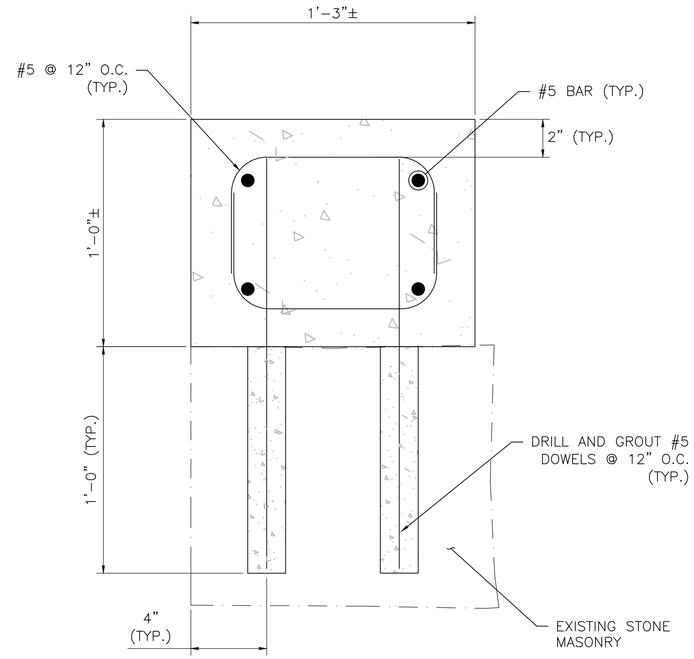
massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	BMH	BMH	JQW	SHEET: S–404	



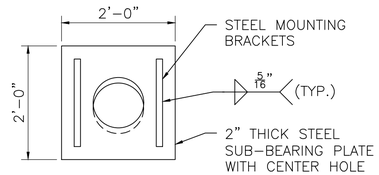
PROPOSED CONCRETE CAP – PLAN

SCALE: $\frac{3}{4}$" = 1'-0"



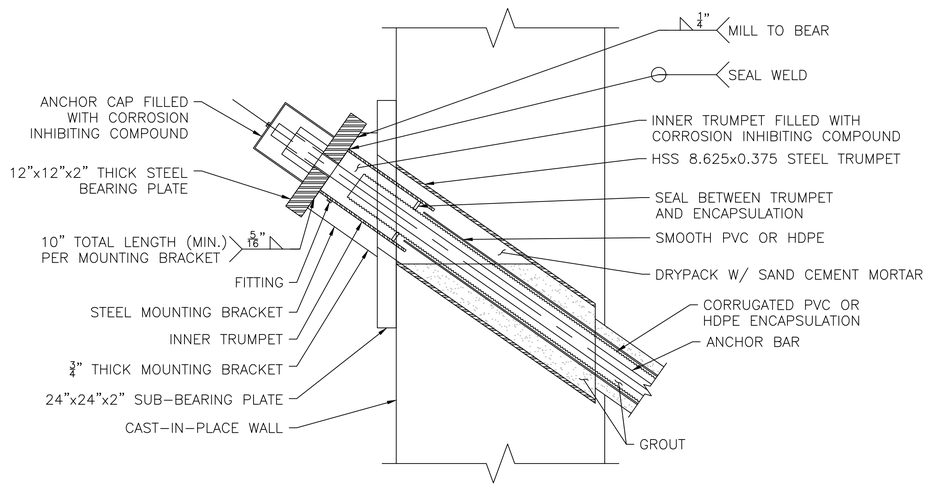
SECTION 3

SCALE: 3" = 1'-0"



SUB-BEARING PLATE AND MOUNTING BRACKET DETAIL

SCALE: NTS



SECTION – ANCHOR HEAD DETAIL

SCALE: NTS

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
TYPICAL DETAILS

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	BMH	BMH	JQW	SHEET: S-405	

GENERAL NOTES:

DESIGN, CONSTRUCTION AND FABRICATION:

ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2024 MASSDOT STANDARD SPECIFICATIONS AND SUPPLEMENTALS, SPECIAL PROVISIONS PROVIDED IN THE CONTRACT DOCUMENTS, AND THE 2023 AMERICAN RAILWAY ENGINEERING AND MAINTENANCE–OF–WAY ASSOCIATION (AREMA) "MANUAL FOR RAILWAY ENGINEERING". IN THE EVENT OF DISCREPANCIES BETWEEN THE AREMA SPECIFICATIONS AND THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, THE MORE STRINGENT SPECIFICATION SHALL APPLY AS DETERMINED BY THE ENGINEER.

EXISTING CONDITIONS:

ALL DIMENSIONS AND ELEVATIONS SHOWN ON EXISTING STRUCTURE ARE APPROXIMATED FROM EXISTING DRAWINGS. ALL DIMENSIONS AND EXISTING DETAILS NECESSARY FOR THE COMPLETION OF WORK SHALL BE DETERMINED BY THE CONTRACTOR BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY OF THE ABOVE WORK, AND SHALL NOT ORDER ANY MATERIAL OR BEGIN FABRICATION OR CONSTRUCTION UNTIL THE ABOVE WORK IS COMPLETED AND THE EXTENT OF THE PROPOSED WORK IS APPROVED BY THE ENGINEER.

SCOPE OF WORK:

THE GENERAL SCOPE OF WORK AT THIS BRIDGE INCLUDES:

- CLEAN VEGETATION FROM THE STONE MASONRY JOINTS OF THE ABUTMENTS AND WINGWALLS.
- CLEAN DEBRIS FROM THE BRIDGE SEATS AND GIRDER BOTTOM FLANGES ABOVE THE BRIDGE SEAT AREAS.
- INSTALLING SANDBAG COFFERDAM AND DEWATERING. DEMOLITION OF EXISTING CONCRETE SECTION ON THE FOOTING.
- CLEAN SURFACES AND RE–POINT STONE JOINTS PRIOR TO PLACEMENT OF CONCRETE APRON AS DIRECTED BY THE ENGINEER.
- INSTALL NEW CONCRETE APRON AND SOIL ANCHORS.
- REMOVE EXISTING MASONRY STONE AT THE SOUTHEAST CORNER OF WINGWALL AND INSTALL NEW CONCRETE CAP.

REINFORCING STEEL:

REINFORCING STEEL SHALL BE ASTM A615 GRADE 60, EPOXY COATED.

CONCRETE:

ALL CAST–IN–PLACE CONCRETE SHALL BE IN ACCORDANCE THE SPECIFIED MINIMUM COMPRESSIVE STRENGTH (f'c) AND CONCRETE AT 28 DAYS:

f'c = 4000 PSI, $\frac{3}{4}$" MAX. AGGREGATE, 610 LBS CEMENT PER CUBIC YARD

THE CONTRACTOR SHALL PROVIDE THE CONCRETE MIX DATA SHEET FOR THE ENGINEER'S REVIEW AND APPROVAL. THE CONCRETE PRODUCT SHOULD BE ON THE MASSDOT PRE–APPROVED LIST AND BE SUITABLE FOR THIS SPECIFIC USE.

CONSTRUCTION WORK:

1. THERE IS NO CONSTRUCTION STAGING AREA AT THE JOB SITE DESIGNATED. AS NECESSARY TO PERFORM THE WORK, THE CONTRACTOR SHALL PROVIDE HIS/HER OWN OFF–SITE STAGING AREA.

2. THE CONTRACTORS'S ATTENTION IS CALLED TO THE FACT THAT CONTINUOUS COORDINATION WITH THE OPERATOR, HOUSATONIC RAILROAD COMPANY (HRRC), WILL BE REQUIRED THROUGHOUT CONSTRUCTION. HRRC WILL PROVIDE THE CONTRACTOR WITH FLAGGERS FOR PROTECTION FROM RAILROAD TRAFFIC WHILE WORK IS BEING PERFORMED ON THE RAILROAD RIGHT–OF–WAY (R.O.W.). THE CONTRACTOR SHALL NOT ENTER THE R.O.W. AT ANY TIME WITHOUT HRRC AUTHORIZATION.

3. ALL WORK SHALL BE PREFORMED DURING A SERIES OF SHUTDOWNS OF RAILROAD TRAFFIC. THE CONTRACTOR SHALL COORDINATE ALL SHUTDOWNS WITH HRRC. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION REGARDING SPECIFICS OF RAILROAD SCHEDULES AND SHUTDOWNS, AND LIQUIDATED DAMAGE PENALTIES FOR EXCEEDING AUTHORIZED TIME LIMITS.

4. ALL CONSTRUCTION AND ACCESS SHALL BE WITHIN THE R.O.W. UNLESS OTHERWISE APPROVED BY THE PROPERTY OWNER(S). THE CONTRACTOR SHALL COORDINATE DIRECTLY WITH THE PROPERTY OWNER(S) TO OBTAIN WRITTEN APPROVAL OF LAND USE OUTSIDE THE R.O.W. THE CONTRACTOR SHALL SUBMIT COPIES OF WRITTEN PROPERTY AGREEMENTS TO THE RESIDENT ENGINEER.

5. ANY DAMAGE TO REMAINING EXISTING COMPONENTS THAT IS CAUSED BY THE CONTRACTOR'S ACTIVITY SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AS DIRECTED AND APPROVED BY THE ENGINEER, AT NO ADDITIONAL EXPENSE TO THE BRIDGE OWNER OR RAILROAD OPERATOR.

6. THE CONTRACTOR SHALL PROVIDE SAFE ACCESS TO ALL AREAS OF WORK ON THE BRIDGES FOR THE ENGINEER'S INSPECTIONS. COSTS SHALL BE INCLUDED IN MOBILIZATION.

8. ALL EXISTING MATERIALS NOT REUSED OR RESET AS PART OF THIS PROJECT SHALL BE CONSIDERED WASTE MATERIAL. ALL WASTE MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF. ALL TREATED TIMBER SHALL BE DISPOSED OF ONLY AT AN APPROVED FACILITY.

9. DIMENSIONS AND ELEVATIONS SHOWN ON THESE PLANS HAVE BEEN OBTAINED FROM LIMITED FIELD INVESTIGATION AND EXISTING PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING FIELD MEASUREMENTS OF ALL EXISTING BRIDGE COMPONENTS AS NECESSARY FOR COMPLETION OF THE WORK AS SPECIFIED IN THE CONTRACT DOCUMENTS. ANY DISCREPANCIES IN DIMENSIONS, CHARACTER OR EXTENT OF THE EXISTING FEATURES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ADVANCING THE WORK.

SUGGESTED CONSTRUCTION SEQUENCE FOR SOUTH ABUTMENT CONCRETE REPAIR:

1. COORDINATE RAIL TRAFFIC SHUTDOWNS AND THE USE OF STAGING AREA WITH THE RAILROAD.

2. MOBILIZATION.

3. FIELD MEASURE EXISTING BRIDGE COMPONENTS IMPACTED BY THE NEW WORK TO ENSURE CONSISTENCY WITH PROPOSED WORK.

4. CLEAN THE VEGETATION AND DEBRIS ON THE BRIDGE SEATS AND BOTTOM FLANGES OF GIRDERS AT THE BRIDGE SEAT AREAS.

5. CLEAN SURFACES AND RE–POINT STONE JOINTS AS DIRECTED BY THE ENGINEER.

6. INSTALL SANDBAG COFFERDAM AND DEWATER. DEMOLISH EXISTING CONCRETE SECTION ON THE FOOTING AND REMOVE EXISTING STONE AT THE NORTHEAST CORNER OF THE WINGWALL.

7. INSTALL PROPOSED CONCRETE APRON AT THE SOUTH ABUTMENT AND CONCRETE CAP AT THE SOUTHEAST CORNER OF THE WINGWALL.

8. INSTALL SOIL ANCHORS.

9. DEMOBILIZE.

ENVIRONMENTAL CONTAINMENT:

1. THE CONTRACTOR SHALL PREVENT ANY CONSTRUCTION DEBRIS FROM ENTERING THE WATERWAYS, PUBLIC OR PRIVATE PROPERTY, OR TRAVELED WAYS DURING CONSTRUCTION.
2. FOR CONSTRUCTION WORK, ANY STAGING AREA AND PROPERTY ACCESS OUTSIDE WHAT IS SHOWN ON THE PLANS NEEDS TO BE IN NON–JURISDICTIONAL WETLAND RESOURCE AREAS, INCLUDING BUFFER ZONE OR RIVERFRONT AREAS. ANY WORK OUTSIDE OF WHAT IS SHOWN ON THE PLANS SHALL BE PROPERLY AUTHORIZED BY THE LEE CONSERVATION COMMISSION UNDER THE MA WETLANDS PROTECTION ACT, AS MAY BE NECESSARY.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

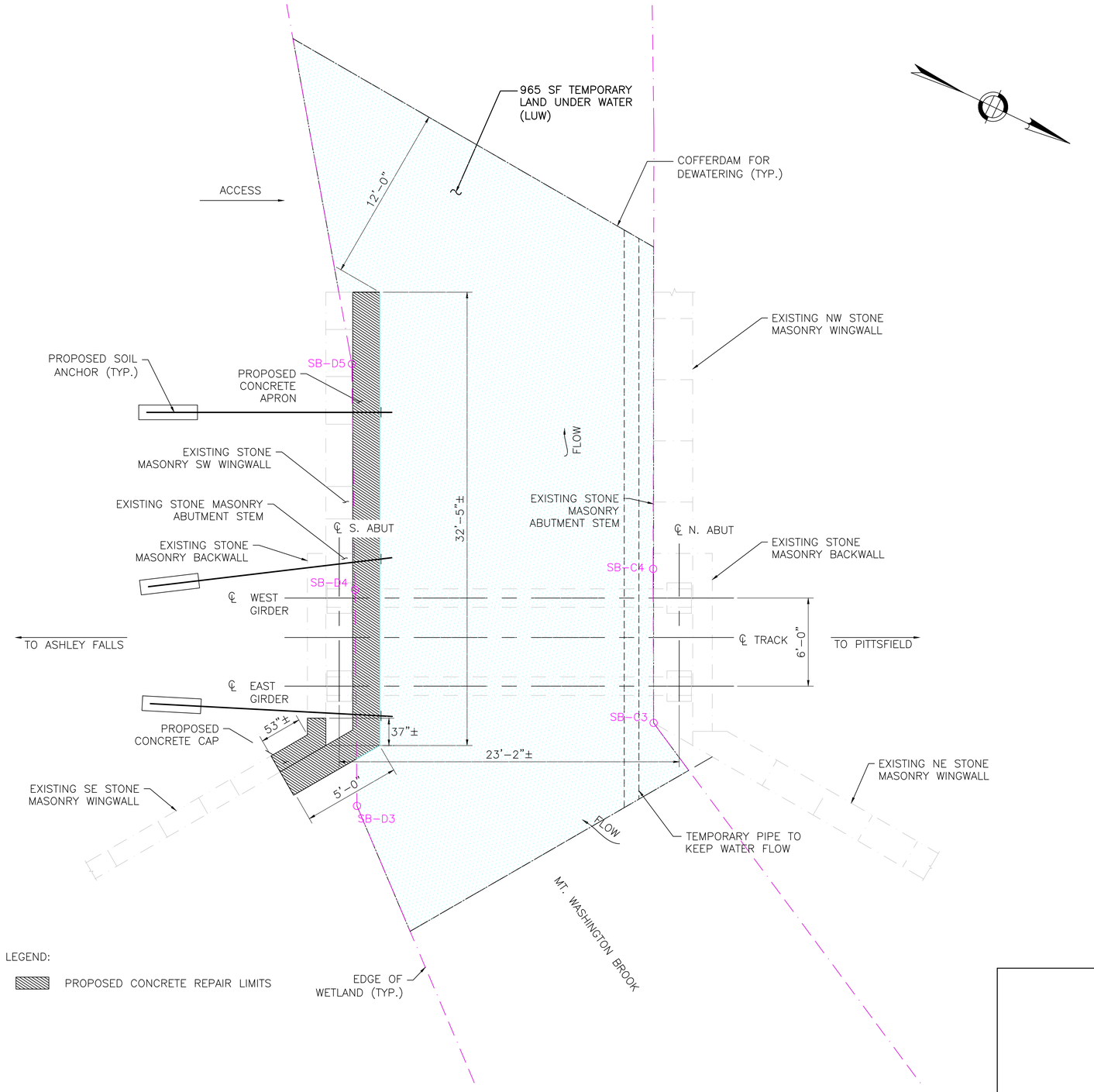
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
GENERAL NOTES

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/6/2025	BMH	BMH	JQW	SHEET: S–1	



LEGEND:

PROPOSED CONCRETE REPAIR LIMITS

BRIDGE PLAN – PROPOSED WORK

SCALE: $\frac{1}{4}$" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

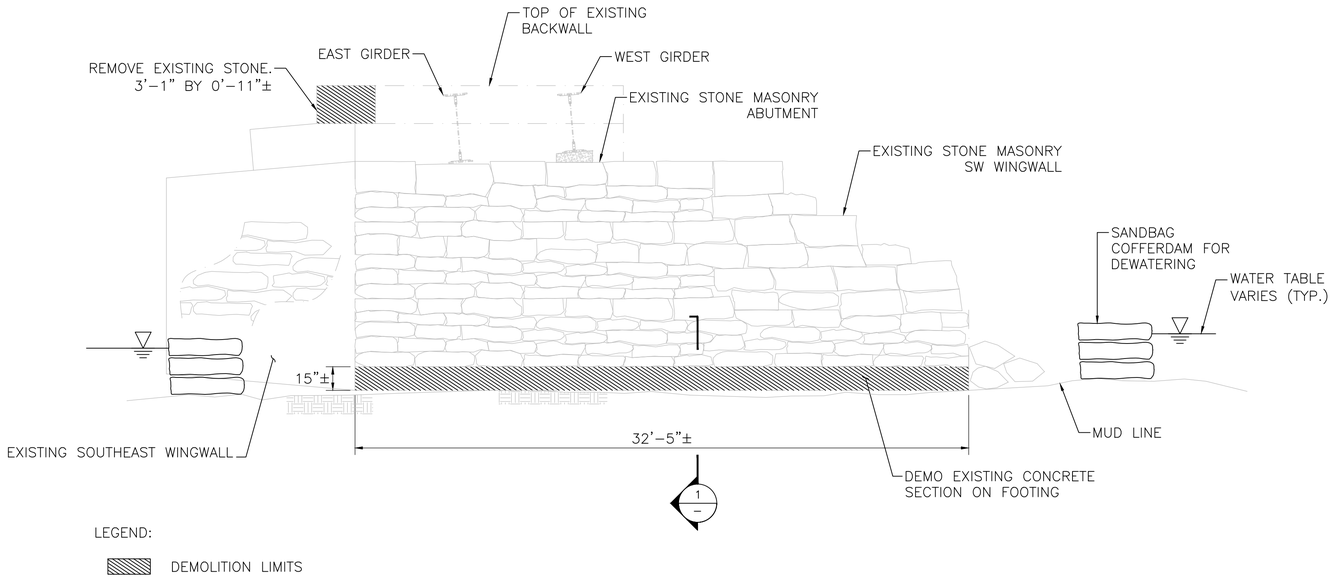
REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
BRIDGE PLAN - PROPOSED WORK

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

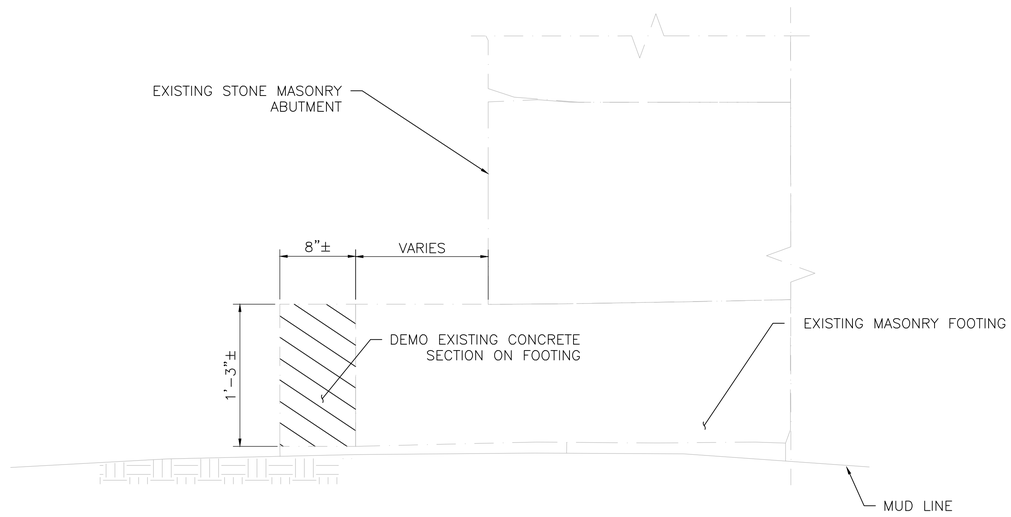
massDOT Massachusetts Department of Transportation
Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/6/2025	BMH	BMH	JQW	SHEET: S-2	



SOUTH ABUTMENT ELEVATION – DEMOLITION LIMITS

SCALE: $\frac{1}{4}$" = 1'-0"



SECTION 1

SCALE: $1\frac{1}{2}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

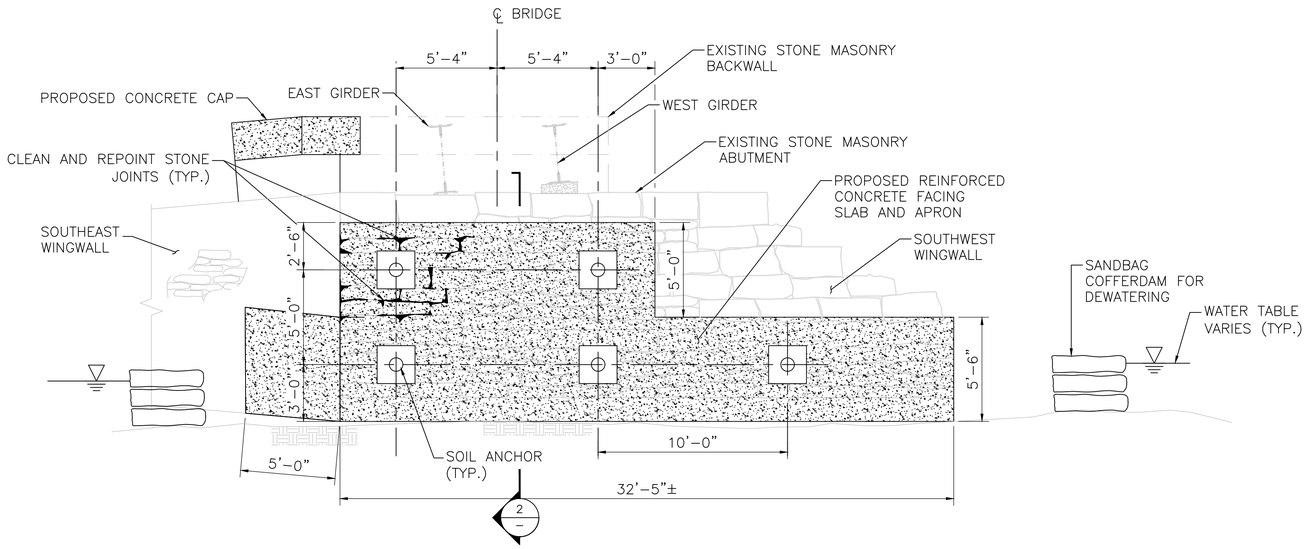
REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK DEMOLITION LIMITS

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

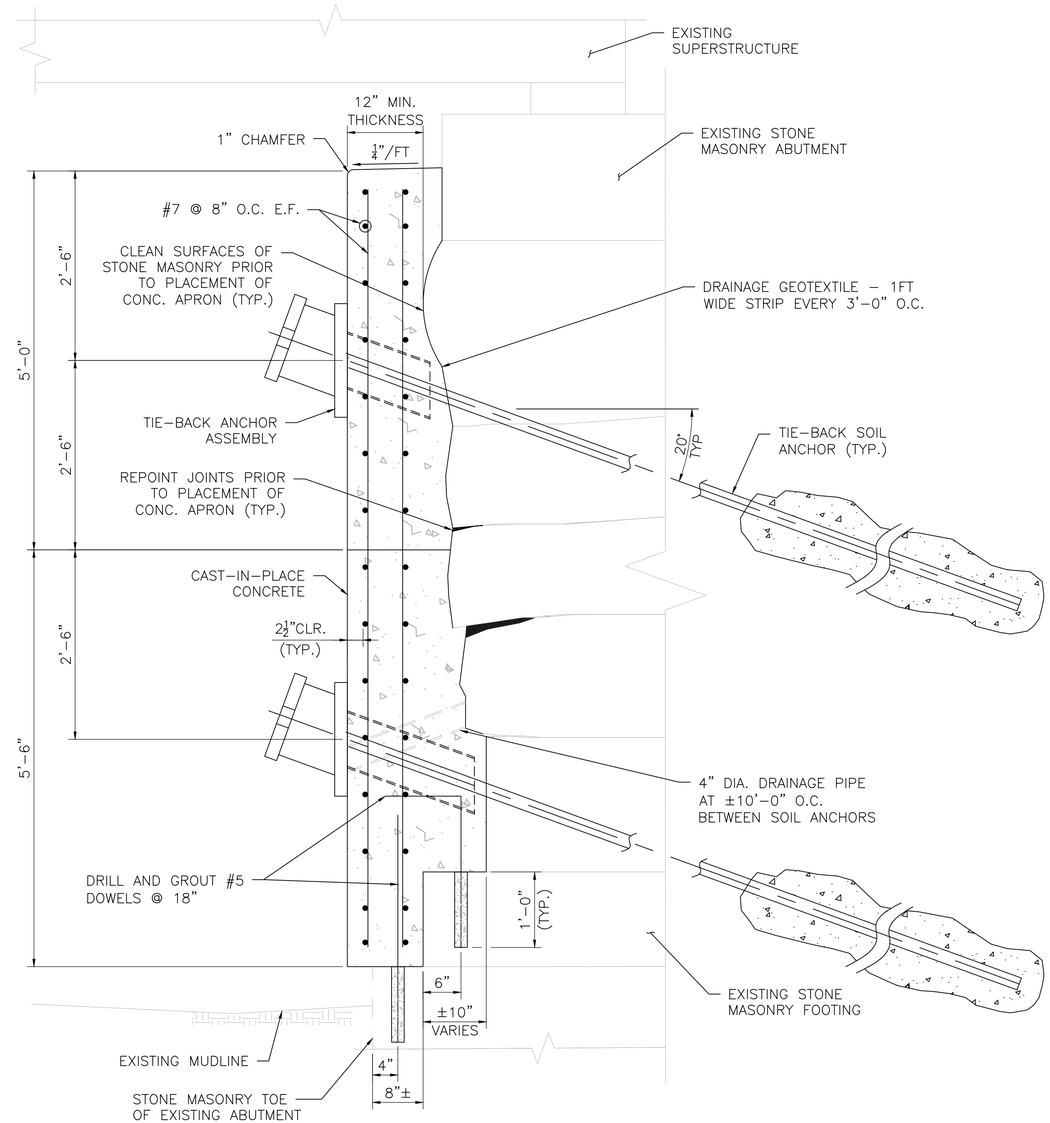
ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/6/2025	BMH	BMH	JQW	SHEET: S-3	



SOUTH ABUTMENT ELEVATION – PROPOSED CONCRETE APRON & WINGWALL CAP

SCALE: $\frac{1}{4}$" = 1'–0"



SECTION 2

SCALE: 1" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK
PROPOSED CONCRETE REPAIRS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/6/2025	BMH	BMH	JQW	SHEET: S–4	

Attachment E

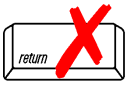
Filling Fee Information

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Applicant Information

1. Location of Project:

Mile Marker 74.17 & 77.28 Housatonic Rail Line	Lee
a. Street Address	b. City/Town
56820	237.50
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Scott	Conti	
a. First Name	b. Last Name	
Massachusetts Department of Transportation - Rail & Transit Division		
c. Organization		
10 Park Plaza		
d. Mailing Address		
Boston	MA	02116
e. City/Town	f. State	g. Zip Code
(857) 368-8965		Scott.Conti@dot.state.ma.us
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name	
c. Organization		
d. Mailing Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Bridge Repairs (limited project)	1	500	$500

Step 5/Total Project Fee:

Step 6/Fee Payments:

Total Project Fee:	500.00 a. Total Fee from Step 5
State share of filing Fee:	$237.50 b. 1/2 Total Fee **less $**12.50
City/Town share of filling Fee:	$262.50 c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

WARNING - THIS CHECK IS PROTECTED BY SPECIAL SECURITY FEATURES

Epsilon ASSOCIATES INC.

Epsilon Associates, Inc
3 Mil & Main; Suite 250
MAYNARD, MA 01754
(978) 897-7100

MIDDLESEX SAVING BANK
CONCORD, MA 01742

53-7122
2113

56820

Two Hundred Thirty Seven and 50/100

DATE		AMOUNT
01/29/25	56820	$237.50

PAY TO THE ORDER OF **COMMONWEALTH OF MASSACHUSETTS**

Robert D. O'Neal

SECURITY FEATURES INCLUDE FOIL HOLOGRAM • HEAT SENSITIVE ICON • MICROPRINT • MULTI-COLOR BACKGROUND

[redacted]

WARNING - THIS CHECK IS PROTECTED BY SPECIAL SECURITY FEATURES

Epsilon ASSOCIATES INC.

Epsilon Associates, Inc
3 Mil & Main; Suite 250
MAYNARD, MA 01754
(978) 897-7100

MIDDLESEX SAVING BANK
CONCORD, MA 01742

53-7122
2113

56821

Two Hundred Sixty Seven and 50/100

DATE		AMOUNT
01/29/25	56821	$267.50

PAY TO THE ORDER OF **TOWN OF LEE**

Robert D. O'Neal

SECURITY FEATURES INCLUDE FOIL HOLOGRAM • HEAT SENSITIVE ICON • MICROPRINT • MULTI-COLOR BACKGROUND

[redacted]

Attachment F

Wetland Delineation Report Bridge 74.17

MEMORANDUM

Date: September 9, 2019

To: Ms. June Wu, HDR Inc.

From: Epsilon Associates, Inc.

Subject: Wetland Delineation Memo – HDR Housatonic Bridges.

Overview

Epsilon Associates, Inc. ("Epsilon") has prepared the following Wetland Resource Area Delineation Report for the repair and rehabilitation of two timber MassDOT Rail bridges on tributaries to the Housatonic Railroad in Lee, Massachusetts ("Study Area"). The Study Area and Environmental Constraints maps, provided in Figures 1 and 2 in Attachment A depict the locations of the bridges, and the Federal Emergency Management Agency ("FEMA") floodplain information associated with them. The wetland sketches provided in Attachment B depict the locations of the field delineated wetland resource areas by Epsilon.

As described in further detail below, wetland resource areas delineated or otherwise identified by Epsilon within the Study Area include Bordering Land Subject to Flooding ("BLSF"), Bordering Vegetated Wetlands ("BVW"), Inland Bank, Land Under Water ("LUW"), and Riverfront Area ("RFA").

Existing Site Conditions

The first bridge, 77.16 crosses Codding Brook, a perennial stream which flows west into the Housatonic River. The second bridge, 74.21, crosses Willow Brook, a perennial stream which flows east into the Housatonic River. Bordering vegetated wetlands are located adjacent to both of these bridges and against the toe of slope of the rail lines.

According to FEMA FIRM Panel 2500280006B and 2500280009B, there is mapped floodplain within the Study Area associated with Bridge 77.16 over Codding Brook. The 100-year floodplain is regulated as BLSF under the local and state wetlands regulations. The 100-year flood plain elevation identified by the Hydraulic Engineer (elevation 916.75 feet) should be added to the existing and proposed conditions permit drawings to delineate the edge of BLSF.

Epsilon ASSOCIATES INC.

According to the Natural Heritage and Endangered Species Program (Natural Heritage Atlas, 2017), no mapped Priority or Estimated Habitat is located within the Study Area. Bridge 77.16, associated with Codding Brook, is located within an Area of Critical Environmental Concern. Natural Resources Conservation Service ("NRCS")-mapped associated with the bridges in the Study Area consist of Palms and Carlisle mucks, 0-1 percent slopes, and Winooski silt loam, 0-3 percent slopes.

Wetland Delineation Methodology

Epsilon delineated wetland resource areas within the Study Area on July 2nd and October 3rd, 2018. Vegetated wetlands were delineated in accordance with the U.S. Army Corps of Engineers *Wetland Delineation Manual* (USACE, 1987), the "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0" (2012), the Massachusetts Wetlands Protection Act and implementing regulations (310 CMR 10.00), and the Massachusetts Department of Environmental Protection's handbook, *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (MADEP, 1995). The state and federal delineation methodologies generally prescribe a multi-parameter approach, where hydrophytic vegetation and hydrology (including hydric soils) are reviewed in conjunction with one another when delineating a wetland edge. The Lee Conservation commission administers the Wetlands Protection Act and does not have a separate wetlands bylaw.

In addition to BLSF described above, the following wetlands and waterways were identified in the Study Area. Detailed descriptions of each wetland series and their jurisdictional status is provided in the attached Table 1-1. Representative photographs are provided in Attachment B. A wetlands map showing the approximate locations of delineated resource areas is provided in Figures 5 and 6 of Attachment A. Wetland determination data forms are provided in Attachment C.

Inland Bank:

According to 310 CMR 10.54, a Bank is the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and upland. The upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level. The mean annual high water ("MAHW") levels used to delineate Riverfront Area were coincident with the top of bank, as both reflect "the line that is apparent from visible markings or changes in the character of soils or vegetation due to the prolonged presence of water and that distinguishes between predominantly aquatic and predominantly terrestrial land" (310 CMR 10.58(2)). Banks are likely to be significant to public or private water supply, to ground water supply, to flood control, to storm damage prevention, to the prevention of pollution and to the protection of fisheries and wildlife habitat. Where Banks are composed of concrete, asphalt or

other artificial impervious material, said Banks are likely to be significant to flood control and storm damage prevention. A 100-foot buffer zone is associated with Inland Bank.

Inland Bank in the Study Area is associated with Codding Brook and Willow Brook, perennial tributaries to the Housatonic River in Lee, Massachusetts.

Bank flag Series B delineates the Bank of Codding Brook which passes beneath Bridge 77.16, and Bank flag series B/Ba delineate the Banks of Willow Brook which passes beneath Bridge 74.23.

Land Under Water:

According to 310 CMR 10.56, LUW is the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. The boundary of Land Under Water Bodies and Waterways is the mean annual low water level. LUW is likely to be significant to public and private water supply, to ground water supply, to flood control, to storm damage prevention, to prevention of pollution and to protection of fisheries and wildlife habitat. Where such land is composed of concrete, asphalt or other artificial impervious material, said land is likely to be significant to flood control and storm damage prevention.

Land Under Water within the Study Area is associated with Codding Brook and Willow Brook, perennial tributaries to the Housatonic River in Lee, Massachusetts.

Riverfront Area:

According to 310 CMR 10.58, a Riverfront Area is the area of land between a river's mean annual high water line and a parallel line measured horizontally. The riverfront area may include or overlap other resource areas or their buffer zones. The riverfront area does not have a buffer zone. Riverfront areas are likely to be significant to protect the private or public water supply; to protect groundwater; to provide flood control; to prevent storm damage; to prevent pollution; to protect land containing shellfish; to protect wildlife habitat; and to protect the fisheries. The RFA extends 200 feet horizontally from the mean annual high-water line of Codding Brook, Willow Brook, and the Housatonic River.

Bordering Vegetated Wetland:

According to 310 CMR 10.55, BVW's are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetative community which occur in each type of freshwater wetland are specified in M.G.L. c. 131, § 40. Bordering Vegetated Wetlands are likely to be significant to public or private water supply, to ground water supply, to flood control, to storm damage prevention, to prevention of pollution, to the protection of fisheries and to wildlife habitat. A 100-foot buffer zone is associated with BVW. The Lee Conservation commission administers the Wetlands Protection Act and does not have a separate wetlands bylaw.

Five BVW series were identified and flagged within the Study Areas. Wetland Series 200A is located along the northwestern toe of slope of the rail line north of Bridge 77.16, associated with Codding Brook. Wetland Series 100A is located along the southwestern toe of slope of the rail line south of Bridge 77.16. Wetland Series 220 is located along the northeastern toe of slope of the rail line north of Bridge 77.16. Wetland Series 110 is located along the southeastern toe of slope of the rail line south of Bridge 77.16. Wetland Series 200A and 100A are hydrologically connected to Wetland Series Wetland Series 220 and Series 110 by Codding Brook.

Wetland Series A, C and D are all associated with Willow Brook. Wetland A is located along the toe-of-slope of the railway line to the northwest of Bridge 74.23. Wetland C is located opposite Wetland A on the southeastern side of Willow Brook. Wetland D is located on northeastern side of Bridge 74.23, and along the northern banks of Willow Brook.

Table 1-1 Summary of Wetland Resource Areas Delineated within the Study Area

Wetland ID / Flag Series	Associated Bridge	Description
Wetland Series 100A / 200A 201A to 208A, and 101A to 107A	77.16	This flag series delineates the border of a seasonally flooded, forested Bordering Vegetated Wetland ("BVW") along the northwestern and southwestern edges of the rail line associated with Bridge 77.16 and Codding Brook. Water from this wetland drains west into Codding Brook and eventually the Housatonic River. Dominant species included red maple (*Acer rubrum*), skunk cabbage (*Symplocarpus foetidus*), poison ivy (*Toxicodendron radicans*), rough-stemmed goldenrod (*Solidago rugosa*), and Tartarian honeysuckle (*Lonicera tartarica*). Soils in this wetland were dark brown muck down to 20". This series has an associated 100-foot Buffer Zone that is jurisdictional under the Wetlands Protection Act.
Wetland Series 220 / 110 111 to 115, and 221 to 225	77.16	This flag series delineates the border of a seasonally flooded, forested BVW along the northeastern and southeastern edges of the rail line associated with Bridge 77.16 and Codding Brook. Water from this wetland drains west into Codding Brook and eventually the Housatonic River. Dominant species included red maple, skunk cabbage, poison ivy, rough-stemmed goldenrod, and Tartarian honeysuckle. Soils in this wetland were dark brown muck down to 20". This series has an associated 100-foot Buffer Zone that is jurisdictional under the Wetlands Protection Act.
Wetland Series A A-1 to A-6	74.17	This flag series delineates the edge of a BVW as it runs along the toe-of-slope of the Railway line north of Bridge 74.23. Water from this wetland drains southwest into Willow Brook. Dominant species included green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus Americana*), gray dogwood (Cornus racemose), narrow-leaved goldenrod (*Euthamia graminifolia*), silky dogwood (*Cornus amomum*), phragmites (*Pragmites australis*), and Tartarian honeysuckle.
Wetland Series D Wingwall 4 to D-1 to D-2	74.17	This flag series delineates the edge of a BVW to Willow Brook, on the northeastern side of Bridge 74.23. Dominant species included silky dogwood, American elm, sensitive fern (*Onoclea sensibilis*), and water horsetail (*Equisetum fluviatile*).

Wetland ID / Flag Series	Associated Bridge	Description
Wetland Series C Wingwall 1a to C-1 to C-3	74.17	This flag series delineates the edge of a BVW to Willow Brook, on the northwestern side of Bridge 74.23, across the water from Wetland Series A. Dominant species included silky dogwood, water horsetail, goldenrod (*Solidago sp.*), and black willow (*Salix nigra*).
Stream Series B B-1 to B-7, and B-3[2] to B-5[2]	77.16	This series delineates the banks of Codding Brook, where it flows under Bridge 77.16. The brook was approximately 10-20 feet wide with a deep muck substrate and gradual slopes. Dominant vegetation along the banks included sensitive fern and silky dogwood. Codding Brook is a perennial stream, and thus has an associated 200-foot Buffer Zone that is jurisdictional under the Wetlands Protection Act.
Stream Series B/Ba B-1 to B-3, B-1a to B-3a to Wingwall 1, Wingwall 4 to B-B1 to B-B2, and Wingwall 2a to B-B1a to B-B2a	74.17	This series delineates the banks of Willow Brook, where it flows under Bridge 74.17 The brook was approximately 3 feet wide with a cobble and silt substrate. Dominant vegetation along the banks included black willow, elderberry (*Sambucus sp.*) and swamp rose (*Rosa palustris*). Willow Brook is a perennial stream, and thus has an associated 200-foot Buffer Zone that is jurisdictional under the Wetlands Protection Act.

Attachment A

Figures

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

HDR Housatonic Bridge 74.17 Lee, Massachusetts

Epsilon Associates Inc.

Figure 1

Willow Brook Crossing: USGS Locus Map

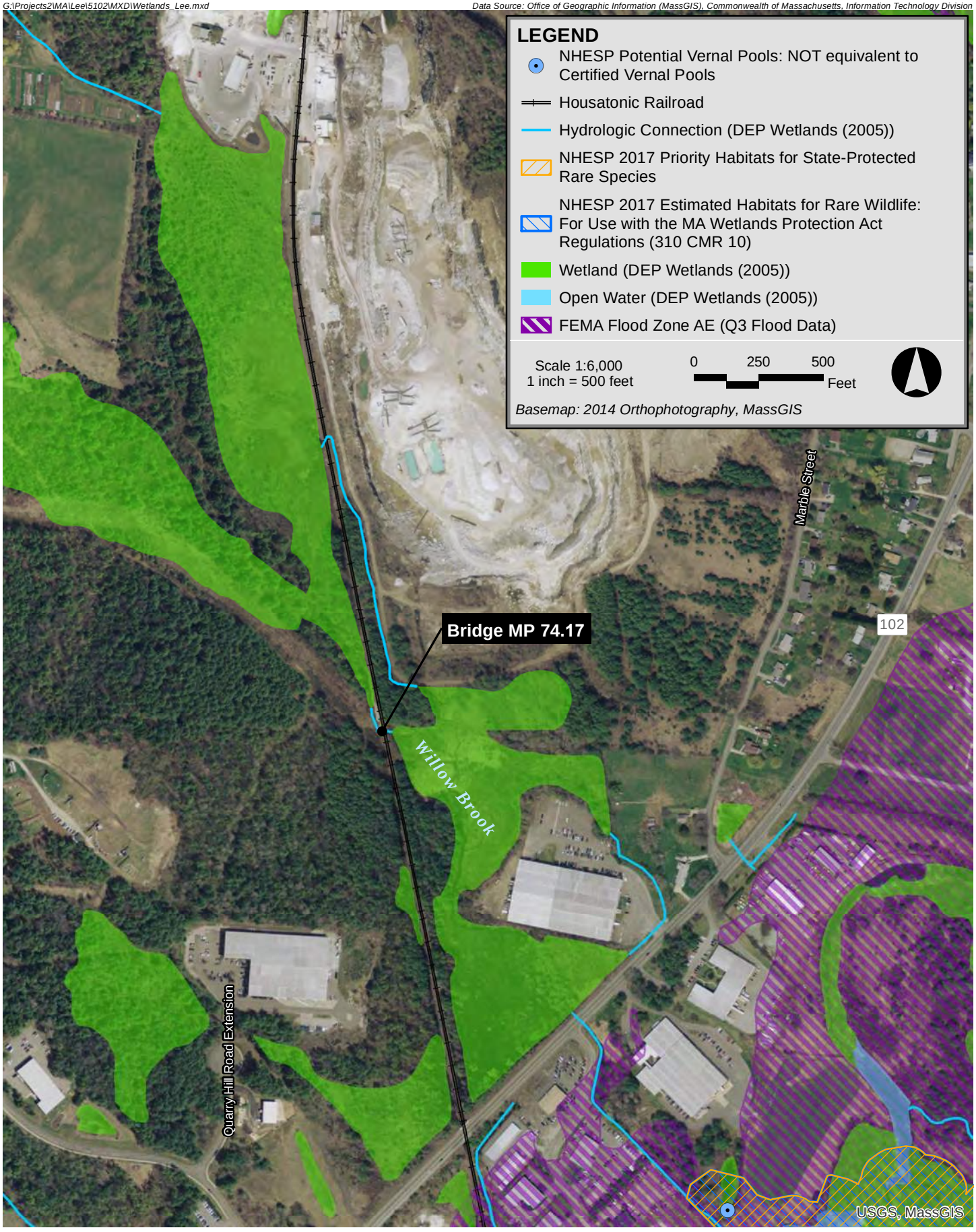
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

HDR Housatonic Bridge 77.16 Lee, Massachusetts

Epsilon Associates Inc.

Figure 2

Codding Brook Crossing Bridge 77.16: USGS Locus Map



HDR Housatonic Bridge 74.17 Lee, Massachusetts

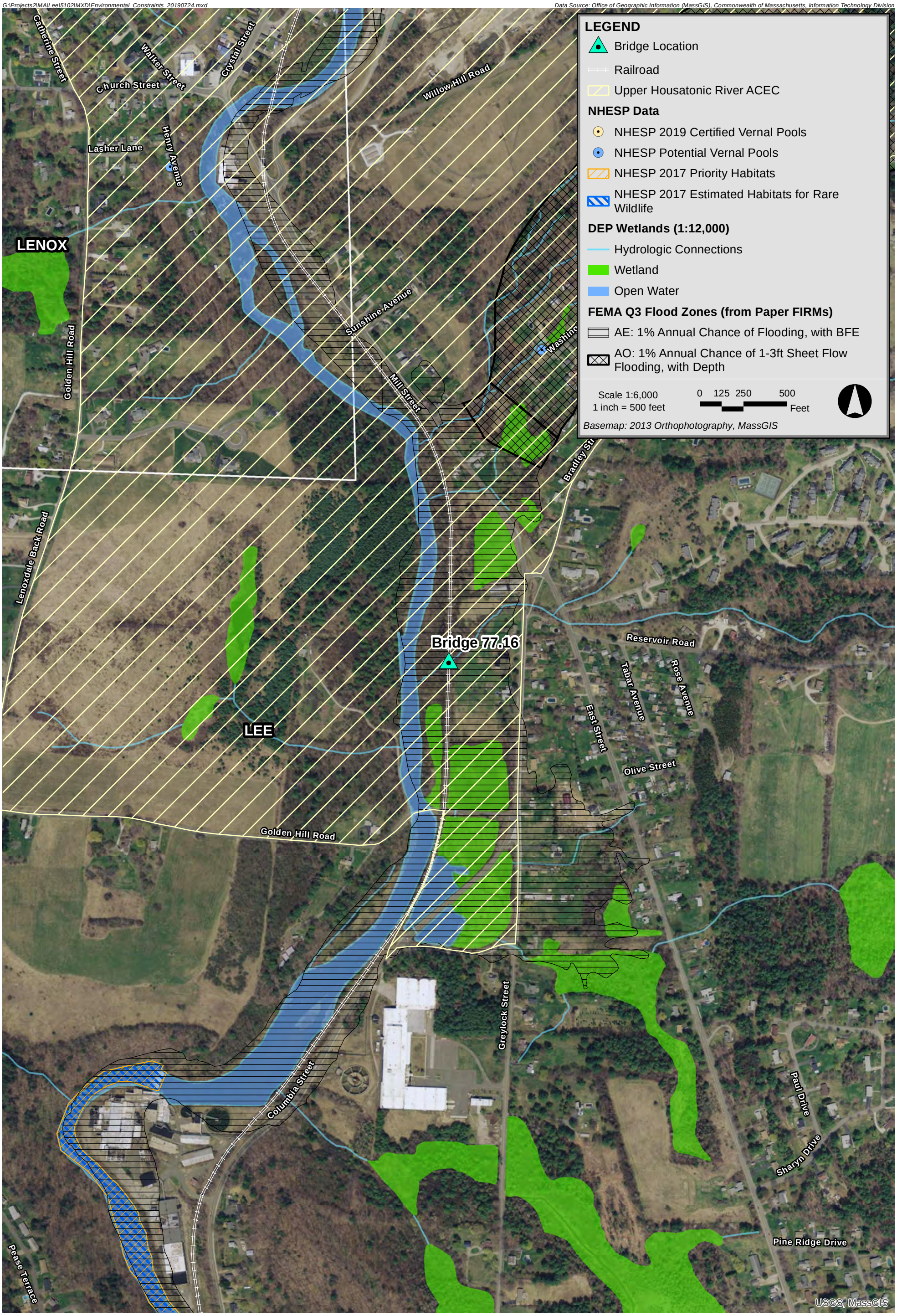
Epsilon Associates Inc.

Figure 3

Environmental Constraints Map

G:\Projects2\MA\Lee\5102\MXD\Environmental_Constraints_20190724.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

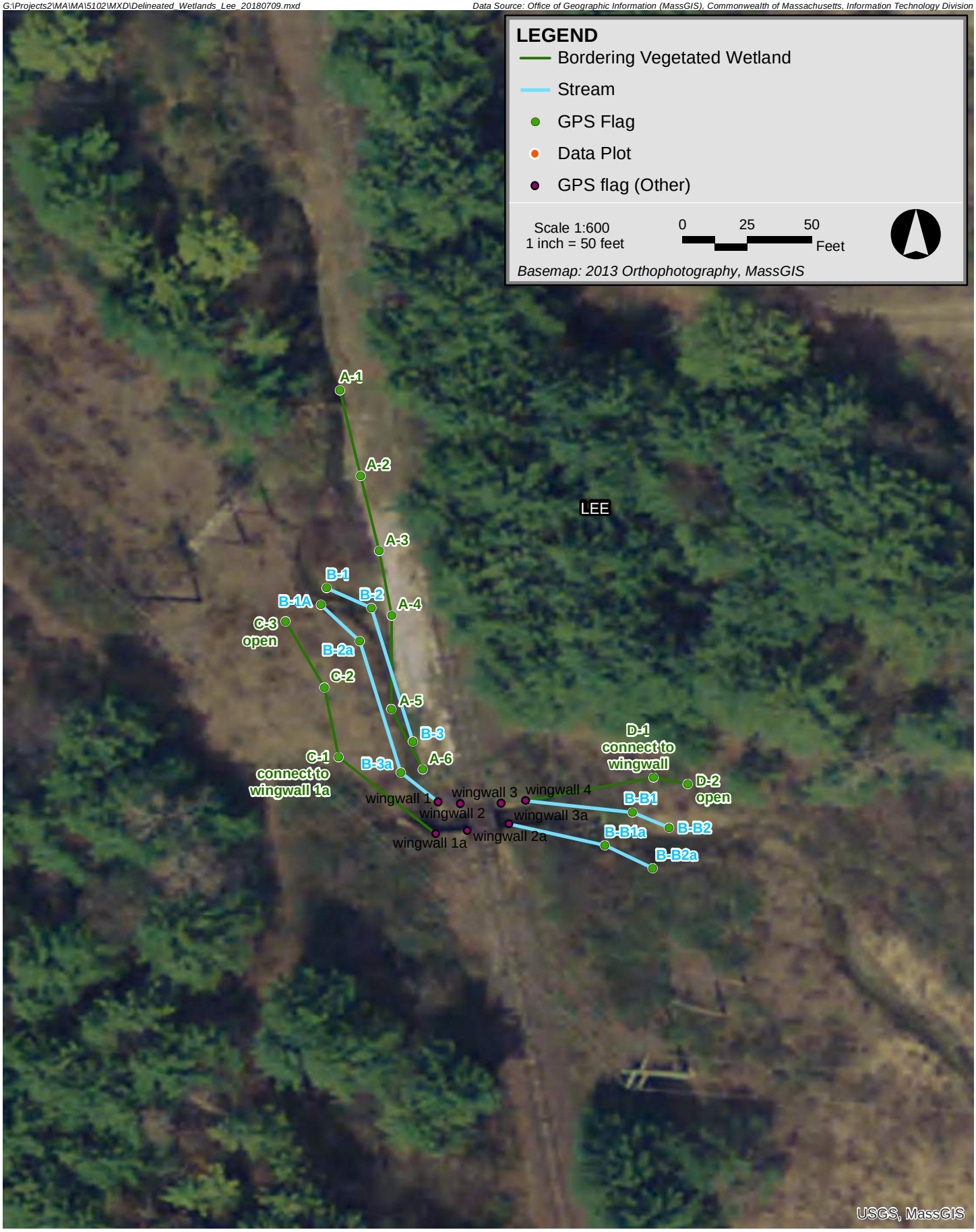


HDR Housatonic Bridge 77.16 **Lee, Massachusetts**

Epsilon Associates Inc.

Figure 4

Environmental Constraints Map



HDR Housatonic Bridge 74.17 **Lee, Massachusetts**

Figure 5
Delineated Wetlands

G:\Projects2\MA\MA\5102\MXD\Delineated_Wetlands_Lee_Codding_Brook_20181015.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

HDR Housatonic Bridge 77.16 Lee, Massachusetts

Figure 6

Delineated Wetlands - Codding Brook, Lee

Attachment B

Representative Photographs of the Study Area

Photo 1: View of bridge MP 74.17 over Willow Brook, looking west.

Photo 2: View of Willow Brook stream channel by flag B-B2, looking east. Wetland Series D extends to the left of the picture, north of the stream channel.

Photo 3: View of Willow Brook, looking north towards flag B-2a. Wetland Series C is to the left of the stream in this photograph, and Series A extends to the right of the stream along the toe of slope of the rail lines.

Photo 4: View of Wetland Series C associated with Willow Brook, looking southeast from Flag C-1 towards Bridge 74.17and flag A-6.

Photo 5: View of Bridge MP 77.16 over Codding Brook, looking North by wetland flag 114.

Photo 6: View of Bridge MP 77.16 and Codding Brook, looking southeast towards bank flag B-5.

Photo 7: View of Wetland Series 110, looking east towards flag 114.

Photo 8: View of Bridge MP 77.16 and Codding Brook, looking south.

Attachment C

Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: HDR Housatonic Bridge 74.17 City/County: Lee Sampling Date: 2018-10-03

Applicant/Owner: MassDOT State: Massachusetts Sampling Point: 207 up

Investigator(s): C. Gorss,J. Vaccaro Section, Township, Range: New England and Eastern New York Upland, Northern Part

Landform (hillslope, terrace, etc.): Hillslope Local Relief (concave, convex, none): Convex Slope (%): 30

Subregion (LRR or MLRA): MLRA Lat: 42.3243284086 Long: -73.2415788621 Datum: DD

Soil Map Unit Name: Winooski silt loam, 0 to 3 percent slopes NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (if no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation, Soil, or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point location, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- __ Surface Water (A1)
- __ High Water Table (A2)
- __ Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Water-Stained Leaves (B9)
- __ Aquatic Fauna (B13)
- __ Marl Deposits (B15)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres on Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- __ Thin Muck Surface (C7)
- __ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- __ Surface Soil Cracks (B6)
- __ Drainage Patterns (B10)
- __ Moss Trim Lines(B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Stunted or Stressed Plants (D1)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches):
Water Table Present?	Yes	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No X	Depth (inches):

Wetland Hydrology Present? Yes No X

Describe Recorded Data(stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants.

Sampling Point: 207 up

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratuum (Plot size: 15')			
1. Rubus hispidus	30	Y	FACW
2. Rosa multiflora	25	Y	FACU
3. Rhus typhina	5	N	FACU-
4.			
5.			
6.			
7.			
	60 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Trientalis borealis	10	Y	FAC
2. Fragaria virginiana	10	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Parthenocissus quinquefolia	10	Y	FACU
1. Celastrus scandens	5	Y	FACU
1.			
1.			
	15 = Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.33 (A/B)

Prevalence Index Worksheet:

	Total % Cover of:	Multiply by:
OBL species	0	x 1 = 0
FACW species	30	x 2 = 60
FAC species	10	x 3 = 30
FACU species	50	x 4 = 200
UPL species	0	x 5 = 0
Column Totals:	90 (A)	290 (B)

Prevalence Index = B/A = 3.22

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.01

___ 4 - Morphological Adaptations1 (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation1 (Explain)

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type	Loc		

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histisol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
__ Depleted Below Dark Suface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
__ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
__ High Chroma Sands (S11) **(LRR K, L)**
__ Loamy Mucky Mineral (F1) **(LRR K, L)**
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Marl (F10) **(LRR K, L)**

Indicators for Problematic Hydric Soils:

__ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
__ Coast Prairie Redox (A16) **(LRR K, L, R)**
__ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
__ Polyvalue Below Surface (S8) **(LRR K, L)**
__ Thin Dark Surface (S9) **(LRR K, L)**
__ Iron-Manganese Masses (F12) **(LRR K, L, R)**
__ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
__ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
__ Red Parent Material (F21)
__ Very Shallow Dark Surface (F22)
__ Other (Explain in Remarks)

Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rail Ballast

Depth (inches): 0

Hydric Soil Present? Yes ____ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: HDR Housatonic Bridge 74.17 City/County: Lee Sampling Date: 2018-10-03

Applicant/Owner: MassDOT State: Massachusetts Sampling Point: Point 207 wet

Investigator(s): C. Gorss,J. Vaccaro Landform Section, Township, Range: New England and Eastern New York Upland, Northern Part

(hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): MLRA Lat: 42.324316674 Long: -73.2416184247 Datum: DD

Soil Map Unit Name: Winooski silt loam, 0 to 3 percent slopes NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (if no, explain in Remarks.)

Are Vegetation_____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation_____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point location, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- X Sediment Deposits (B2)
- X Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- __ Aquatic Fauna (B13)
- __ Marl Deposits (B15)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres on Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- X Thin Muck Surface (C7)
- __ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- __ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- __ Moss Trim Lines(B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No Depth (inches): 0

Water Table Present? Yes X No Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No Depth (inches): 0

Wetland Hydrology Present? Yes X No

Describe Recorded Data(stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants.

Sampling Point: Point 207 wet

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	20	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Sapling/Shrub Stratuum (Plot size: 15')			
1. Cornus amomum	50	Y	FACW
2. Alnus incana	15	Y	FACW
3. Lonicera tartarica	5	N	UPL
4.			
5.			
6.			
7.			
	70	= Total Cover	
Herb Stratum (Plot size: 5')			
1.	50	Y	OBL
2. Onoclea sensibilis	10	N	FACW
3. Mitchella repens	5	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
1.			
1.			
1.			
	0	= Total Cover	

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

	Total % Cover of:	Multiply by:
OBL species	70	x 1 = 70
FACW species	75	x 2 = 150
FAC species	0	x 3 = 0
FACU species	5	x 4 = 20
UPL species	5	x 5 = 25
Column Totals:	155 (A)	265 (B)

Prevalence Index = B/A = 1.71

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

_X_ 2 - Dominance Test is >50%

_X_ 3 - Prevalence Index is ≤3.01

___ 4 - Morphological Adaptations1 (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation1 (Explain)

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Point 207

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type	Loc		
0-6"	10YR 2/1	100					Muck	
6-20"	10YR 3/1	100					Sandy Loam	

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histisol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
X Depleted Below Dark Suface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
__ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
__ High Chroma Sands (S11) **(LRR K, L)**
__ Loamy Mucky Mineral (F1) **(LRR K, L)**
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Marl (F10) **(LRR K, L)**

Indicators for Problematic Hydric Soils:

__ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
__ Coast Prairie Redox (A16) **(LRR K, L, R)**
__ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
__ Polyvalue Below Surface (S8) **(LRR K, L)**
__ Thin Dark Surface (S9) **(LRR K, L)**
__ Iron-Manganese Masses (F12) **(LRR K, L, R)**
__ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
__ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
__ Red Parent Material (F21)
__ Very Shallow Dark Surface (F22)
__ Other (Explain in Remarks)

Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X **No** ____

Remarks:

Water at 6"

DOCUMENT A00831

ARMY CORPS OF ENGINEERS

VERIFICATION AND GENERAL PERMIT

THIS PAGE IS INTENTIONALLY LEFT BLANK

U.S. Army Corps of Engineers (USACE)

SELF-VERIFICATION NOTIFICATION (SVN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose This information will be used in evaluating activities under Self-Verification procedures within Massachusetts.

Routine Uses Routine uses will include: (1) Documenting compliance with the terms and conditions of the General Permit (GP) for activities that may require authorization pursuant to one or more of USACE's Regulatory authorities. (2) Records may be referred to other Federal, State, and local agencies for evaluation and enforcement purposes.

Disclosure Failure to fully comply and abide by the GP terms and conditions prior to commencing work and after completion project may result in formal enforcement action, up to and including monetary penalties and/or legal action, pursuant to 33 CFR Part 326.

Instructions The permittee must complete ALL required sections of this document before commencing USACE-regulated activities. A copy of this completed SVN must be kept on site during construction and be made available for review by USACE and other Federal, State, & Local regulatory authorities at any time. Within 30 days of initiating project construction, the permittee shall submit the completed SVN to USACE. The SVN shall be submitted to USACE as **ONE signed document** that includes project plans and documentation that supports each field (e.g., emails, letters, description, phone calls, surveys). Electronic submissions to the following address are strongly preferred: cenae-r-ma-sv@usace.army.mil. The email subject line shall contain the following: GP #, SVN, City/Town, and date submitted.

(ITEMS 1 THRU 3 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED

APPLICANT AND AGENT INFORMATION

4. APPLICANT'S NAME	7. AGENT'S ADDRESS:
First - Scott Middle - Last - Conti	First - Alyssa Middle - Last - Jacobs
Company - Massachusetts Department of Transportation	Company - Epsilon Associates Inc.
E-mail Address - scott.conti@dot.state.ma.us	E-mail Address - ajacobs@epsilonassociates.com
5. APPLICANT'S ADDRESS:	**8. AGENT'S ADDRESS:**
Address- 10 Park Plaza	Address- 3 Mill & Main, Suite 250
City - Boston State - MA Zip - 02116 Country - USA	City - Maynard State - MA Zip - 0175 Country - U
6. APPLICANT'S PHONE NOs. w/AREA CODE	**9. AGENTS PHONE NOs. w/AREA CODE**
a. Residence b. Business c. Fax	a. Residence b. Business c. Fax
(857) 368-8965	(978) 461-6271

NAME, LOCATION, AND DESCRIPTION OF PROJECT SITE

10. PROJECT NAME OR TITLE
Bridge Replacement Willow Brook (Bridge 74.17)

11. FILE NUMBER(S) OF PREVIOUS USACE ACTIONS ON THE SITE (if applicable)	12. NAME OF WATERBODY
	Willow Brook
13. PROJECT COORDINATES (in decimal degrees)	**14. PROJECT STREET ADDRESS (if applicable)**
Latitude: ◦N Longitude: ◦W	Address Mile Marker 74.17 Housatonic Rail Line
42.28714 -73.25062	City - Lee State - MA Zip - 01238

ACTIVITY TYPE, PROJECT IMPACTS, AVOIDANCE & MINIMIZATION

15. GENERAL PERMIT ACTIVITIES (CHECK ALL THAT APPLY)

1 ☐	6 ☐	11 ☐	16 ☐	21 ☐
2 ☐	7 ☐	12 ☐	17 ☐	22 ☐
3 ☐	8 ☐	13 ☐	18 ☐	23 ☑
4 ☐	9 ☐	14 ☐	19 ☐	24 ☑
5 ☐	10 ☐	15 ☐	20 ☐	25 ☐

16. SUMMARY OF PROJECT IMPACTS (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration
waterway 204			Perm.
wetland 37			Temp.
waterway 202	36		Temp.
			Temp.
			Temp.

17. PROJECT PLANS (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE ITEMS ARE COMPLETE) (*see instructions*)

- [x] a. Plans shall at least contain the following: Vicinity Map, Plan View, and Typical Cross Section View of the proposed activity.
- [x] b. All direct, indirect and secondary impacts from USACE regulated activities are shown on the project plans.
- [x] c. The size of the impact area for each activity (acre, square feet, linear feet) are shown on the project plans.
- [x] d. For discharges of fill material (§404), the volume of fill material is identified on the project plans.
- [x] e. The duration of each impact, permanent or temporary (X days), is identified on the project plans.
- [x] f. Do activities with permanent impacts result in the loss of waters? If so, this is identified on the project plans.
- [x] g. All aquatic resources in the vicinity of the USACE regulated activities are delineated on the project plans.

18. AVOIDANCE & MINIMIZATION (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE CRITERIA ARE MET) (*see instructions*)

- [x] a. The project has been designed to avoid and minimize impacts to aquatic resources.
- [x] b. The footprint of activities in waters of the U.S. has been reduced to only what is necessary to achieve the overall project purpose.
- [x] c. All practicable measures have been taken to avoid and minimize impacts to aquatic resources through construction techniques and site access (e.g., Best Management Practices, Time of Year Restrictions).
- [x] d. All temporary impacts from USACE regulated activities will be restored upon completion of construction and the project area will be returned to pre-construction contours and conditions.

COMPLIANCE WITH FEDERAL REGULATIONS & SUPPLEMENTAL INFORMATION

19. DUE DILIGENCE (*see instructions*)

Complete the entries below to document compliance with the following Federal requirements. Construction may NOT begin if a PCN is/may be required, and you must contact USACE to determine permitting requirements. Documentation that demonstrates how the activity complies with each field below shall be submitted to the USACE as noted in the instructions block. See each General Condition (GC) in the GP for how to comply with each requirement.

a. State Historic Preservation Officer	Per Appendix A, SHPO was notified and they did not respond with concerns within 30 days.
b. Massachusetts BUAR	Per Appendix A, BUAR was notified and they did not respond with concerns within 30 days.
c. Tribal Historic Preservation Officers	The Tribe(s) were notified and they didn't respond with concerns within 30 days.
d. Endangered Species Act - NOAA	The activity is not located within the ESA-listed Species Range.
e. Endangered Species Act - USFWS	The activity is not located within the ESA-listed Species Range.
f. Northern Long Eared Bat (ESA)	No effect determination reached with the Rangewide D-Key. See Instructions below.*
g. Essential Fish Habitat	The project footprint does not contain EFH (see EFH definition in the MA GP).
h. Wild & Scenic Rivers	There are no WSR's within 0.25 miles of the project area.
i. 401 Water Quality Certification 401	The activity qualifies under the general 401 WQC for the 2023 MA GPs.
	401 WQC/OOC File Number: OOC issued: 4/7/25 401 issued:
j. Section 408 Permission	Not Required per GC 15a-f, no Federal Projects are within the project vicinity.
k. Coastal Zone	The project is not located within the coastal zone.
l. Construction Mats	N/A, the activity does not require the installation of construction mats.
m.Time of Year Restrictions	N/A, the project is not located in a waterbody that has TOY restrictions.
n. Vernal Pools	Per GC 28, the project is not located in a vernal pool.
o. Sediment & Erosion Controls	Per GC 25, the activity uses BMPs to avoid/minimize sedimentation & erosion.
p. Stream/Wetland Crossings	The activity complies with all applicable terms in GC 31.

20. AQUACULTURE ACTIVITIES - GP 18 (*see instructions*)

- [ ] a. If required, an Aquaculture Certification from the Massachusetts Division of Marine Fisheries was obtained prior to commencing work.
- [ ] b. Coordination with the U.S. Coast Guard pursuant to Private Aids to Navigation has occurred prior to commencing work.
- [ ] c. If required, a MEPA Certificate was obtained from the Massachusetts Environmental Protection Agency prior to commencing work. Not Required
- [ ] d. The prospective permittee contacted local authorities (e.g. harbormaster, select board, shellfish constable) for authorization of their facility prior to commencing work.

21. ADDITIONAL INFORMATION/ATTACHMENTS (*see instructions*)

- [x] a. The project plans are enclosed in this SVN submittal (see block 17).
- [x] b. The activity IS NOT funded through the Bipartisan Infrastructure Bill (also known as the Infrastructure Investment and Jobs Act).
- [x] c. All required state, local and federal approvals were acquired prior to starting construction in USACE jurisdiction.
- [x] d. After construction of the activity is completed, a complete Certificate of Compliance will be submitted to USACE.

22. IS THERE ANOTHER LEAD FEDERAL AGENCY:

- [ ] YES
- [x] NO

23. STATEMENT OF AUTHORIZATION *(see instructions)*

I certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Scott Conti	4/28/25		
SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

24. SIGNATURES *(see instructions)*

I hereby certify that the information in this Self-Verification Notification is complete and accurate. As the applicant or their duly authorized agent, I certify the activity was completed in accordance with the terms and conditions of the GP. This includes all applicable terms, general conditions, and activity-specific GP criteria. I agree to allow the duly authorized representatives of the Corps of Engineers Regulatory Program and other regulatory or advisory agencies to enter upon the premises of the project site at reasonable times to evaluate inspect and photograph site conditions. This consent to enter the property is superior to, takes precedence over, and waives any communication to the contrary. For example, if the property is posted as “no trespassing” this consent specifically supersedes and waives that prohibition and grants permission to enter the property despite such posting.

Scott Conti	4/28/25		
SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a
Department of the Army
General Permit (GP) Self-Verification

Blocks 1 through 3. To be completed by the Corps of Engineers.

Block 4. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the self-verification, please attach a sheet of paper with the necessary information marked Block 4.

Block 5. Address of Applicant. Please provide the full address of the party or parties responsible for the self-verification. If more space is needed, attach an extra sheet of paper marked Block 5.

Block 6. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 7 through 9. To be completed, if you choose to have an agent.

Block 7. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 8 and 9. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 10. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 11. File Number(s) of Previous USACE Actions on the Site Please provide any known USACE file number. If the activity does not have a known USACE file number, you may state N/A.

Block 12. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 13. Proposed Activity Coordinates. Please enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 13.

Block 14. Proposed Activity Street Address. If the proposed activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. General Permit Activity Type. Please select all GP activity types that apply to the proposed activity. A list of GP activity types can be found in Section III of the GP.

Block 16. Summary of Project Impacts. Please provide ALL proposed impacts, both temporary and permanent in duration, that are located in Waters of the United States. The area of impact shall be provided in square feet (SF). When applicable, impacts that result in conversion of stream bank or shoreline must also be identified in linear feet (LF). Dredging or the discharge of dredged or fill material shall also include the volume, cubic yards (CY), of material removed from or placed into Waters of the U.S. If more entries are required, please attach a table matching the desired format in Block 16.

Block 17. Project Plans. Please verify that items a-g are included in the project plans. Three types of illustrations are necessary to properly depict the proposed work. These illustrations or drawings are identified as a Vicinity Map, a Plan View (Aerial view) and a Cross Section Map. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings (longitudinal profile) should also be included. Plans must accurately depict the existing conditions and all aspects of the proposed activity located in waters of the U.S. Please submit one copy of all drawings formatted to print on 8½ x 11 inch or 11 x 17 inch plain white paper. Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be certified engineering sheets; they should be clear, accurate, contain all necessary information, and depict all proposed work. Each submission must also include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by USACE.

Block 18. Avoidance & Minimization. Please verify that items a-d have been implemented for the proposed activity.

Block 19. Due Diligence. Please complete all the fields and submit documentation to USACE to demonstrate compliance with the above requirements. This Documentation may include emails, letters, meeting notes, phone call log, project narrative, project plans, a species list from the NOAA Section 7 Mapper, a completed copy of the IPAC determination keys, etc. Documentation should be limited to what is necessary to demonstrate how the proposed activity meets each requirement. Refer to the MA GP, Appendix A, for specific guidance on the identification of previously identified historic properties and previously unidentified historic properties. Endangered Species: *The applicant must be designated as the non-federal representative for the purposes of Section 7 consultation to select the Rangewide D-Key options. Otherwise, the applicant shall select the following option when IPAC indicates the NLEB is present: "The activity IS located within the NLEB Species Range (PCN Required)."

Block 20. Aquaculture Activities. Please verify that items a-d have been obtained or completed prior to commencing work in waters of the U.S.

Block 21. Additional Information/Attachments. Please verify that items a-d have been completed prior to commencing work in waters of the U.S.

Block 22. Lead Federal Agency. Please identify if there is another lead federal agency involved with the proposed activity. Enter the lead federal agency name (e.g., the Federal Emergency Management Agency, FEMA) and the agency's designated person of contact for the activity.

Block 23. Statement of Authorization. The applicant shall sign this section for all activities. If an agent is to be employed, the agent shall sign this section.

Block 24. Signatures. The SVN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the SVN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the SVN possesses the requisite property rights to undertake the GP activity.

THIS PAGE IS INTENTIONALLY LEFT BLANK

Project Summary

On behalf of the Massachusetts Department of Transportation – Rail & Transit Division ("MassDOT-Rail"), (the "Applicant"), Epsilon Associates, Inc. ("Epsilon") is pleased to submit this Self Verification Notification ("SVN") to U.S. Army Corps of Engineers (USACE) for work associated with the proposed bridge replacement with a culvert at Willow Brook (Bridge 74.17).The Willow Brook bridge is part of a group of bridges along the Housatonic Railroad line in Lee, MA (the "Project Area"). The proposed Willow Brook bridge replacement will occur along the railroad line right-of-way at mile marker 74.17 in Lee, MA (see Attachment C, Figures 1 and 2). This bridge is a 11-foot single span timber superstructure with an open timber deck on masonry abutments and wingwalls. The bridge carries one track on a flat profile. Willow Brook, a USGS-mapped perennial flows west to east beneath the bridge. The bridge construction date is unknown. The brook then flows easterly to the Housatonic River approximately 500 feet away. The bridge is in fair condition with one beam in poor condition. Additionally, the bearing timbers at the north abutment exhibits crushing and splitting.

Attachments included in this SVN submittal include: completed Self Verification Notification form ("Atachment A"), USGS Map and Environmental Constraints Map ("Attachment B"), photos of the Project Site ("Attachment C"), and permit drawings depicting Project Plans ("Attachment D").

The project site has been previously delineated by wetland scientists, in accordance with the U.S. Army Corps of Engineers Wetland Delineation Manual (USACE, 1987), and the "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0" (2012).

The Applicant is proposing to replace the timber deck bridge and stone abutments with a pre-cast concrete culvert. The proposed replacement culvert will match the existing cross section. Stone walls east and west of the culvert will remain and thus will continue to contain Willow Brook up and downstream. As described, the majority of the work footprint will occur within the previously disturbed areas of railroad and embankment. Temporary impacts at Bridge 74.17 will result from site access, equipment and material stockpiling, excavation and grading relative to the bridge replacement and culvert installation work, and the installation of the coffer dam, dewatering, and temporary flow diversion. All work will be conducted within the railroad right-of-way. Permanent impacts are associated with the installation of the box culvert totaling 204 square feet of waterway and 12 feet of stream bank. The box culvert will be set at a lower position and in-filled with two feet of natural stream bed material. Bank in this location is the stone abutment walls. All temporary impacts will be restored in kind via grading to pre-existing contours and revegetation.

Compliance with Massachusetts Stream Crossing Standards

Spans that preserve the natural stream channel are strongly preferred.

A replacement span is infeasible in this location due to the site constraints described above under Section 3.0.

Crossing Span – Minimum 1.2 times bankfull width.

The bridge replacement and culvert installation at Bridge 74.17 is being proposed to meet the Stream Crossing Standards to the maximum extent practicable, but it is not proposed to expand the crossing width to meet the 1.2 time bankfull width requirement. A crossing of 10.3 feet wide in order to meet the 1.2 times bankfull width standard is not feasible in this location without significant additional work to raise the track bed to provide the depth for installation as well as significant instream work up and downstream of the bridge to remove the existing stone wall. Therefore, relief from this performance standard is being requested under the limited projects provisions.

There are no proposed alterations to the crossing span at Bridge 77.28.

Substrate – natural bottom substrate within the structure.

The box culvert will be embedded two feet with natural bottom substrate. Natural bottom substrate will be stockpiled from the existing stream bed and replaced within the culvert bottom. A natural low stream channel will be constructed within the culvert.

There are no proposed alterations to existing bottom substrate at Bridge 77.28.

Water Depth and Velocity – Designed with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows.

Water depths and velocities within the new culvert will be comparable to those in the existing crossing.

There are no proposed alterations at Bridge 77.28.

Openness > 0.82 feet (0.25 meters)

The proposed culvert has an openness value of 2.6 feet (including the 2-foot embedment), which is significantly greater than 0.82 feet.

There are no proposed alterations at Bridge 77.28.

Banks should be present on each side of the stream matching the horizontal profile of the existing stream and banks.

No modification to the banks up and downstream of the proposed bridge replacement is proposed as part of this project. The existing stone walls will remain.

Attachment B

Figures

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

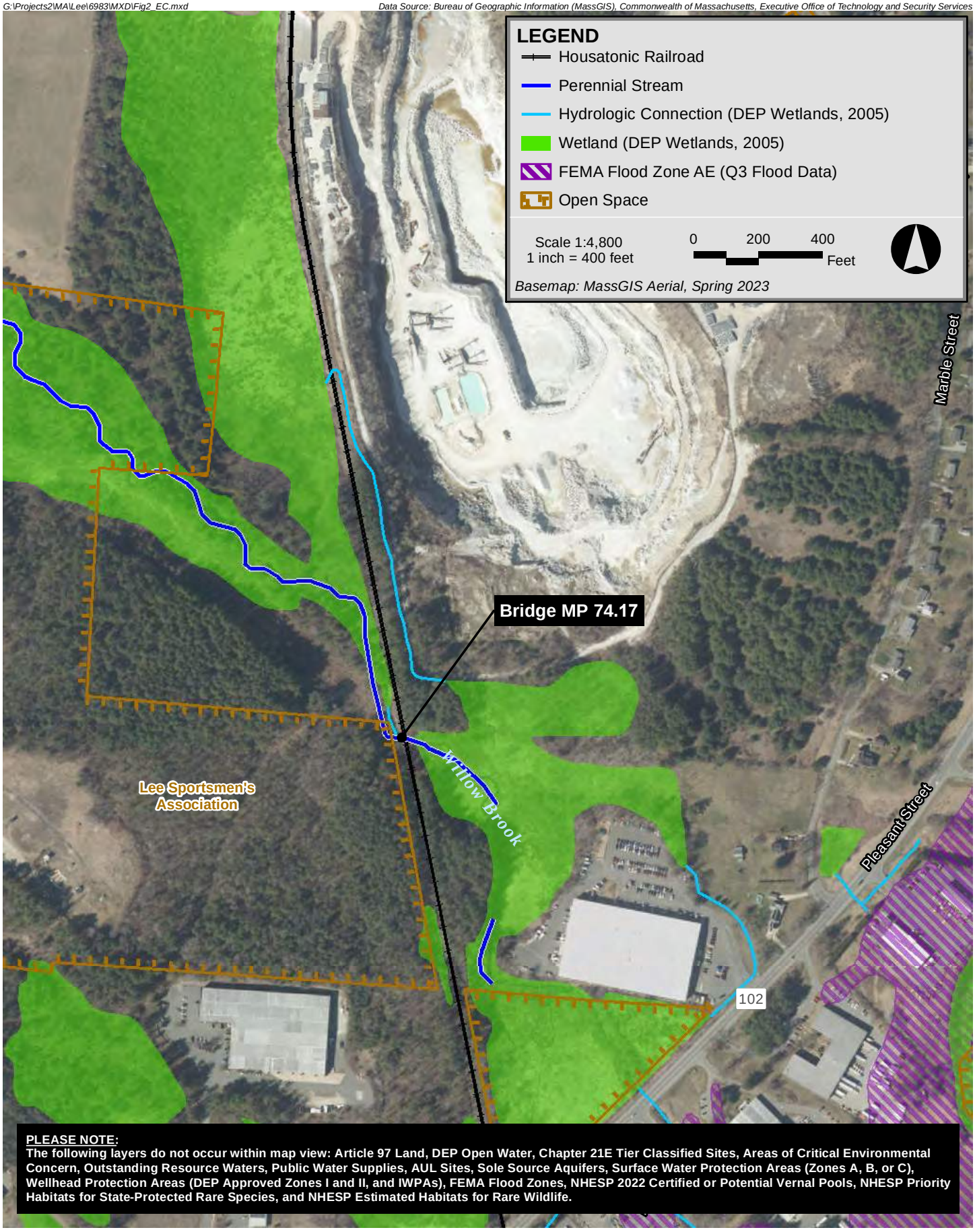
HDR Housatonic Bridge 74.17 Lee, Massachusetts

Epsilon Associates Inc.

Figure 1

Willow Brook Crossing: USGS Locus Map

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



HDR Housatonic Bridge 74.17 Lee, Massachusetts

Epsilon Associates Inc.

Figure 2

Bridge 74.17: Environmental Constraints Map

Attachment C

Site Photos

Photo 1: View of bridge MP 74.17 over Willow Brook, looking west.

Photo 2: View of Willow Brook stream channel by flag B-B2, looking east. Wetland Series D extends to the left of the picture, north of the stream channel.

Photo 3: View of Willow Brook, looking north towards flag B-2a. Wetland Series C is to the left of the stream in this photograph, and Series A extends to the right of the stream along the toe of slope of the rail lines.

Photo 4: View of Wetland Series C associated with Willow Brook, looking southeast from Flag C-1 towards Bridge 74.23 and flag A-6.

Attachment D

Figures

FABRICATION

CONCRETE

1. PRODUCTION PROCEDURES AND DIMENSIONAL TOLERANCES FOR THE MANUFACTURE OF PRECAST. PRESTRESSED GIRDERS SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL FOR RAILWAY ENGINEERING AND THE PRESTRESSED CONCRETE INSTITUTES CURRENT MANUALL MNL –116 FOR QUALITY CONTROL.
2. TOLERANCE FOR LOCATION OF LIFTING LOOPS SHALL BE ± 1/2".
3. THE ENDS OF THE STRANDS SHALL BE CUT OFF FLUSH WITH THE END OF THE BEAM AND PAINTED. RECESSES AND MINOR SPALLS MUST BE FILLED AND FINISHED TO THE PLAN DIMENSIONS USING AN EPOXY BONDING COMPOUND AND GROUT.
4. CONCRETE CURB SHALL BE CAST AFTER THE GIRDER IS REMOVED FROM THE FORM.
5. CONCRETE BONDING AGENT: REFER TO SPECIFICATIONS.
6. SURFACES SHALL BE FORMED IN A MANNER WHICH WILL PRODUCE A SMOOTH AND UNIFORM APPEARANCE WITHOUT RUBBING OR PLASTERING. UNLESS OTHERWISE NOTED, EXPOSED EDGES OF 90–DEGREES OR LESS ARE TO BE CHAFFERED 3/4" X 3/4". UNFORMED SURFACES SHALL HAVE A SMOOTH FINISH FREE OF ALL FLOAT AND TROWEL MARKS.
7. THE FABRICATOR SHALL STENCIL THE FABRICATOR'S NAME, DATE OF FABRICATION PLACE MARK AND LIFTING WEIGHT ON EACH PIECE.
8. FABRICATOR IS RESPONSIBLE FOR ADEQUACY OF LIFTING DEVICES.
9. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
10. ALL BAR–BENDING AND STANDARD HOOK DIMENSIONS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE" AS PUBLISHED BY THE CONCRETE REINFORCING STEEL INSTITUTE UNLESS OTHERWISE SHOWN OR NOTED.

CONSTRUCTION

GENERAL

1. THE CONTRACTORS'S ATTENTION IS CALLED TO THE FACT THAT CONTINUOUS COORDINATION WITH THE OPERATOR, HOUSATONIC RAILROAD COMPANY (HRRC), WILL BE REQUIRED THROUGHOUT CONSTRUCTION. HRRC WILL PROVIDE THE CONTRACTOR WITH FLAGGERS FOR PROTECTION FROM RAILROAD TRAFFIC WHILE WORK IS BEING PERFORMED ON THE RAILROAD RIGHT–OF–WAY (R.O.W.). THE CONTRACTOR SHALL NOT ENTER THE R.O.W. AT ANYTIME WITHOUT HRRC AUTHORIZATION. THE CONTRACTOR WILL ALSO BE REQUIRED TO OBTAIN R.O.W. TRAINING PRIOR TO WORKING IN THE R.O.W.
2. ALL WORK SHALL BE PERFORMED DURING A SERIES OF SHUTDOWNS OF RAILROAD TRAFFIC. THE CONTRACTOR SHALL COORDINATE ALL SHUTDOWNS WITH HRRC. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION REGARDING SPECIFIC DATES, LENGTH OF SHUTDOWNS, AND LIQUIDATED DAMAGE PENALTIES FOR EXCEEDING AUTHORIZED TIME LIMITS.
3. ALL CONSTRUCTION AND ACCESS SHALL BE WITHIN THE R.O.W. UNLESS OTHERWISE APPROVED BY THE PROPERTY OWNER(S) AND MASSDOT. THE CONTRACTOR SHALL COORDINATE DIRECTLY WITH THE PROPERTY OWNER(S) TO OBTAIN WRITTEN APPROVAL OF LAND USE OUTSIDE THE R.O.W. THE CONTRACTOR SHALL SUBMIT COPIES OF WRITTEN PROPERTY AGREEMENTS TO THE RESIDENT ENGINEER.
4. ANY DAMAGE TO REMAINING EXISTING COMPONENTS THAT IS CAUSED BY THE CONTRACTOR'S ACTIVITY SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AS DIRECTED AND APPROVED BY THE ENGINEER, AT NO ADDITIONAL EXPENSE TO THE BRIDGE OWNER OR RAILROAD OPERATOR.
5. THE CONTRACTOR SHALL PROVIDE SAFE ACCESS TO ALL AREAS OF WORK ON THE BRIDGE FOR THE ENGINEER'S INSPECTIONS. COSTS SHALL BE INCLUDED IN MOBILIZATION.
6. ALL EXISTING MATERIALS NOT REUSED OR RESET AS PART OF THIS PROJECT SHALL BE CONSIDERED WASTE MATERIAL. ALL WASTE MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF. ALL TREATED TIMBER SHALL BE DISPOSED OF ONLY AT AN APPROVED FACILITY.
7. COORDINATE RAIL TRAFFIC SHUTDOWNS AND THE USE OF TEMPORARY STAGING AREA DURING THE SHUTDOWN WITH THE RAILROAD.

ENVIRONMENTAL:

1. THE CONTRACTOR SHALL PREVENT ANY CONSTRUCTION DEBRIS FROM ENTERING THE WATERWAYS, PUBLIC OR PRIVATE PROPERTY, OR TRAVELED WAYS DURING CONSTRUCTION. ALL WASTE MATERIAL GENERATED AS PART OF THIS PROJECT SHALL BE DISPOSED OF OFF SITE.
2. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE STATUES AND REGULATIONS RELATING TO THE PREVENTION AND ABATEMENT OF ALL POLLUTION.
3. SEE SPECIFICATIONS FOR REQUIREMENTS FOR WORKING AT PROJECT SITE.

ABBREVIATIONS:

B.F.	BACK FACE
BOT.	BOTTOM
E.F.	EACH FACE
EL. OR ELEV.	ELEVATION
EQ. SP.	EQUALLY SPACED
F.F.	FRONT FACE
R/F	REINFORCEMENT
TYP.	TYPICAL
W.P.	WORKING POINT

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

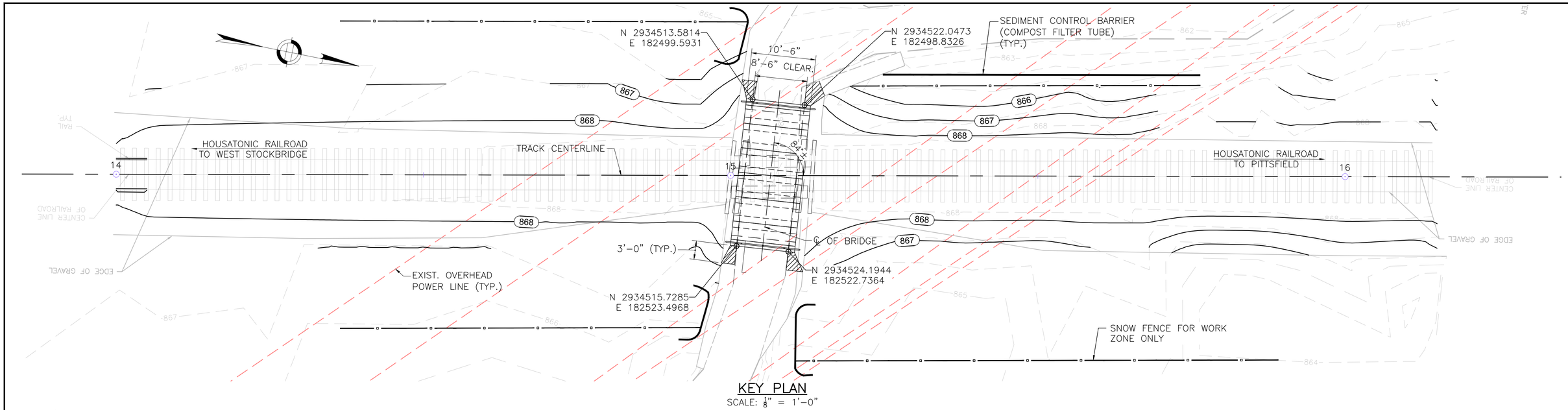
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK STRUCTURAL GENERAL NOTES

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

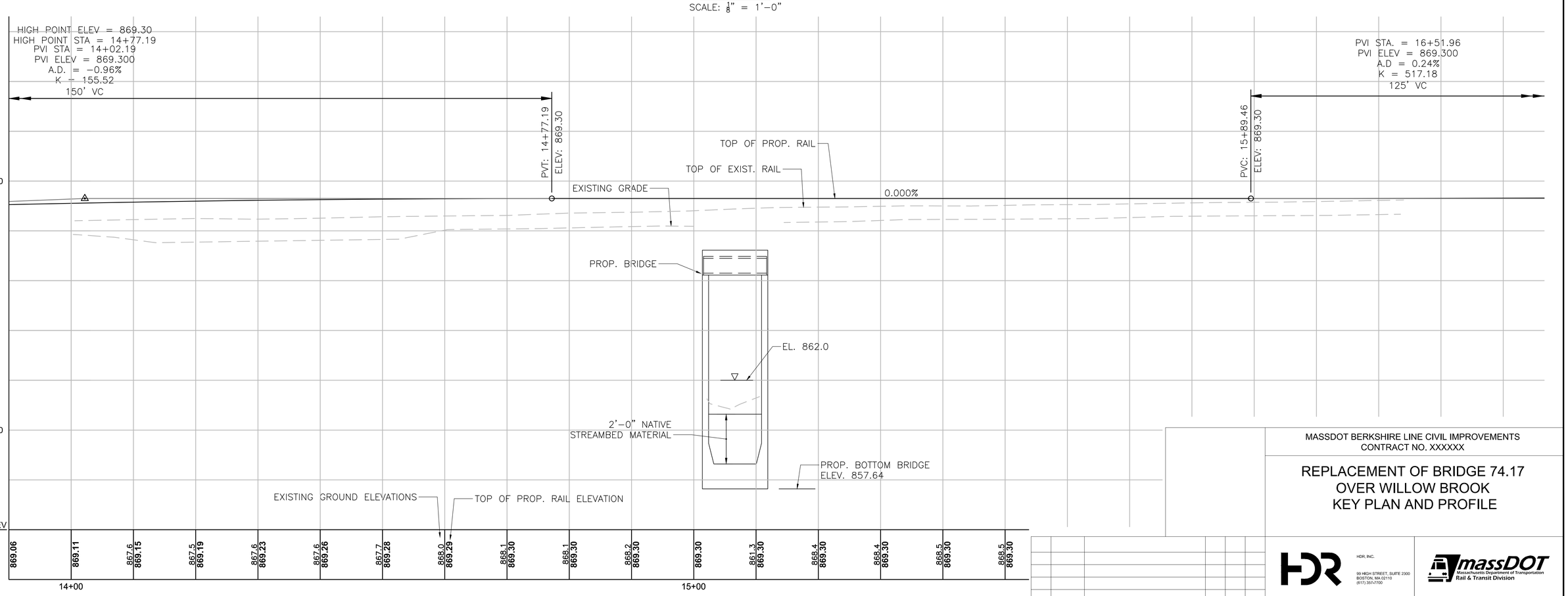
massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S–201	



KEY PLAN

SCALE: 1/8" = 1'-0"



PROFILE ALONG TRACK CENTERLINE

HORIZONTAL SCALE: 1" = 8'-0"
VERTICAL SCALE: 1" = 2-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

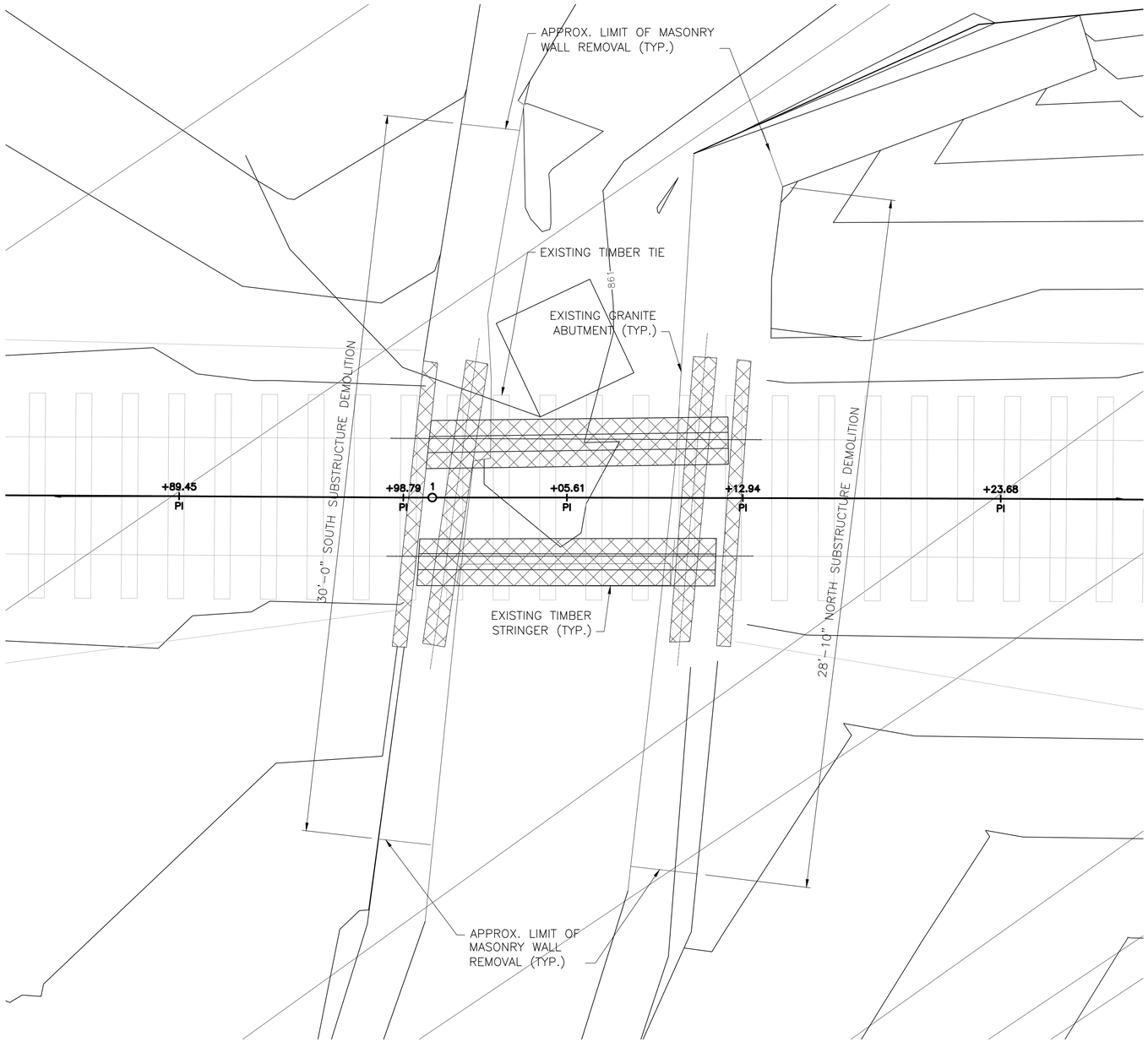
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK KEY PLAN AND PROFILE

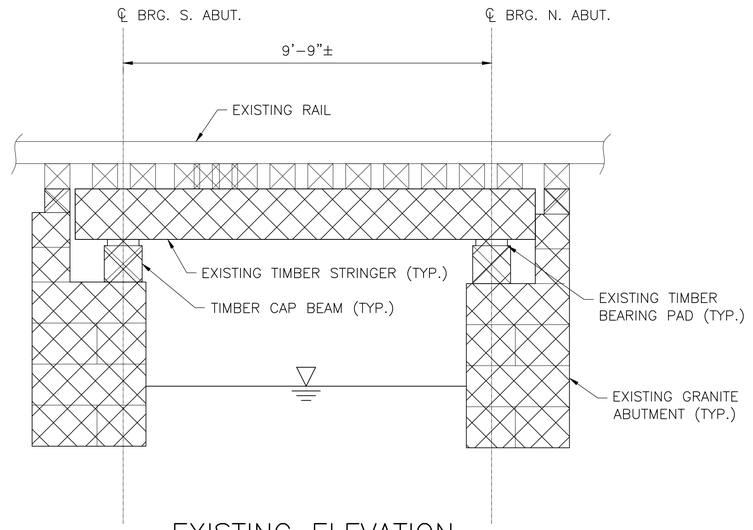
ISSUE	DATE	DESCRIPTION	BY	CH'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

MassDOT Massachusetts Department of Transportation Rail & Transit Division

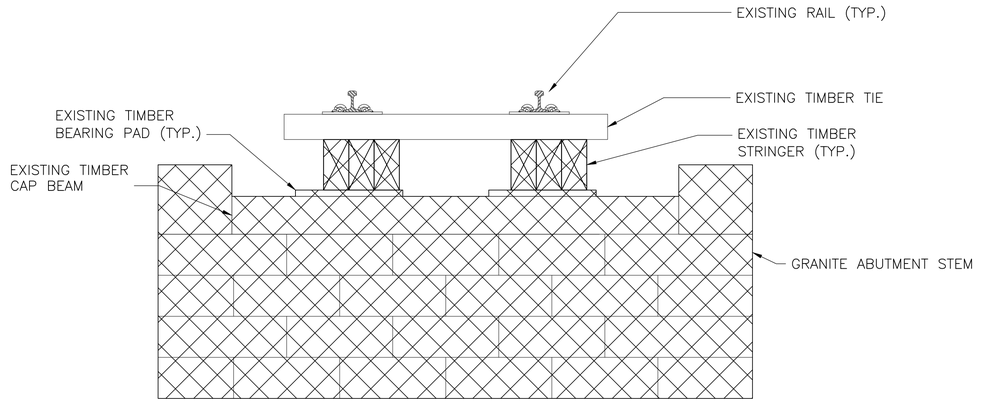
SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S-202	





EXISTING ELEVATION

SCALE: $\frac{1}{2}$" = 1'-0"



EXISTING – TYPICAL ABUTMENT ELEVATION

SCALE: $\frac{1}{2}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

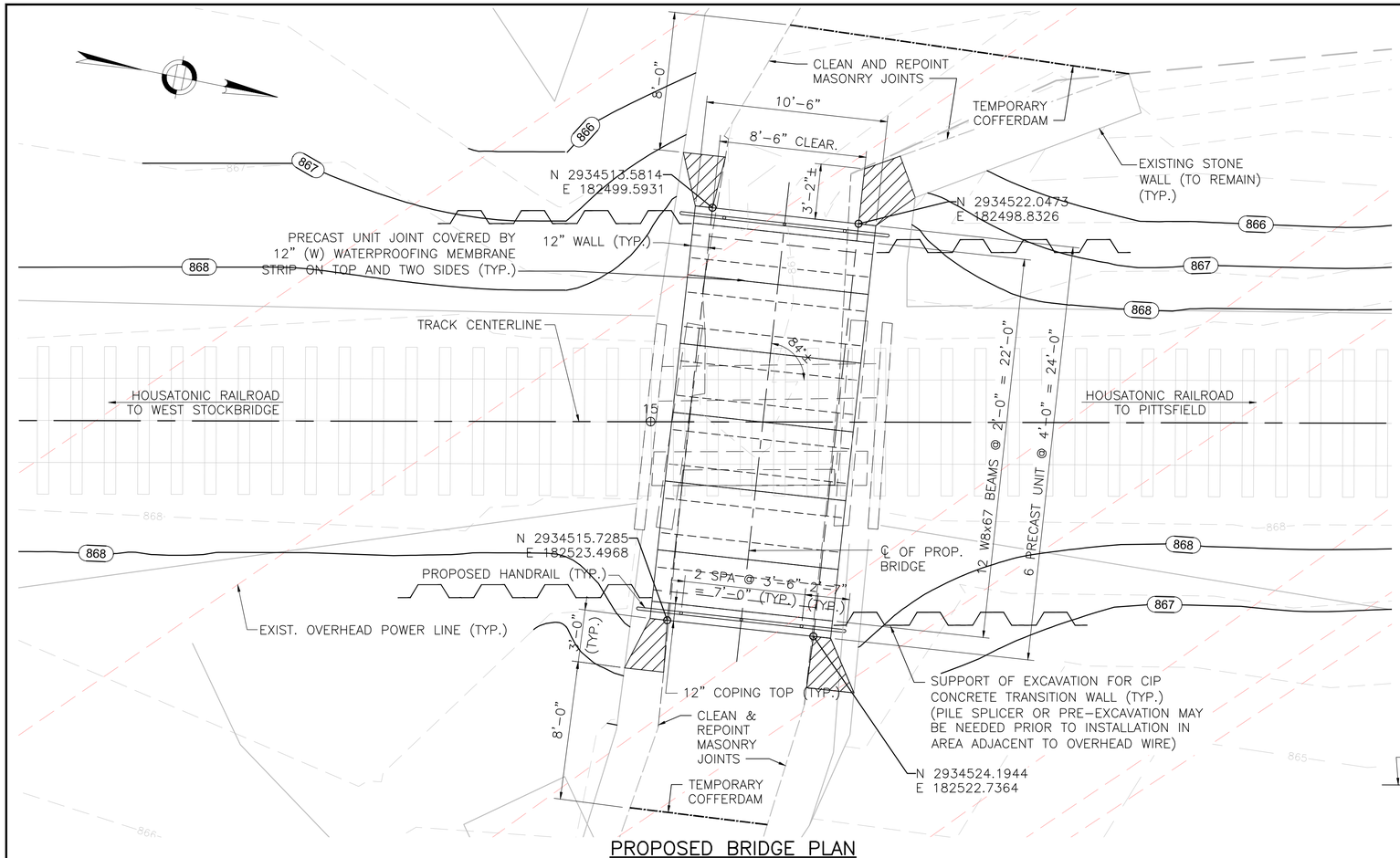
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK EXISTING PLAN AND DEMOLITION

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

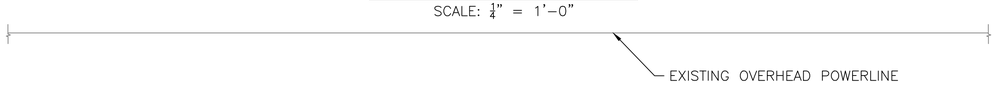
massDOT Massachusetts Department of Transportation Rail & Transit Division

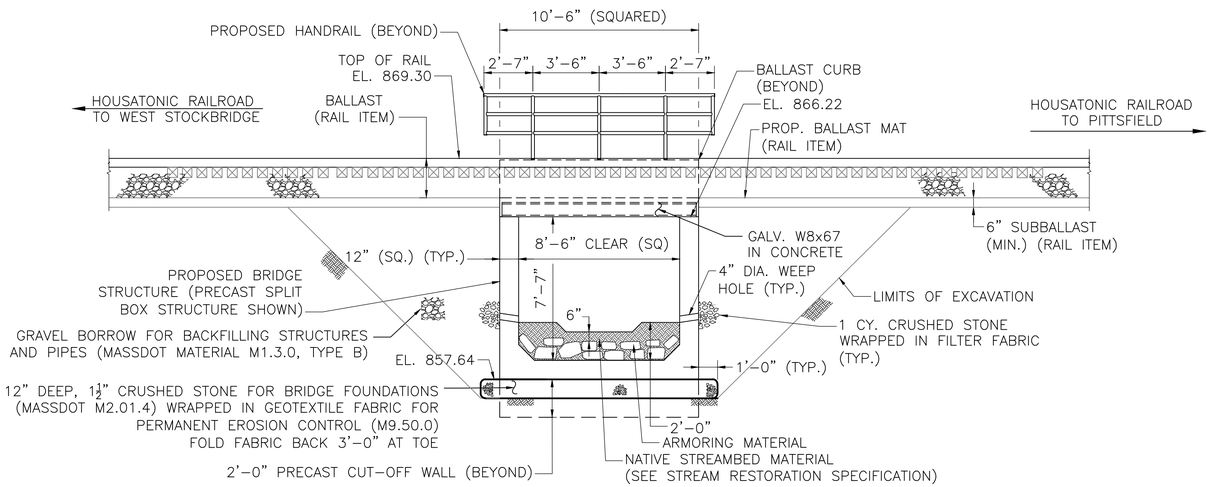
SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S-203	



PROPOSED BRIDGE PLAN

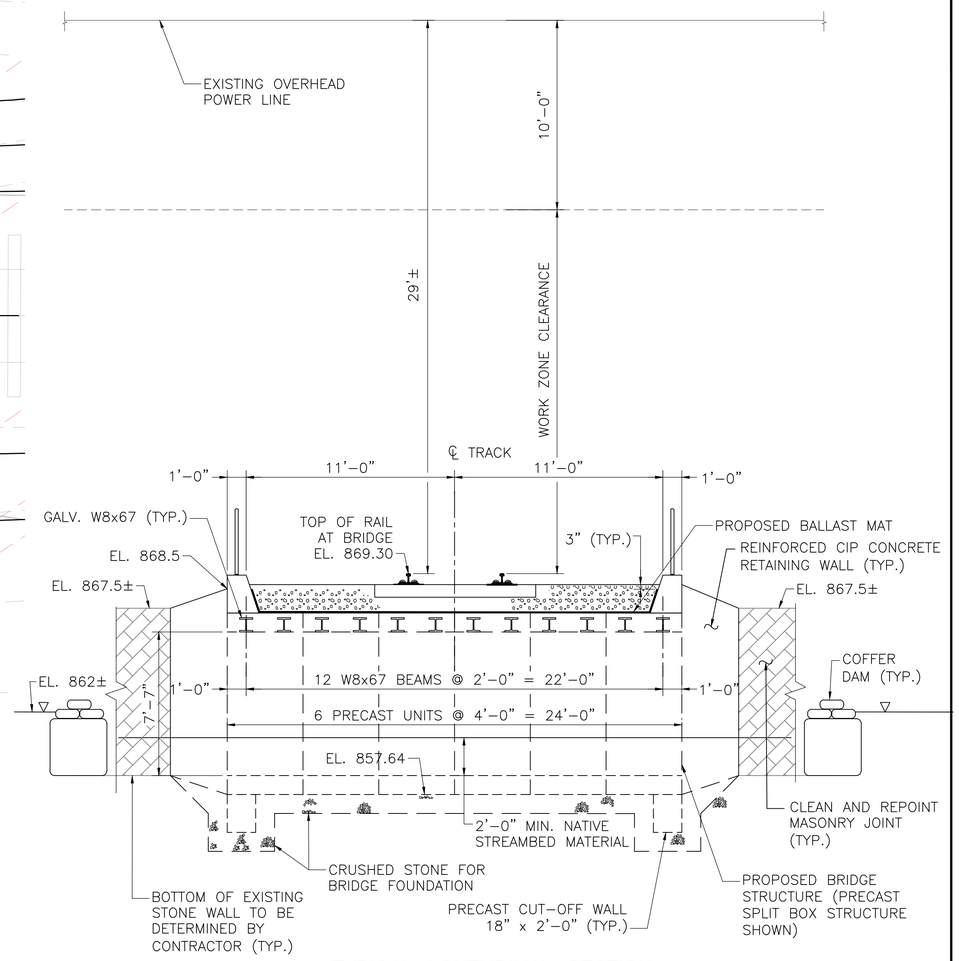
SCALE: $\frac{1}{4}$" = 1'-0"





PROPOSED BRIDGE SECTION

SCALE: $\frac{1}{4}$" = 1'-0"



TYPICAL LONTUDINAL SECTION

SCALE: $\frac{1}{4}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

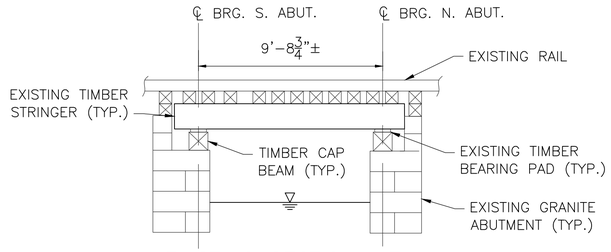
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK
PROPOSED BRIDGE PLAN AND SECTIONS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

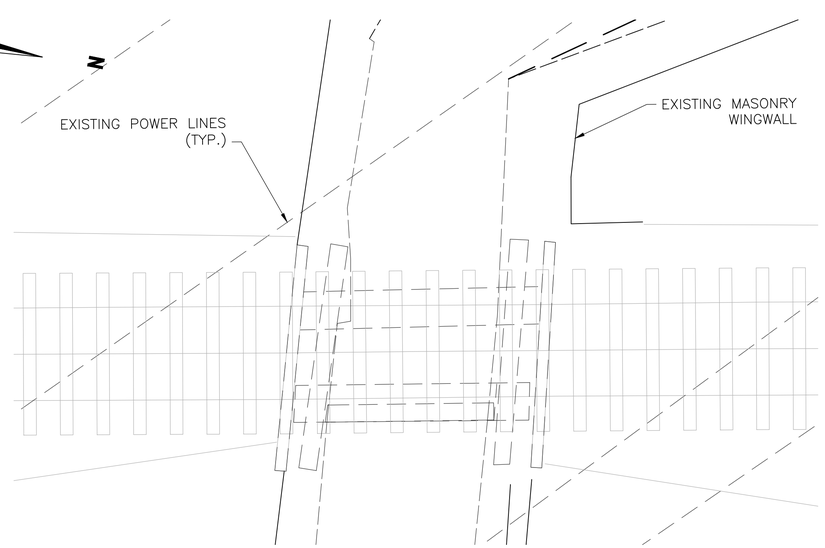
MassDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S-204	



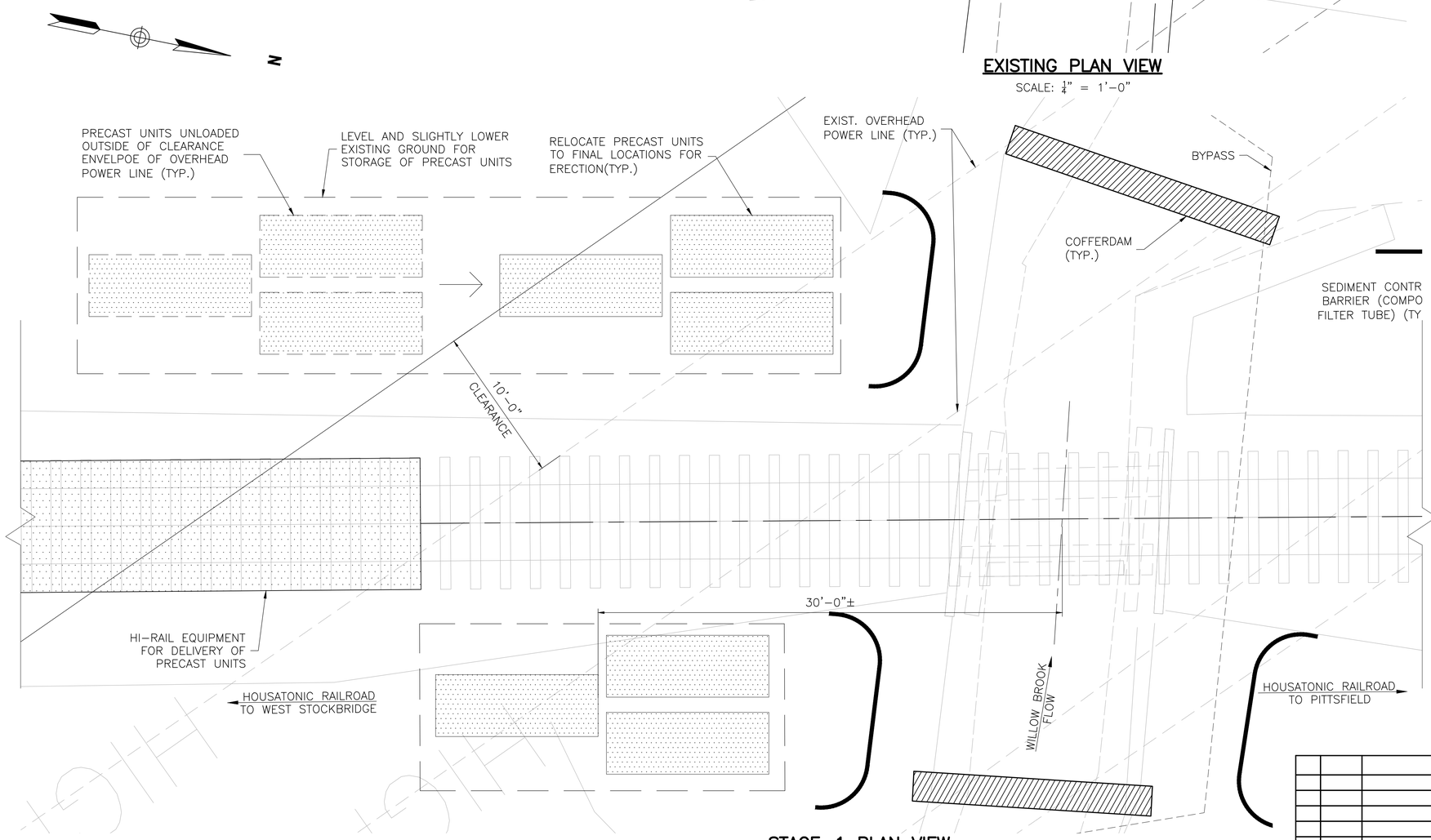
EXISTING SECTION VIEW

SCALE: ¼" = 1'–0"



EXISTING PLAN VIEW

SCALE: ¼" = 1'–0"



STAGE–1 PLAN VIEW

SCALE: ¼" = 1'–0"

SUGGESTED CONSTRUCTION SEQUENCING FOR BR. 74.17:

STAGE 1 – WORK WILL BE PERFORMED DURING NON–OPERATION HOURS

1. INSTALL COFFERDAM.
2. COORDINATE WITH EVERSOURCE FOR DEENERGIZE THE OVERHEAD POWERLINE DURING CONSTRUCTION.
3. DEENERGIZE THE OVERHEAD POWER LINE.
4. USE HI–RAIL EQUIPMENT TO DELIVER PRECAST U–SECTIONS AND CULVERT ROOFS TO THE SITE AND USE EXCAVATOR TO OFFLOAD THE SECTIONS OUTSIDE OF CLEARANCE ENVELOPE OF OVERHEAD POWER LINE FIRST, THEN RELOCATE PRECAST UNITS TO FINAL LOCATIONS FOR ERECTIONS.
5. REENERGIZE THE OVERHEAD POWER LINE.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

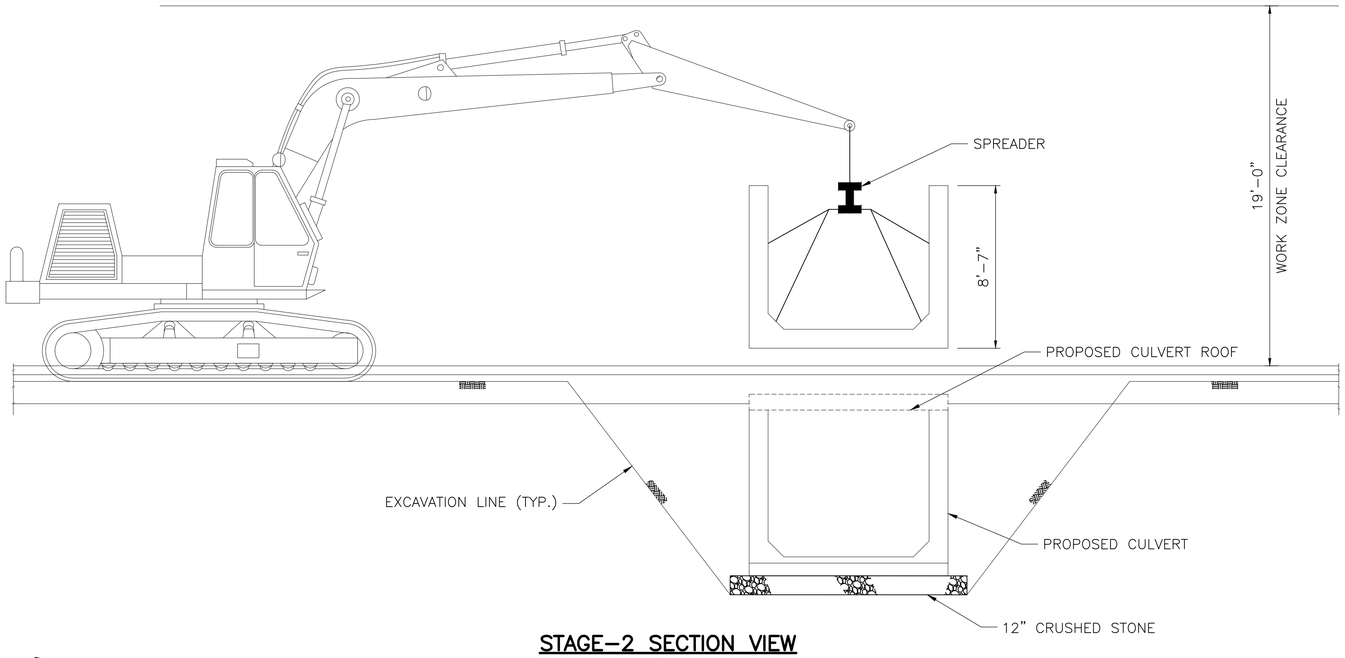
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK CONSTRUCTION STAGING 1 OF 2

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

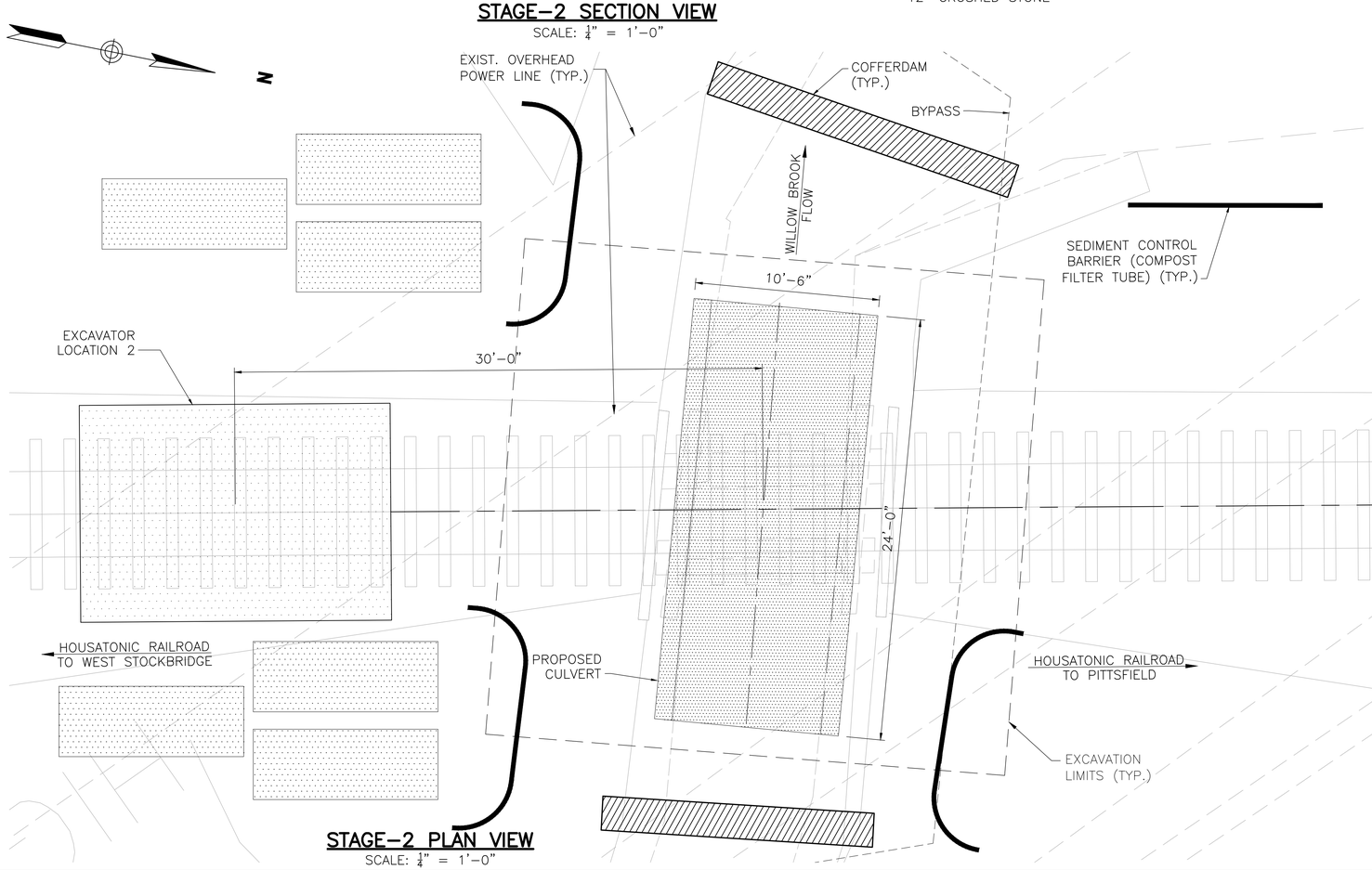
MassDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S–205	



STAGE-2 SECTION VIEW

SCALE: $\frac{1}{4}$" = 1'-0"



STAGE-2 PLAN VIEW

SCALE: $\frac{1}{4}$" = 1'-0"

STAGE 2 – WORK WILL BE PERFORMED DURING 1ST WEEKEND TRACK CLOSURE

1. DEENERGIZE THE OVERHEAD POWER LINE AND DEWATER.
2. TEMPORARILY REMOVE EXISTING TRACK IN THE CONSTRUCTION ZONE.
3. DEMOLISH EXISTING TIMBER BRIDGE SUPERSTRUCTURE AND EXISTING STONE MASONRY ABUTMENTS AND WINGWALLS AS SHOWN ON PLANS.
4. EXCAVATE AND PLACE 12" CRUSHED STONE AT BOTTOM OF EXCAVATION AS SHOWN ON SECTION.
5. USE EXCAVATOR TO ERECT PRECAST U-SECTIONS TO THE FINAL LOCATIONS.
6. USE EXCAVATOR TO ERECT CULVERT ROOF ONTO U-SECTIONS.
7. INSTALL MEMBRANE WATERPROOFING STRIPS AT THE JOINTS OF BOX SECTIONS.
8. BACKFILL AND INSTALL TEMPORARY TIMBER MAT ON TOP OF BOX SECTIONS FOR SUPPORTING TRACK.
9. INSTALL TRACK ON OPEN BRIDGE TO TRAIN SERVICE.

STAGE 3 – WORK WILL BE PERFORMED DURING 2ND WEEKEND TRACK CLOSURE

1. CONSTRUCT CAST-IN-PLACE CONCRETE RETAINING WALLS AT FOUR CORNERS AND BACKFILL

STAGE 4 – WORK WILL BE PERFORMED DURING 3RD WEEKEND TRACK CLOSURE

1. REMOVE TEMPORARY TIMBER MAT AND RAILS ON BRIDGE.
2. PERFORM TRACK WORK AT BRIDGE APPROACHES.
3. INSTALL APPROACHES
4. INSTALL BALLAST MAT, BALLAST, CROSSTIES, AND RAILS.
5. OPEN BRIDGE TO TRAIN SERVICE.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

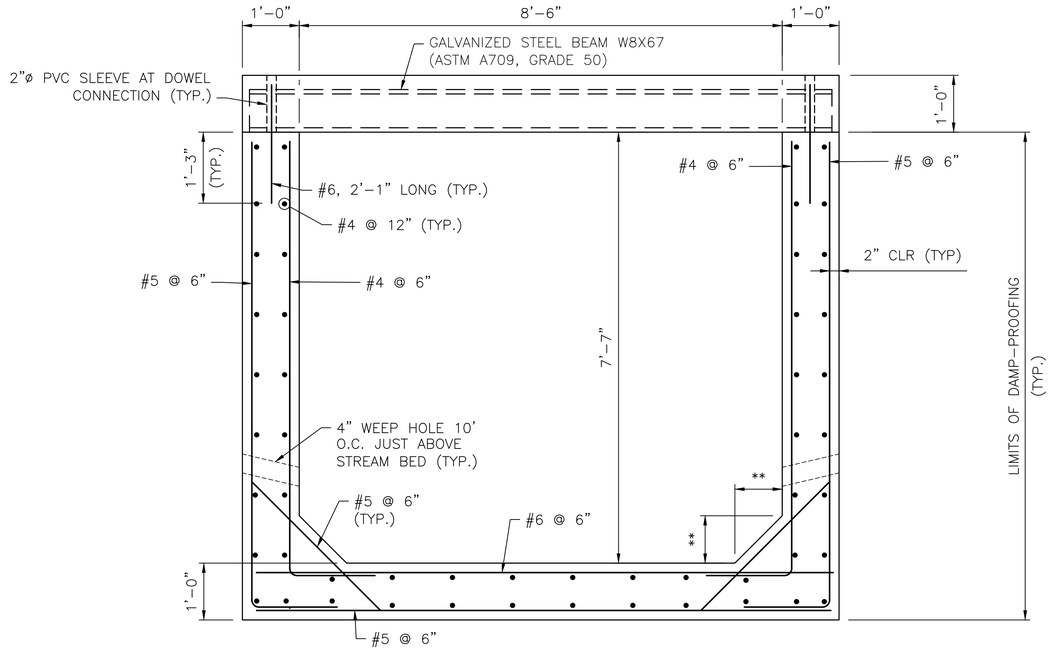
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK CONSTRUCTION STAGING SHEET 2 OF 2

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

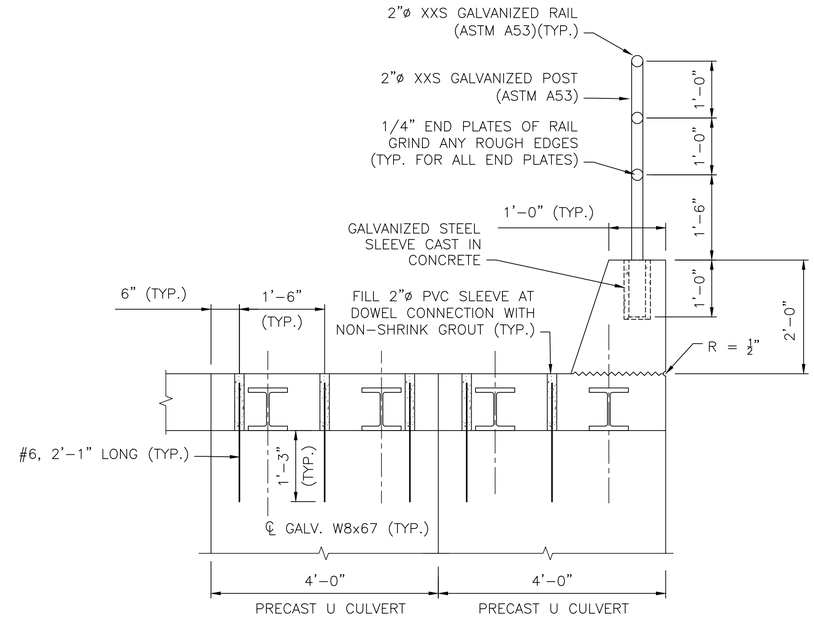
SCALE: XXX	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	XXX	XXX	XXX	SHEET: S-206	



** HAUNCH MAY VARY BY CONTRACTOR.

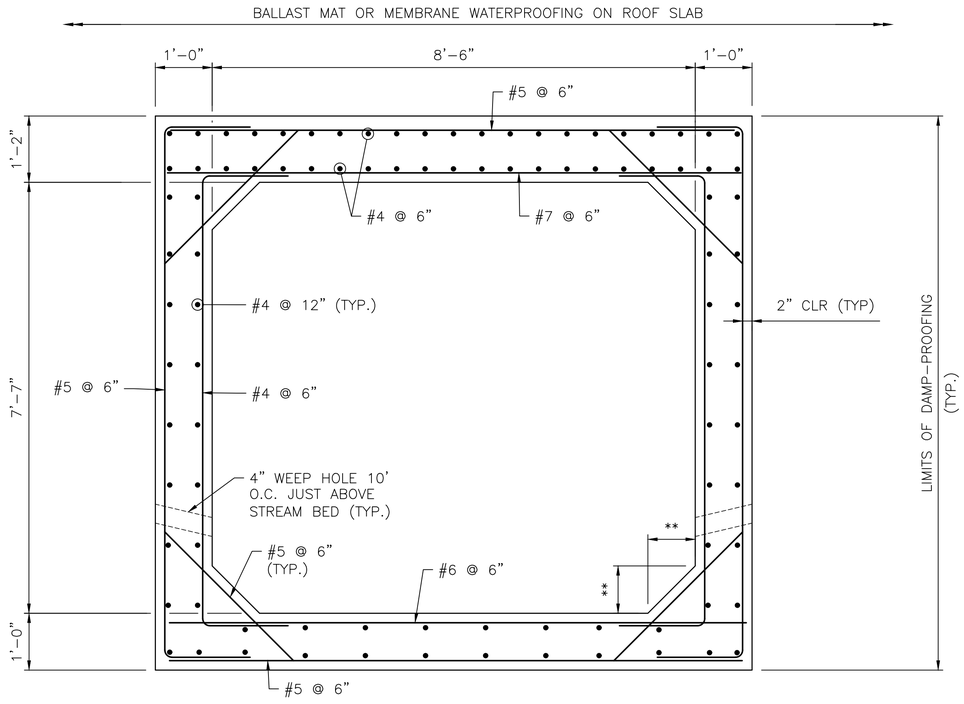
TYPICAL SECTION FOR PRECAST SPLIT BOX ALTERNATIVE

SCALE: $\frac{3}{4}$" = 1'-0"



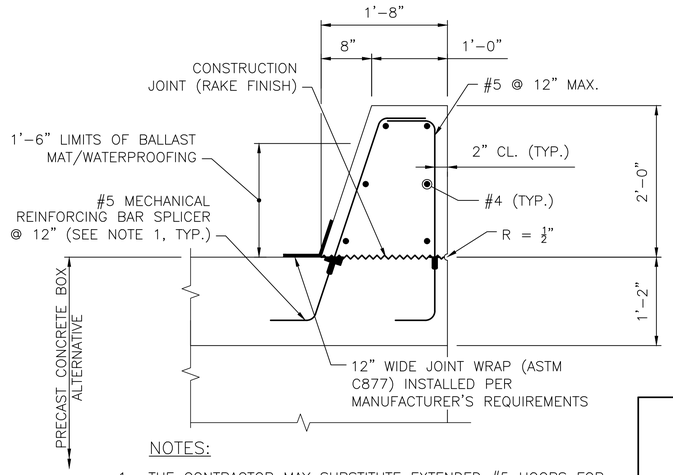
DETAILS

SCALE: $\frac{3}{4}$" = 1'-0"



TYPICAL SECTION FOR PRECAST CONCRETE BOX ALTERNATIVE

SCALE: $\frac{3}{4}$" = 1'-0"



NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE EXTENDED #5 HOOPS FOR THE MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS AS SHOWN.
2. CULVERT REINFORCEMENT AND HANDRAIL NOT SHOWN FOR CLARITY.

COPING DETAILS

SCALE: 1" = 1'-0"

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

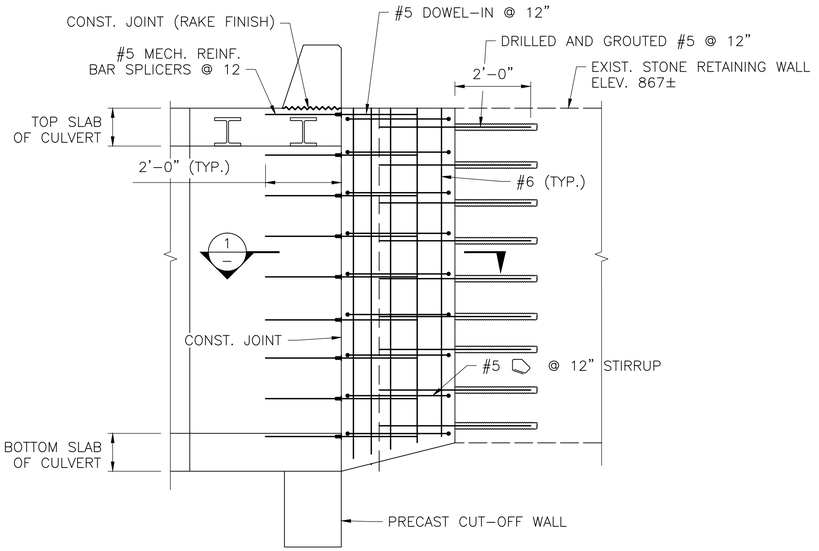
MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK PRECAST CONCRETE BOX CULVERT DETAILS

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

MassDOT Massachusetts Department of Transportation Rail & Transit Division

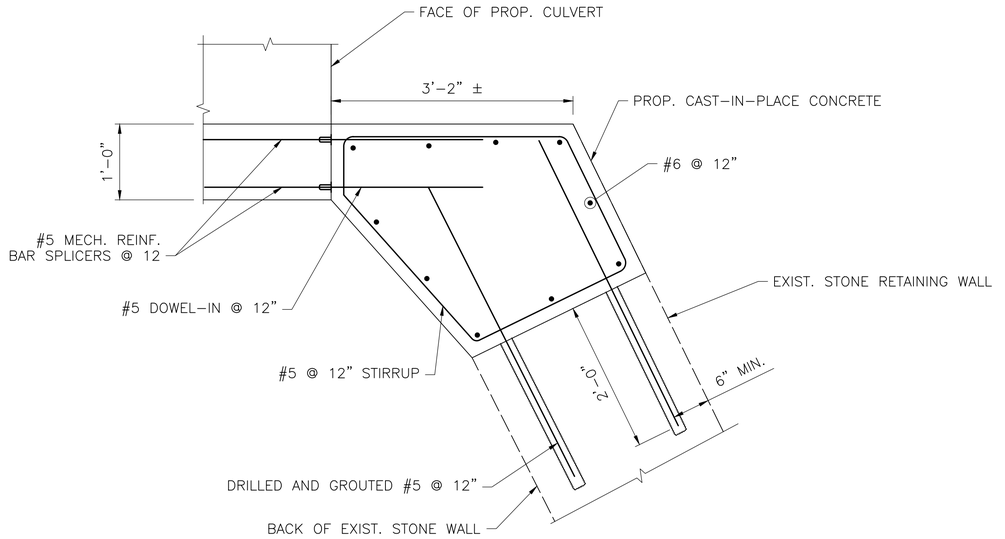
SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	SSL	SSL	JQW	SHEET: S-207	



NOTES:
NORTHWEST RETAINING WALL DETAIL SHOWN. OTHER WALLS SIMILAR
EXTERIOR PRECAST SPLIT BOX STRUCTURE SHOWN.
EXTERIOR PRECAST CLOSED BOX STRUCTURE SIMILAR.

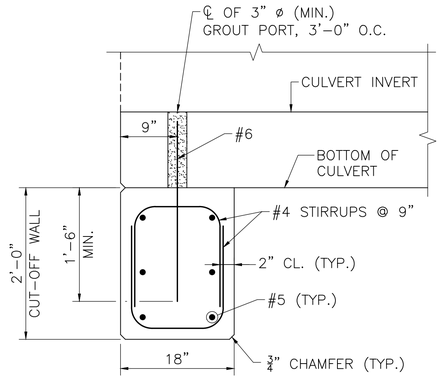
SECTION AT WINGWALL

SCALE: $\frac{1}{2}$" = 1'–0"



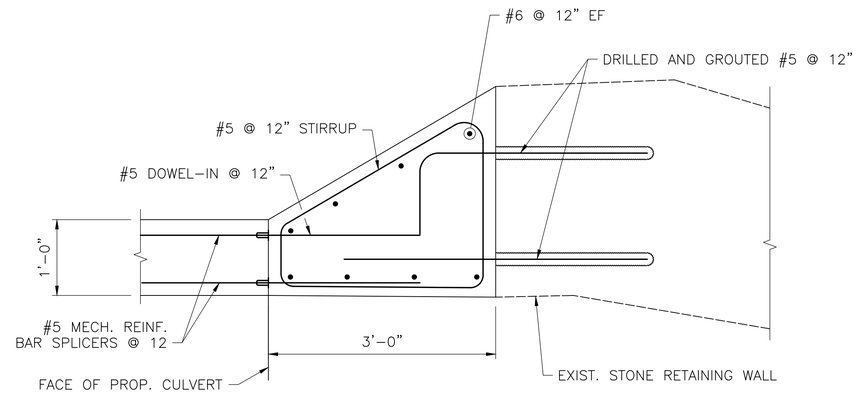
SECTION 1 (NW WALL TRANSITION)

SCALE: 1" = 1'–0"



CUT–OFF WALL CONNECTION DETAIL

SCALE: 1" = 1'–0"



SECTION 1

SCALE: 1" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

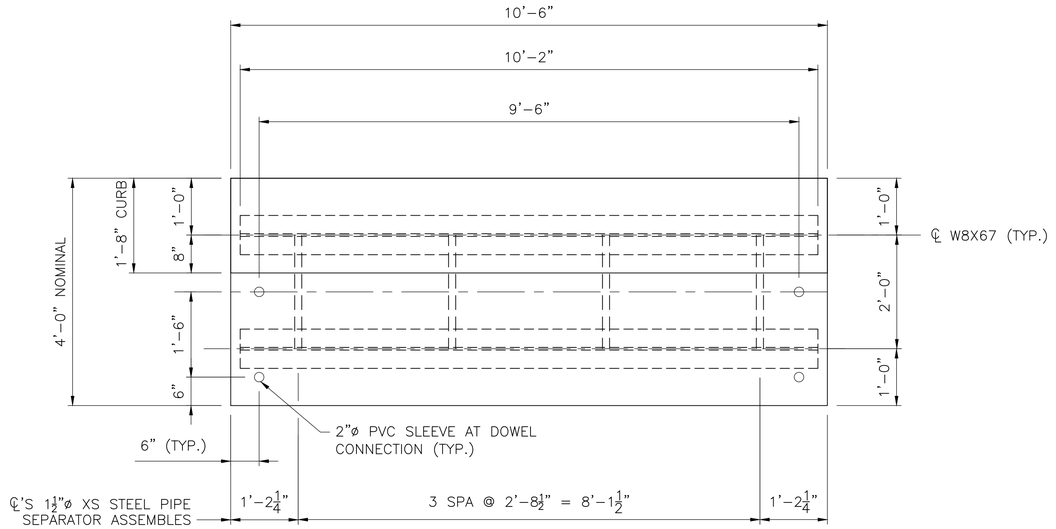
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK WINGWALL DETAILS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 307-7700

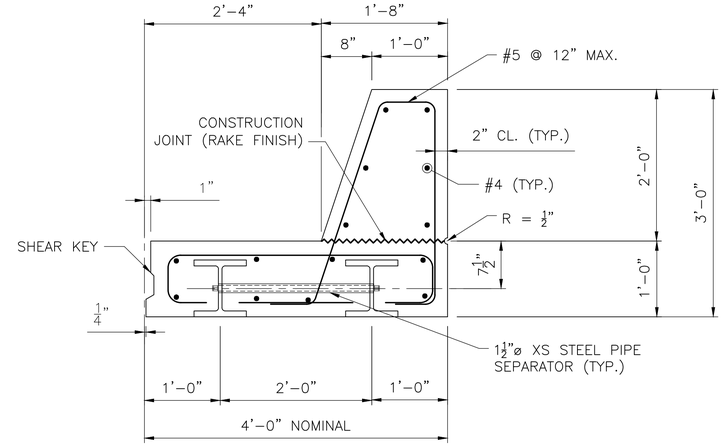
massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S–208	



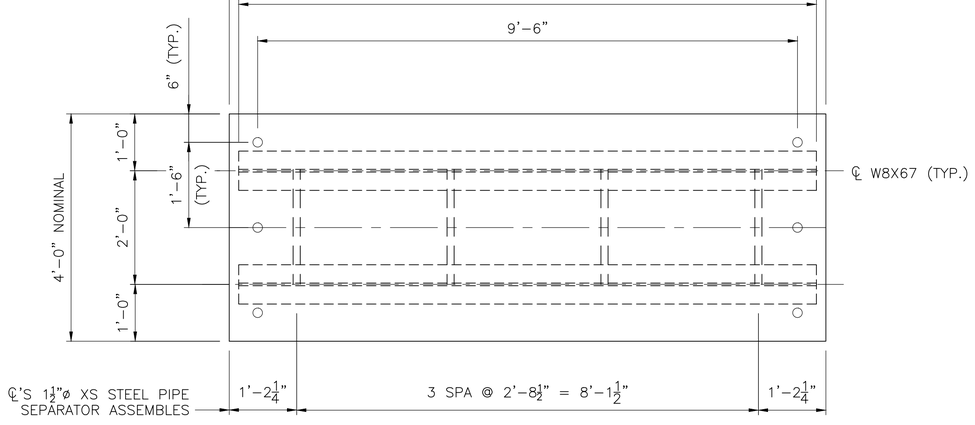
PLAN – EXTERIOR PRECAST PANEL

SCALE: ¾" = 1'–0"



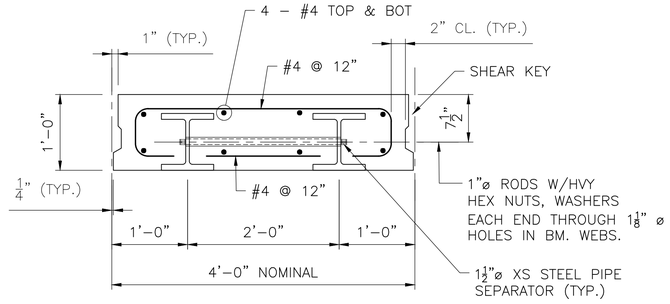
EXTERIOR PRECAST PANEL

SCALE: 1" = 1'–0"



PLAN – INTERIOR PRECAST PANEL

SCALE: ¾" = 1'–0"



INTERIOR PRECAST PANEL

SCALE: 1" = 1'–0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

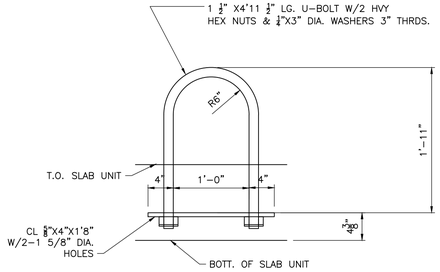
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK PROPOSED PRECAST PANEL 1

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S–209	

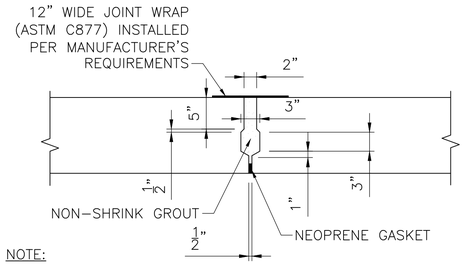


LIFTING LUG DETAIL

SCALE: 1" = 1'-0"

NOTE:

BURN LIFTING LUGS ½" BELOW TOP OF CONC. AFTER PLACEMENT & FILL AND SMOOTH WITH POLYMER MORTAR.

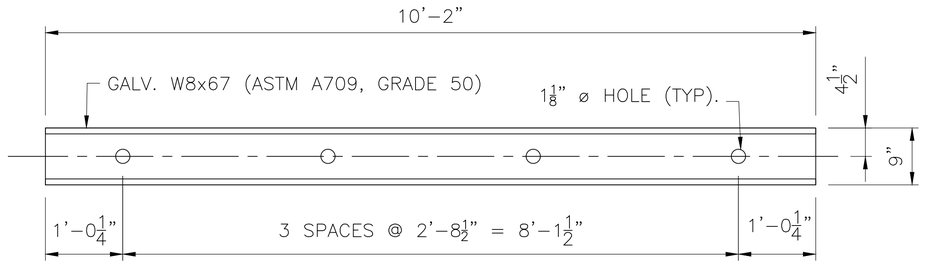


NOTE:

DETAILS AND DIMENSIONS ARE CONCEPTUAL AND MAY BE ALTERED BY THE FABRICATOR TO SUIT THEIR OPERATIONS, HOWEVER THE FUNCTION AND INTENT OF THE DETAIL MUST BE MET.

TOP SLAB SHEAR KEY

SCALE: 1" = 1'-0"



STEEL ENCASED BEAM DETAIL

SCALE: 1" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

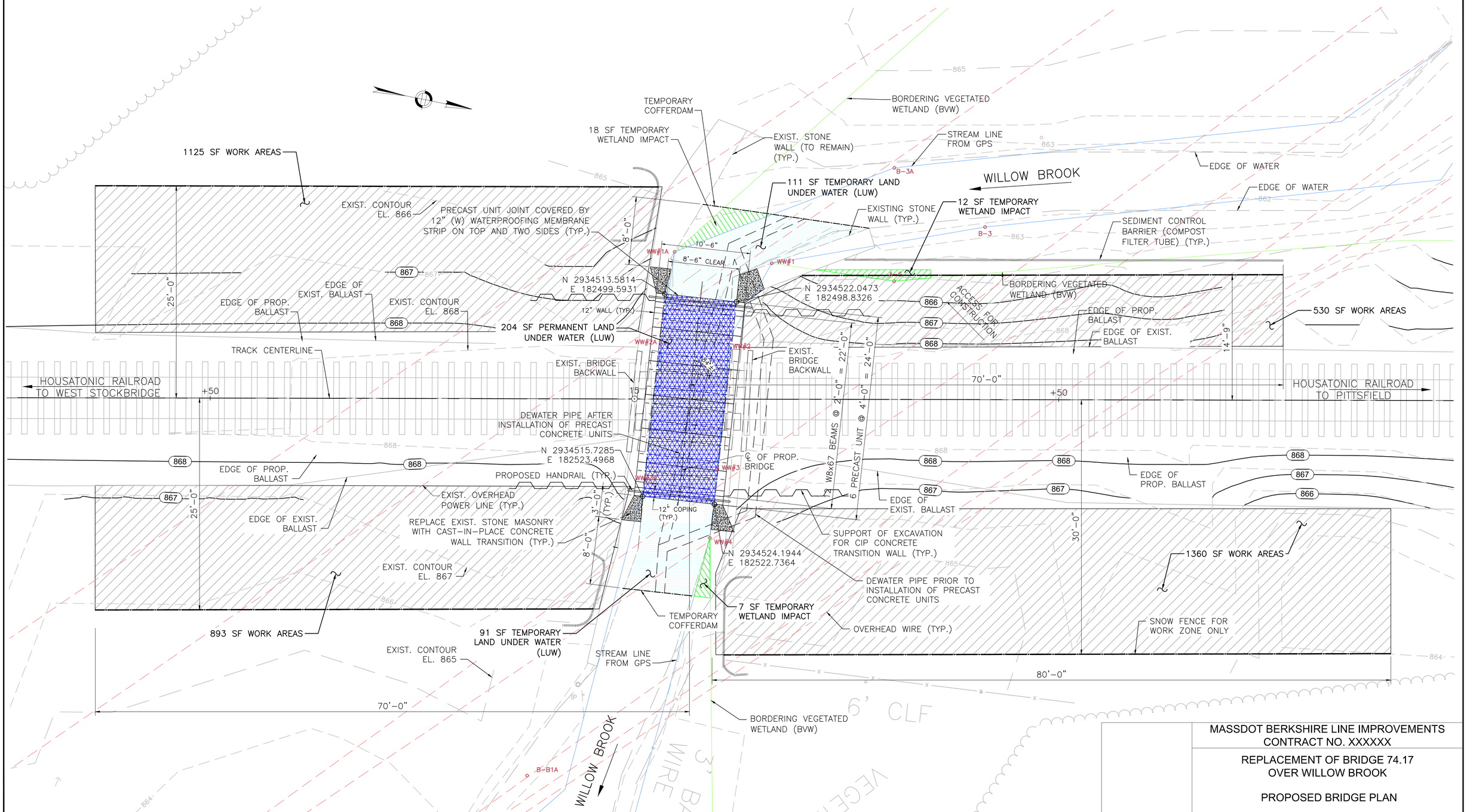
REPLACEMENT OF BRIDGE 74.17 OVER WILLOW BROOK PROPOSED PRECAST PANEL 2

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 1/17/25	JQW	JQW	SSL	SHEET: S-210	



PROPOSED BRIDGE PLAN

SCALE: $\frac{3}{16}$" = 1'-0"

NOTE:

1. ALL ELEVATIONS ARE BASED ON NAVD 88.
2. ENTIRE WORK AREA IS WITHIN THE 100-FOOT BUFFER ZONE AND 200 FOOT RIVERFRONT AREA.

MASSDOT BERKSHIRE LINE IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17
OVER WILLOW BROOK

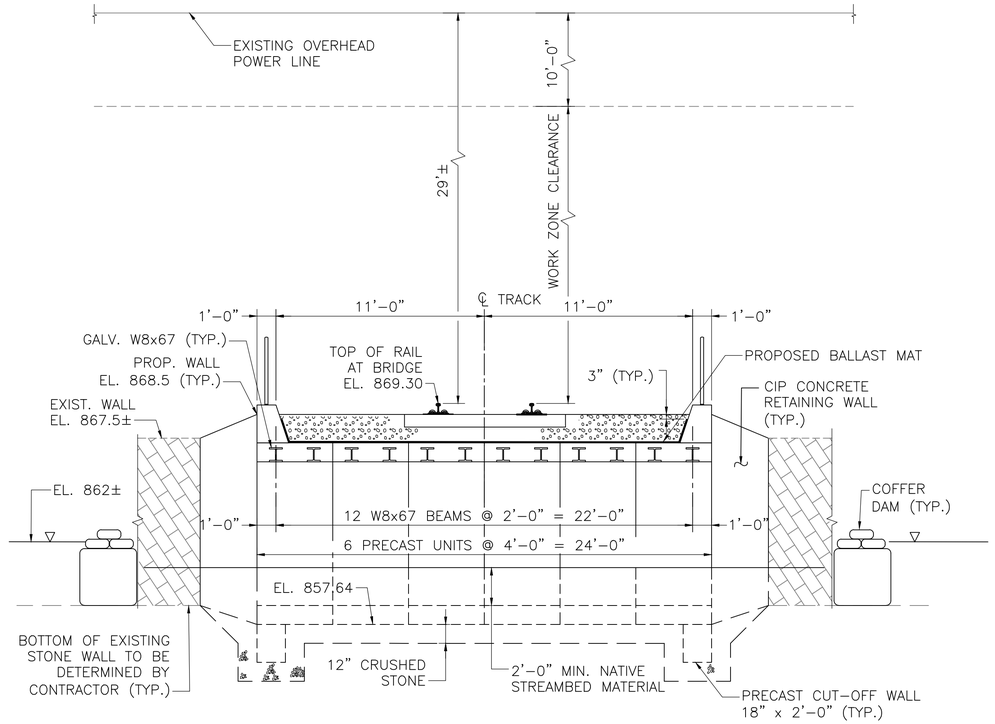
PROPOSED BRIDGE PLAN

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

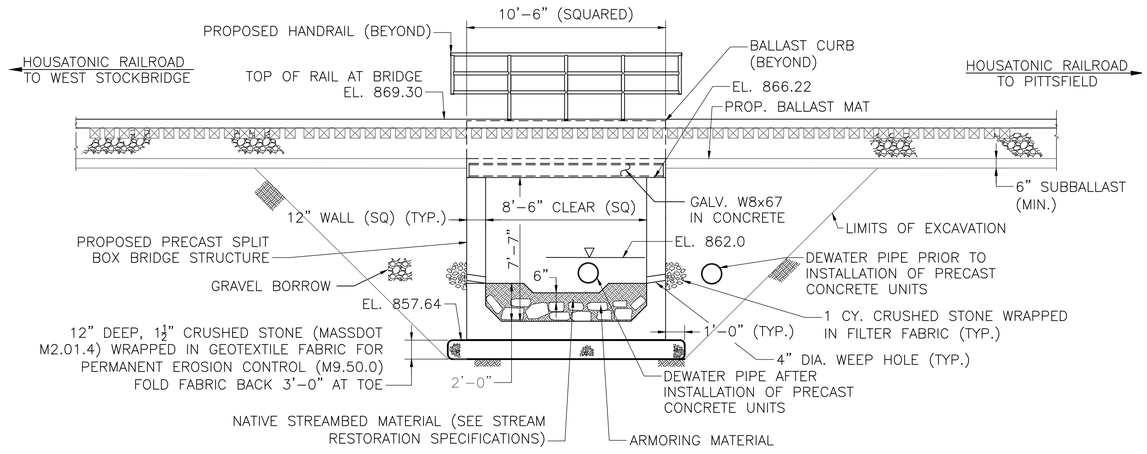
massDOT
Massachusetts Department of Transportation
Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE:				SHEET: E-1	



TYPICAL LONTUDINAL SECTION

SCALE: $\frac{1}{4}$" = 1'-0"



PROPOSED BRIDGE SECTION

SCALE: $\frac{1}{4}$" = 1'-0"

NOTES:

1. ALL ELEVATIONS ARE BASED ON NAVD 88.
2. THE STREAMBED RESTORATION SHALL REPLICATE THE EXISTING NATURAL CHANNEL BED FOUND OUTSIDE THE WORK AREA IN TERMS OF MATERIAL, ROUGHNESS, SHAPE, PROFILE, AND APPEARANCE.
3. EXISTING STREAMBED MATERIAL EXCAVATED FROM LOCATIONS OF PERMANENT WATERWAY IMPACTS SHALL BE STOCKPILED TO FACILITATED STREAMBED MATERIAL SHALL BE REUSED TO FILL THE VOIDS IN THE PROPOSED ARMORING MATERIAL.
4. ADDITIONAL STREAMBED MATERIAL SHALL BE LOCALLY SOURCED AND MATCH THE COMPOSITION OF THE EXISTING NATIVE RIVERBED.
5. THE PROPOSED CULVERT AND STREAMBED RESTORATION IS REQUIRED TO COMPLY WITH ALL ENVIRONMENTAL PERMITS ISSUED FOR THE PROJECT.

MASSDOT BERKSHIRE LINE IMPROVEMENTS
CONTRACT NO. XXXXXX

REPLACEMENT OF BRIDGE 74.17
OVER WILLOW BROOK

PROPOSED BRIDGE SECTIONS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE:				SHEET: E-2	

THIS PAGE IS INTENTIONALLY LEFT BLANK

Department of the Army
General Permits for the Commonwealth of Massachusetts

The New England District of the U.S. Army Corps of Engineers (USACE) hereby issues twenty-five (25) regional general permits (GPs) for activities subject to USACE jurisdiction in waters of the U.S., including wetlands, navigable waters within the Commonwealth of Massachusetts and adjacent ocean waters to the seaward limit of the outer continental shelf. The Massachusetts GPs (hereafter referred to as the MA GP or GP) are issued in accordance with USACE regulations at 33 CFR 320 – 332 [see 33 CFR 325.5(c)(1)]. These GPs establish criteria and contain permit conditions to ensure that the authorized activities have no more than minimal individual and cumulative adverse impacts to the environment.

This document contains the following sections: Pages

SECTION I	Statutory Authorities & Regulated Activities	2
SECTION II	Review Categories & Application Procedures	3-7
SECTION III	Massachusetts General Permits	8-34
SECTION IV	General Conditions	35-51
SECTION V	Mitigation Standards	52-54
SECTION VI	Federal & State Agency Contact Information & Websites	55-56
SECTION VII	Definitions & Acronyms	57-66
APPENDIX A	Guidance for Section 106 NHPA Compliance in Massachusetts	67-71
APPENDIX B	Pre-Construction Notification	72-77
APPENDIX C	Self-Verification Notification	78-81
APPENDIX D	Pre-Construction Notification Application Checklist	82-88

In issuing these GPs, the Federal Government does not assume any liability for the following: (a) damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; (b) damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the U.S. in the public interest; (c) damages to persons, property or to other permitted or unpermitted activities or structures caused by the activity authorized by any of the GPs; (d) design or construction deficiencies associated with the permitted work; or (e) damage claims associated with any future modification, suspension or revocation of these permits.

Tammy R. Turley 02 June 2023

Tammy R. Turley Date
Chief, Regulatory Division

SECTION I. STATUTORY AUTHORITES & REGULATED ACTIVITIES

1. Work Requiring USACE Authorization

a. Section 10: Work and structures that are located in, over, under or that affect navigable waters of the United States (U.S.) (see 33 CFR 329). The USACE regulates these activities under section 10 of the Rivers and Harbors Act of 1899 (see 33 CFR 322).

b. Section 404: The discharge of dredged or fill material into waters of the U.S (see 33 CFR 328). The USACE regulates these activities under Section 404 of the Clean Water Act (CWA). The term "discharge of dredged or fill material" also includes certain discharges resulting from excavation. Applicants should contact USACE to determine if a particular excavation discharge occurring within waters of the U.S., is a regulated activity. See 33 CFR 323.4 of the CWA for exempted activities.

For additional information on the limits of USACE jurisdiction, please see: https://www.nae.usace.army.mil/Portals/74/docs/regulatory/JurisdictionalLimits/Jurisdictional_Limits_Brochure.pdf

2. Authority to Issue General Permits

a. In accordance with 33 CFR 322.2(f), 325.2(e)(2), and 325.5(c), USACE may issue regional general permits authorizing activities under Section 10 of the RHA.

b. In accordance with Section 404(e) of the CWA, 33 USC 1344(e), and 33 CFR 323.2(h), 325.2(e)(2), and 325.5(c), after notice and opportunity for public hearing, USACE may issue regional general permits for any category of activities involving discharges of dredged or fill material if the activities in such category are similar in nature, will cause only minimal adverse environmental effects when performed separately, and will only have minimal cumulative adverse effect on the environment.

3. Related Laws

33 CFR 320.3 includes a list of related laws including, but not limited to, Section 408 of the Rivers and Harbors Act of 1899, Section 401 of the Clean Water Act, Section 402 of the Clean Water Act, Section 307(c) of the Coastal Zone Management Act of 1972, Section 106 of the National Historic Preservation Act of 1966, Section 7 of the Endangered Species Act, the Fish and Wildlife Coordination Act of 1956, the Magnuson-Stevens Fishery Conservation and Management Act, the Fish and Wildlife Coordination Act, Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, Section 7(a) of the Wild and Scenic Rivers Act, the Golden Eagle Protection Act, and the Migratory Bird Treaty Act.

SECTION II. REVIEW CATEGORIES & APPLICATION PROCEDURES

To qualify under these GPs, the design, construction, and maintenance associated with each proposed activity must meet the terms and eligibility criteria listed in Section III, all applicable general conditions (GCs) in Section IV, and any specific mitigation requirements in Section V. Applicants should first review the GPs to see if a project is eligible for authorization under one or more of the GPs within this document. Any activity not specifically listed may still be eligible for authorization under these GPs; applicants are advised to contact USACE for specific eligibility determination.

Please note that these GPs allow for Self-Verification (SV) contingent upon meeting all criteria and with full adherence to all GCs. Projects that do not qualify for SV, may meet criteria for Pre-Constriction Notification (PCN). Tables are provided under each activity, which outline criteria for SV and PCN. Activities that do not meet criteria for SV or PCN may require review as an Individual Permit (IP). Activities may require a PCN or IP as noted in Sections III and/or IV of this GP. Notwithstanding compliance with the terms of these GPs, USACE retains discretionary authority to require either PCN review or IP review on a case-by-case basis for any project based on concerns for the environment or for any of the other public interest factors found in 33 CFR 320.4(a). These GPs also do not replace or change those activities identified as exempt from USACE regulation (33 CFR 323.4).

1. Pre-Application Assistance

Prospective applicants may request a pre-application meeting to address any questions they may have. USACE may also request a pre-application meeting or additional information to facilitate review of the request. Pre-application meetings and/or site visits help streamline the authorization process by alerting the prospective applicant to potentially time-consuming factors that may arise during the evaluation of their project (e.g., avoidance, minimization and compensatory mitigation requirements, historic properties, endangered species, essential fish habitat, impacts to federal projects, and/or dredging of contaminated sediments).

To schedule a pre-application meeting, present questions, or if you need further assistance, please contact USACE at:

Email: cenae-r-ma@usace.army.mil (strongly preferred) Phone: (978) 318-8338

Mail: U.S. Army Corps of Engineers
New England District
Regulatory Division, Massachusetts Section
696 Virginia Road
Concord, MA 01742

2. Submitting a Request

Please follow the procedures outlined in Sections II.2-5 when requesting an SV or applying for PCN authorization for activities covered by these GPs. The GPs are provided in Section III below. For SV-eligible projects, the Self-Verification Notification (SVN) must be submitted within 30 days of commencing work. Otherwise, a Pre-Construction Notification (PCN) must be submitted for work that is not SV-eligible. Please include appropriate drawings and attachments and submit your request using the mailbox identified in Section II.4 or II.5 below. USACE will promptly confirm receipt of your request and notify you in the event additional information is required. Guidance on

how to submit electronic correspondence is located on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/Submitting-Electronic-Correspondence.

3. Local, State & Federal Approvals

Applicants are responsible for applying for and obtaining any required local, state, and federal permits or approvals. These must be obtained prior to the commencement of work in waters. Such authorizations may include a Water Quality Certification, a Coastal Zone Management Act consistency determination, and other approvals as noted below. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law.

I. Water Quality Certification under Section 401 of the Federal Clean Water Act (33 USC 1341).
Applicants are responsible for determining the appropriate 401 Water quality Certification (WQC) requirements and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Applicants that are unsure of whether their activity has been certified should contact MassDEP, or EPA Region 1 when the activity is located on tribal lands, for a determination. The 401 WQC requirement must be satisfied by acquiring one of the following WQCs from MassDEP (see GC 8):

General 401 WQC: The MassDEP issued a WQC on April 21, 2023 conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of this WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC

Applicants should refer to the following link to determine if their activity is eligible: *https://www.nae.usace.army.mil/Missions/Regulatory/ State-General-Permits/ Massachusetts-General-Permit/*. If eligible, you must comply with all applicable WQC conditions. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.

Individual 401 WQC: In the event the proposed activity is not covered by the general WQC, applicants shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the applicant shall submit their Individual 401 WQC application concurrently to MassDEP and the USACE to comply with 40 CFR 121.

Activities Proposed on Tribal Lands: When an activity is proposed on Tribal lands, the applicant shall refer to the general 401 WQCs granted by the Environmental Protection Agency (EPA), Region 1 on May 15, 2023. These 401 WQCs are located on the USACE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

II. Coastal Zone Management Act Federal Consistency Concurrence pursuant to Section 307 of the CZMA of 1972, as amended. Federal consistency concurrence is required for all activities located within the coastal zone, unless determined otherwise by the Massachusetts Office of Coastal Zone Management (MA CZM) (see GC 9). As applicable, this requirement must be satisfied by acquiring one of the following from the MA CZM:

General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25 and this can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. The applicant must obtain all applicable permits and approvals prior to the commencement of work in USACE jurisdiction (i.e., construction begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the applicant. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review. During review of the PCN application, USACE may request additional information from the applicant to support CZM's evaluation of the activity.

Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 to require Individual Concurrence. The applicant must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.

The MA CZM program includes five regional offices that serve 78 coastal municipalities. The following map provides more information about these offices: https://www.mass.gov/service-details/czm-regions-coastal-communities-and-coastal-zone-boundary

III. Other Approvals: Approvals typically required in Massachusetts include, but are not limited to, a Chapter 91 Permit/License, Massachusetts Environmental Protection Act (MEPA) review, Wetlands Protection Act Order of Conditions, and/or Aquaculture Certification. *Applicants should also be aware that USACE may not be able to render a permit decision in the event the proposed activity is denied by another local, state and/or federal agency.*

4. Procedures for Self-Verification (SV) Eligible Projects

If the activity is eligible for an SV, the Self-Verification Notification (SVN) must be completed prior to the start of project construction and submitted to USACE within 30 days of commencing work. The purpose of the SVN is to provide applicants with a tool to assist them when determining if the activity as proposed is SV-eligible. The following GPs do not require submission of the SVN: GP 1 (SV #1), GP 3 (SV #2-3), GP 4 (SV #2), GP 11, GP 12 (note #2), GP 14 (see note), GP 15 (see note), and GP 24 (SV #3). **For the activities not listed above, the SVN must be completed prior to the start of work and be kept on site at all times during project construction.** The applicant shall not begin work for SV-eligible activities until they have completely verified the bulleted items below.

Digital submittals by email are **strongly encouraged** to facilitate the most efficient processing of the SVN submittal. Please communicate with USACE staff if you are unable to provide a digital copy. Addresses are cenae-r-ma-sv@usace.army.mil (email) or Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751 (mail).

Eligible SV Activities:

- Are subject to USACE jurisdiction (see GC 2); and
- Qualify for one or more of the GPs within this document (Section III); and
- Meet the GCs within this document (Section IV); and

- When required, are supported by a complete SVN (Appendix C); and
- Receive all other required local, State, and/or Federal approvals.

5. Procedures for Pre-Construction Notification (PCN) Eligible Projects

For activities that require a PCN, an application to and written authorization from USACE is required. *No work requiring a PCN may proceed until the applicant receives written authorization from USACE verifying that the activity is authorized.* The verification letter may include special conditions that the applicant must comply with. When possible, it is *highly* recommended that PCN application materials are submitted at least 90 days before the target start date to allow for USACE evaluation and any necessary agency consultations. PCN applications shall demonstrate in writing how the proposed activity complies with all GCs, as applicable to their activity.

Digital submittals by email are **strongly encouraged** to facilitate the most efficient processing of the PCN application. Please communicate with USACE staff if you are unable to provide a digital copy. Addresses are cenae-r-ma@usace.army.mil or Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751 (mail).

Eligible PCN Activities:

- Are subject to USACE jurisdiction (see GC 2); and
- Qualify for one or more of the GPs within this document (Section III); and
- Meet the GCs within this document (Section IV); and
- Comply with the Mitigation Standards within this document (Section V); and
- Are supported by a complete PCN document (Appendix B); and
- When required, are supported by the submittal of project information to the appropriate parties identified in Appendix A; and
- Receive all other required local, State, and/or Federal approvals.

6. Interagency Review Procedures

The USACE reserves the opportunity to coordinate PCN activities with Federal and State agencies to ensure that the proposed activity results in no more than a minimal impact to the aquatic environment. In some cases, USACE may require project modifications involving avoidance, minimization, and/or compensatory mitigation for unavoidable impacts to ensure the net effects of a project are minimal. The USACE determines, after review and coordination with the agencies and/or the applicant, if PCN applications:

a. Meet the terms and conditions of the GP as proposed;
b. Require additional information;
c. Require avoidance, minimization, compensatory mitigation, construction sequencing, project modification, or other special conditions to avoid or minimize adverse impacts to the aquatic environment;
d. Require individual permit review regardless of whether the terms and GCs of these GPs are met, based on concerns for the aquatic environment or any other factor of the public interest (see Section 9 below).

For activities requiring a PCN, the applicant must wait for written authorization from USACE before commencing activities in waters of the U.S. Beginning work for PCN required activities without a USACE written authorization is a violation of these GPs, and the terms and conditions of this document. The applicant may be subjected to an enforcement action by USACE and/or the Environmental Protection Agency (EPA).

7. Construction of Solid Fill Structures and Fills Along the Coastline or Baseline from Which the Territorial Sea is Measured.

Projects involving the construction of solid fill structures or discharge of fill that may extend beyond the coastline or the baseline from which the territorial sea is measured (i.e., mean low water) will require a PCN. The USACE will submit a description of the proposed work and a copy of the plans to the Solicitor, Department of the Interior, Washington, DC 20240, and request comments concerning the effects of the proposed work on the outer continental rights of the United States. These comments will be included in the administrative record of the application. After completion of permit review, the record will be forwarded to the Chief of Engineers. The decision on the application will be made by the Secretary of the Army after coordination with the Attorney General.

8. Emergency Activities

Per 33 CFR 325.2(e)(4), an emergency is limited to a situation that would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a permit is not undertaken within a time period less than the normal time needed to process an application under standard procedures. Emergency work shall be limited to that which is necessary to stabilize and secure the situation. Additional work needed for final repairs shall not be completed until approval is obtained through the appropriate, non-emergency process. Emergency work is subject to the same terms and conditions of these GPs as non-emergency work, and similarly, must qualify for authorization under these GPs; otherwise, an IP is required. *See GP 25 Emergency Situations for additional information.*

9. Individual Permit

Projects that do not meet the terms and conditions of this GP may require review as an IP (33 CFR 325.5 (b)). Proposed work in this category will require a separate Federal application for an individual permit from USACE (33 CFR 325.1). In addition, USACE retains discretionary authority on a case-by-case basis to elevate GP-eligible activities to an IP based on concerns for the environment or any other factor of the public interest (33 CFR 320.4 (a)). Applicants are required to submit the appropriate application materials directly to USACE as early as possible to expedite the permit review process. General information and application forms can be obtained at our website or by contacting our office at cenae-r-ma@usace.army.mil or (978) 318-8338. Individual 401 WQC and/or CZMA Federal consistency concurrence from the appropriate MA agencies are required before USACE can issue an individual permit. Applying for an IP does not relieve the applicant from their obligation to obtain all required Federal, State and/or local approvals.

10. Compliance

Applicants shall ensure compliance with all applicable GPs in Section III, GCs in Section IV, and any special conditions included in USACE verification letters. Noncompliance with these GPs, GCs, and special conditions may subject the applicant to criminal, civil, or administrative penalties, and/or an ordered restoration, and/or the permit may be modified, suspended or revoked by USACE. The USACE will consider any activity requiring USACE authorization to be noncompliant if that activity does not comply with all GP terms and conditions at all times, including while the project is under construction and when work is completed.

SECTION III. MASSACHUSETTS GENERAL PERMITS

Applicants are encouraged to review Sections I & II prior to submitting an application to confirm that the activity as proposed complies with all terms and conditions of the 2023 MA GPs. Applicants are also encouraged to review the definitions in Section VII, Definitions & Acronyms, of this document. Several terms are frequently used throughout the GPs, and it is important for the reader to understand these terms. If seeking verification for an activity previously verified under the 2018 MA GPs, please contact the USACE to discuss permitting needs in advance of submitting an application.

General Permits

1. Aids to Navigation and Temporary Recreational Structures
2. Maintenance
3. Moorings
4. Structures in Navigable Waters of the U.S.
5. Boat Ramps and Marine Railways
6. Utility Lines, Oil or Natural Gas Pipelines, Outfall Or Intake Structures, and Appurtenant Features
7. Dredging, Disposal of Dredged Material, Beach Nourishment, Rock Removal and Rock Relocation
8. U.S. Coast Guard Approved Bridges
9. Bank and Shoreline Stabilization
10. Aquatic Habitat Restoration, Enhancement, and Establishment Activities
11. Fish and Wildlife Harvesting and Attraction Devices and Activities
12. Response Operations, Oil and Hazardous Substances
13. Cleanup of Hazardous and Toxic Waste
14. Scientific Measurement Devices
15. Survey Activities
16. Land and Water-Based Renewable Energy Generation Facilities and Hydropower Projects
17. Residential, Commercial and Institutional Developments, and Recreational Facilities
18. Aquaculture
19. Mining Activities
20. Living Shorelines
21. Agricultural Activities
22. Reshaping Existing Drainage Ditches, Construction of New Ditches, and Mosquito Management
23. Linear Transportation Projects and Wetland/Stream Crossings
24. Temporary Construction, Access, and Dewatering
25. Emergency Situations

GP 1. AIDS TO NAVIGATION AND TEMPORARY RECREATIONAL STRUCTURES (Authority: §10)	
(a) The placement of aids to navigation and regulatory markers that are approved by and installed in accordance with the requirements of the U.S. Coast Guard (USCG). See 33 CFR, Part 66; and (b) Temporary buoys, markers, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use. See GC 16.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Aids to navigation and regulatory markers approved by and installed in accordance with the requirements of the USCG. 2. Temporary buoys, markers and similar structures that are: (a) placed for recreational use during specific events and removed within 30 days after event; or (b) placed during winter events on ice and removed before spring thaw. These structures must be authorized by the local harbormaster, not located within an FNP or its buffer zone, and not located in saltmarsh or tidal vegetated shallows.	1. Impacts in saltmarsh or tidal vegetated shallows. 2. Activities that are not SV eligible.
Note: An SVN submittal to USACE is not required for work authorized under SV #1 above.	

GP 2. MAINTENANCE (Authorities: §10 and §404)

Repair, rehabilitation, or replacement of any previously authorized[1], currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 (activities occurring before certain dates), provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction technique requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above. Maintenance dredging and beach nourishment are not eligible under GP 2 (see GP 7). Stream crossing modifications (including sliplining), replacements or extensions are not eligible under GP 2 (see GPs 6, 17, 23). *See GP 25 Emergency Situations for expedited review of emergency activities.*

Not authorized under GP 2 (IP required): (a) Permanent impacts in >1 acre in non-tidal waters and/or wetlands; or (b) Permanent impacts >1/2 acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; or (c) Temporary impacts >1 acre in tidal waters; >5000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >1000 SF in vegetated shallows; (d) New stream channelization or stream relocation projects (e.g., those in response to storm or flood events).

Self-Verification Eligible

Maintenance activities that meet all of the following terms:

1. In non-tidal waters, the combined permanent and temporary impacts extending beyond the original footprint are ≤5,000 SF[2] and not located in vegetated shallows or riffle and pool complexes.

2. In tidal waters, the combined permanent and temporary impacts extending beyond the original footprint are ≤5,000 SF, ≤1,000 SF in mudflats and/or natural rocky habitat, and not located in saltmarsh and tidal vegetated shallows.

3. Minor deviations in the repair, rehabilitation, or replacement of previously authorized, currently serviceable structures or fills.

4. Bulkhead replacement in tidal and non-tidal waters via installation of new bulkhead within 18 inches of the existing bulkhead and associated backfill.

5. Drawdown of an impoundment for dam/levee repair provided it does not exceed 18 months and one growing season (April through September).

Pre-Construction Notification Required

1. Discharges associated with removal of accumulated sediments and debris in the vicinity of existing structures, including intake and outfall structures and associated canals.

2. The removal of sediment outside the immediate vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.) that is ≥200 linear feet. This activity is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions existing when the structure was built.

3. Dam and flood control or levee repair, rehabilitation, or replacement involves:
   a. A change in the flood elevation or permanent water surface elevation of the impoundment; or
   b. Drawdown of impoundment for construction exceeding one growing season (see SV eligible #5);
   c. Any modification that changes the character, scope, or size of the original fill design; or
   d. Does not meet SV eligible 1-7.

4. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present.

[1] Some maintenance activities may not be subject to regulation under Section 404 of the CWA in accordance with 33 CFR 323.4(a)(2). Per 33 CFR 330.3, Vested dates are: a) Work performed and structures installed before December 18, 1968 (Section 10); and b) Fill placed before July 25, 1975 (Section 404).
[2] This excludes dam projects that may require a temporary drawdown with impacts >5,000 SF in non-tidal waters. Instead, the drawdown shall comply with SV #5 to be eligible under Self-Verification.

6. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project or within the boundaries of the structure or fill. 7. Work to previously approved tide gates not affecting upstream tidal resource areas.	5. Activities located in the Connecticut River or Merrimack River, unless they are completed in the dry or when the tide is waterward of the work area. 6. Activities on USACE properties & USACE-controlled easements. 7. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.
Notes: 1. This authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the CWA §404(f) exemption for maintenance. See 33 CFR 323.4(a)(2). Prior USACE permits may have included authorization to maintain the activity, in which case authorization under this GP is not necessary. 2. See GC 22 for information on temporary construction mats.	

GP 3. MOORINGS (Authority: §10)

New moorings and mooring fields; the relocation of previously authorized moorings; expansions, boundary reconfigurations or modifications of previously authorized mooring fields; and maintenance and replacement of moorings.

Not authorized under GP 3 (IP required): (a) Moorings or mooring fields converted to or associated with a new boating facility[1]; or (b) Moorings in a USACE Federal Navigation Anchorage or USACE Federal Navigation Channel, except municipal-operated mooring fields.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. New or relocated moorings that meet all the following terms: a. Authorized by a local harbormaster/ municipality under MGL Chapter 91 §10A; and b. No interference with navigation; and c. Single boat, single-point and non-commercial; and d. Not associated with a boating facility, and e. Neither placed within nor impact tidal vegetated shallows (e.g., eelgrass); and f. Not located within a USACE Federal navigation project (FNP) or the FNP buffer zone. 2. Existing, authorized moorings are converted from traditional moorings to low impact mooring technology (see note below) and/or helical anchors. 3. Maintenance and replacement of moorings authorized by the USACE.	1. New mooring fields; or expansions, boundary reconfigurations or modifications of existing, authorized mooring fields. 2. Moorings located such that they, and/or vessels docked or moored at them, are within the buffer zone of the horizontal limits of a Federal Anchorage. The buffer zone is equal to 3 times the authorized depth of that channel (see GC 15). 3. New individual moorings located in saltmarsh, mudflats, natural rocky habitat, and tidal vegetated shallows. Locating moorings these areas should be avoided to the maximum extent practicable. If these areas cannot be avoided, plans should show conservation mooring or low-impact mooring systems that prevent mooring chains from resting or dragging on the bottom substrate at all tides, where practicable. USACE may require a survey in areas previously mapped as containing eelgrass or within 100 ft. of existing eelgrass beds to document presence or absence of eelgrass and to determine the appropriate type and amount of compensatory mitigation for impacts to eelgrass. 4. Replacement moorings located in tidal vegetated shallows. 5. Moorings that are not SV eligible and do not require an IP.

Notes:

1. Low impact mooring systems, including conservation moorings, are encouraged to minimize impacts of chain scouring from conventional moorings during the tidal cycle.
2. An SVN submittal to USACE is not required for work authorized under SV #2-3 above.

[1] Boating facilities are marinas, yacht clubs, boat clubs, boat yards, dockominiums, town facilities, land/homeowner's associations, etc. that provide for a fee, rent or sell mooring or docking space. Not classified as boating facilities are municipal moorings or municipal mooring fields that charge an equitable user fee based only on the actual costs incurred.

GP 4. STRUCTURES IN NAVIGABLE WATERS OF THE U.S. (Authority: §10 & §404)

New, expansions, reconfigurations or modifications of structures for navigational access in waters of the U.S. including but not limited to temporary/seasonal or permanent pile and pole-supported piers, floats, stairs, shore outhauls, and boat and float lifts.

Not authorized under GP 4 (IP required): (a) Structures associated with a new boating facility; (b) Structures in a USACE Federal anchorage or channel; or (c) Artificial reefs.

Self-Verification Eligible

1. Private, non-commercial piers, floats and lifts that meet all the following terms:

   a. Piers and floats in: (i) Tidal waters total ≤600 SF combined; and (ii) Non-tidal navigable waters of the U.S. total ≤600 SF combined; and

   b. Piers are ≤4 feet wide and ≥6 feet above the marsh substrate (the height is measured from the marsh substrate to the bottom of the lowest longitudinal support); and

   c. Floats and lifts in tidal waters and non-tidal navigable waters of the U.S. are ≥24 inches above the substrate during all tidal cycles. Float stops are preferred when site conditions warrant them (i.e., low tide exposes substrate), and skids can only be used in areas where piles are not feasible and on sandy or hard bottom substrates; and

   d. Piers, floats and lifts: (i) Are ≥25 feet from previously mapped or existing vegetated shallows, or riparian property line extensions; (ii) Extend ≤25% of the waterway width in non-tidal navigable waters of the U.S. or MHW in tidal navigable waters of the U.S.

   e. Installation of ≤12-inch diameter timber piles. Installation of ≥12-inch diameter piles of any material type when installed in the dry.

2. Fenders and similar structures.

Pre-Construction Notification Required

1. Shore outhauls.
2. Expansions, modifications, or new reconfiguration zones at any authorized boating facility.
3. New, expansions, reconfigurations, reconfiguration zones, or modifications of structures that provide public, community or government recreational uses such as boating, fishing, swimming, access, etc.
4. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present.
5. Located within the buffer zone of the horizontal limits of an FNP (GC 15).
6. Miscellaneous structures.
7. Impacts in tidal vegetated shallows.
8. Structures that are not SV eligible and do not require an IP.

Notes:

1. See GC 19 regarding pile driving and pile removal in navigable waters and
2. See GC 20 regarding time of year restrictions in tidal waters.
3. Boating facilities are facilities that provide for a fee, rent, or sell mooring space, such as marinas, yacht clubs, boat clubs, boat yards, town facilities, dockominiums, etc. Pile supported structures with no discharges of dredged or fill material are not regulated by USACE in non-navigable waters.
4. A SVN submittal to USACE is not required for SV #2 above.

GP 5. BOAT RAMPS AND MARINE RAILWAYS (Authorities: §10 and §404)

Activities required for the construction of boat ramps and marine railways, including excavation and fill.

Not authorized under GP 5 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters of the U.S., >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows[1]; or (c) dredging in navigable waters of the U.S. (see GP 7).

Self-Verification Eligible	Pre-Construction Notification Required
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. Boat ramps are located within 25 feet of property line extensions unless the properties are owned by the same owner. The USACE may require a letter of no objection from the abutter(s).
2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, and (c), not located in saltmarsh and tidal vegetated shallows.	2. Activities that are not eligible for SV and do not require an IP.

GP 6. UTILITY LINES, OIL OR NATURAL GAS PIPELINES, OUTFALL OR INTAKE STRUCTURES, AND APPURTENANT FEATURES (Authorities: §10 & §404)

Activities required for: (a) The construction, maintenance, repair or removal of utility lines, oil or natural gas pipelines[1], outfall or intake structures[2], and appurtenant features including the associated excavation, backfill, or bedding for these structures. (b) The construction, maintenance, or expansion of substations and other appurtenant facilities associated with a utility line, oil or natural gas pipeline, and outfall or intake structure in non-tidal waters of the U.S.; and (c) The construction and maintenance of foundations for overhead utility line towers, poles, and anchors in tidal and non-tidal waters of the U.S., provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible. This GP authorizes the construction of access roads to facilitate construction of the above activities provided the activity, in combination with all other activities included in one single and complete project, does not exceed the thresholds identified below (IP required). Access roads used solely for construction of the utility line must be removed upon completion of the work. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above.[3]

Not authorized under GP 6 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters of the U.S.; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Stormwater treatment or detention systems, or subsurface sewage disposal systems in waters of the U.S.; or (d) New tide gates that do not meet SV criteria below.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, and (c), not located in saltmarsh and tidal vegetated shallows. 3. Intake structures that are dry hydrants used exclusively for firefighting activities with no stream impoundments. 4. New tide gates on outfall structures for pipes conveying stormwater and/or industrial NPDES-permitted discharges from waters that are not waters of the U.S.	1. New outfall and/or intake structures. 2. Unconfined work or silt producing activities in streams with diadromous fish. 3. Submarine cables, conduits, or pipelines that occur in, over or under navigable waters of the U.S. 4. Stream channelization, relocation, impoundment, or loss of streambed occurs. 5. The activity is placed within and runs parallel to or along a streambed within waters of the U.S. 6. There is a permanent change in preconstruction contours in waters of the U.S. 7. Installation of utility lines or gas/oil pipelines using trench excavation where material is temporarily sidecast into waters of the U.S. for >3 months. Applicants must demonstrate how the material would not be dispersed by currents or other forces. 8. Activities that are not SV eligible and do not require an IP.

[1] See the definitions of a “utility line” and “oil or natural gas pipeline” in Section VII.

[2] Outfall structures must be in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (Section 402 of the Clean Water Act).

[3] Temporary impacts shall comply with all GCs, including GC 32 Utility Line Installation and Removal.

GP 7. DREDGING (Authority: §10), DISPOSAL OF DREDGED MATERIAL (Authorities: §10, §404), BEACH NOURISHMENT (Authorities: §10 & §404), ROCK REMOVAL (Authority: §10) AND ROCK RELOCATION (Authorities: §10 & §404)

New, improvement and maintenance dredging (see notes below) including: (a) Disposal of dredged material at a confined aquatic disposal cell, beach nourishment location, near shore site, or ocean disposal site selected under Section 404 of the Clean Water Act pursuant to the 404(b)(1) Guidelines, provided the dredged material meets the requirements for such disposal; (b) Beach nourishment not associated with dredging; and (c) Rock removal and relocation for navigation.

Not authorized under GP 7 (IP required): (a) Dredging where ocean disposal is required for the disposal of dredged material (Section 103); New dredging >½ acre; ≥10,000 CY; >1000 SF permanent impacts to intertidal areas, saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF permanent impacts to tidal vegetated shallows; (b) Maintenance or improvement dredging and/or disposal with >1 acre of impacts to intertidal areas, saltmarsh, mudflats, riffle and pool complexes, or non-tidal vegetated shallows; (c) New dredging where the primary purpose is sand mining for beach nourishment; (d) Beach scraping; (e) Boulder removal and relocation for navigation >½ acre; or (f) Blasting.

Self-Verification Eligible

1. Maintenance dredging of previously dredged areas, with upland disposal, that meet all of the following terms:
   a. Dredged area ≤1/2 acre; and
   b. Activities comply with GC 20, TOY Restrictions. The time-of-year restriction(s) stated in Appendix B of the MA Division of Marine Fisheries (DMF) Technical Report TR-47[1] can apply instead if the general TOY restriction if a TOY is provided for a specific waterbody and is less restrictive. This is to protect endangered species, EFH, and other species; and
   c. The dredge footprint is located >25' from salt marsh or >100' from vegetated shallows; and
   d. Combined permanent and temporary impacts that are (i) ≤1,000 SF in mudflats or natural rocky habitat, or (ii) ≤5,000 SF within intertidal habitat and areas containing shellfish (an area contains shellfish unless: it is verified that minimal shellfish are present per the local shellfish constable or a shellfish survey; or it is not mapped as a MassGIS shellfish suitability area).
   e. No return water from upland disposal areas.

2. Boulder relocation with ≤1,000 SF of impacts, relocated to a similar depth and substrate.

Pre-Construction Notification Required

1. Maintenance dredging where the primary purpose is sand mining for beach nourishment.

2. New dredging and associated disposal ≤1/2 acre or <10,000 cubic yards.

3. Improvement dredging.

4. Beach nourishment in waters of the U.S. not associated with dredging.

5. Activities that are located in saltmarsh and tidal vegetated shallows.

6. Dredging in a Federal Navigation Project or within the buffer zone (see GC 15).

7. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See Section VII for definitions of improvement and maintenance dredging.
2. For PCN activities, the USACE may waive or adjust the time of year requirement on a case-by-case basis after consultation with resource agencies.
3. Disposal site of any dredged material must be identified prior to obtaining USACE authorization.
4. Contact the USACE if a ten-year authorization to maintain an area is desired.

[1] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

GP 8. U.S. COAST GUARD APPROVED BRIDGES (Authorities: §404)

Discharges of dredged or fill material incidental to the construction and modification of bridges across navigable waters of the U.S., including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided that the USCG authorizes the construction of the bridge structure under Section 9 of the Rivers and Harbors Act of 1899 or other applicable laws. A USCG Authorization Act Exemption or a Surface Transportation and Uniform Relocation Assistance Act (STURRA) (144h) exemption do not constitute USCG authorization.

Not authorized under GP 8 (IP Required): Causeways and approach fills (see GP 23).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Discharges of dredged or fill material that are incidental to the construction of bridges across navigable waters and meet all of the following: a. Combined permanent and temporary impacts that are ≤5,000 SF. b. Combined permanent and temporary impacts that are ≤1,000 SF in mudflats and natural rocky habitat. c. Not located in saltmarsh and tidal vegetated shallows.	1. Activities on USACE properties & USACE controlled easements.2. Installation of steel piles, including steel sheet piles, that cannot be done in the dry and where NOAA-ESA listed species are mapped as present. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. GP 8 is not applicable to bridges over inland waters or wetlands that are not tidally influenced or regulated as navigable under Section 10.
2. See eligibility criteria for GPs 2 & 23 for projects that are not subject to USCG regulations.

GP 9. BANK AND SHORELINE STABILIZATION (Authorities: §10 & §404)

Bank stabilization activities necessary for erosion protection along the banks of lakes, ponds, streams, estuarine and ocean waters, and any other open waters. Includes bulkheads, seawalls, riprap, revetments, living seawalls, or slope protection & similar structures, specifically for the purpose of shoreline protection. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the activities above.

Activities must meet the following criteria: (a) No material is placed in excess of the minimum needed for erosion protection; (b) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the U.S.; (c) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas); (d) Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization; (e) The activity is not a stream channelization activity; and (f) The activity must be properly maintained, which may require repairing it after severe storms or erosion events. This GP authorizes those maintenance and repair activities if they require authorization. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the bank stabilization activity. See GP 20 for living shoreline stabilization structures or fills.

Not authorized under GP 9 (IP required): (a) New bank stabilization >500 feet in total length (>1,000 linear feet in total length when necessary to protect transportation infrastructure) or permanent loss of saltmarsh >1,000 SF, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects (an exception is for bulkheads – the district engineer cannot issue a waiver for a new bulkhead that is >1,000 feet in length along the bank); (b) Stream channelization or relocation activities; or (c) Breakwaters, groins or jetties.

Self-Verification Eligible

1. Activities in tidal and non-tidal waters that are:
   a. <200 feet in length.
   b. <400 feet in length when necessary to protect transportation infrastructure.
   c. ≤1 cubic yard of fill per linear foot average along the bank waterward of the plane of OHW or HTL.
   d. Not located in non-tidal wetlands, saltmarsh, vegetated shallows.

Pre-Construction Notification Required

1. Activities in tidal and non-tidal waters that are:
   a. ≥200 feet to ≤500 feet in total length. Activities >500 feet in total length must have a written waiver from USACE.
   b. ≥400 feet to ≤1,000 feet in total length when necessary to protect transportation infrastructure. Activities >1,000 feet in total length must have a written waiver from USACE.
   c. >1 cubic yard of fill per linear foot average along the bank waterward of the plane of OHW or HTL.
   d. Located in non-tidal wetlands, saltmarsh, vegetated shallows.
2. Activities with permanent loss of tidal or non-tidal waters that is (a) ≥5,000 SF or (b) ≥1,000 SF in mudflats and natural rocky habitat.
3. Activities that are (a) located in the Connecticut River or Merrimack River and/or (b) require installation of steel piles/steel sheet piles that cannot be done in the dry where NOAA ESA-listed species are mapped as present.
4. Activities on USACE properties & USACE-controlled easements.
5. Activities that require grouted riprap and/or poured/unformed concrete.
6. Activities that are not eligible for SV and do not require an IP.

Note: The applicant shall comply with GC 24. This includes utilization of bioengineering techniques in lieu of hard armoring to the maximum extent practicable as site conditions allow.

GP 10. AQUATIC HABITAT RESTORATION, ENHANCEMENT, AND ESTABLISHMENT ACTIVITIES (Authorities: §10 and §404)

Activities for the restoration, enhancement and establishment of non-tidal and tidal wetlands and riparian areas, including invasive, non-native or nuisance species control; the restoration and enhancement of non-tidal streams and other non-tidal open waters; the relocation of non-tidal waters, including non-tidal streams & associated wetlands for reestablishment of a natural stream morphology and reconnection of the floodplain; the restoration and enhancement of shellfish, finfish and wildlife; and the rehabilitation or enhancement of tidal streams, tidal wetlands and tidal open waters; provided those activities result in net increases in aquatic resource functions and services. See GP 9 for bank and shoreline stabilization. See GP 20 for living shorelines.

Not authorized under GP 10 (IP required): Stream channelization activities and artificial reefs.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In tidal and non-tidal waters excluding tidal vegetated shallows, the combined permanent and temporary impacts are ≤5,000 SF. 2. Eelgrass (vegetated shallows) planting and transplanting ≤100 SF in tidal waters.	1. In tidal and non-tidal waters excluding tidal vegetated shallows, the combined permanent and temporary impacts are >5,000 SF. 2. Eelgrass (vegetated shallows) planting and transplanting >100 SF in tidal waters. 3. Permanent water impoundments, dam removal, fish ladders, or tide gates. 4. Stream relocation, impoundment, or loss of streambed occurs. 5. Runneling projects with the purpose of restoring saltmarsh by removing excess water that ponds on the saltmarsh surface. 6. The conversion of: (a) a stream or natural wetlands to another aquatic habitat type (e.g., stream to wetland or vice versa, wetland to pond, etc.) or uplands, (b) one wetland type to another (e.g., forested wetland to an emergent wetland). 7. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving permanent or temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species. 8. Activities on USACE properties & USACE-controlled easements. 9. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Changes in wetland plant communities that occur when wetland hydrology is more fully restored during wetland rehabilitation activities are not considered a conversion to another aquatic habitat type.
2. See RGL 18-01 for guidance on removal of obsolete dams and other structures from rivers and streams. https://www.usace.army.mil/missions/civil-works/regulatory-program-and-permits/guidance-letters/
3. An ecological reference site may be used for a design basis of the restoration activity. The reference site should possess characteristics of an intact aquatic habitat or riparian area that exists in the region. The reference site shall represent the target habitat type of the proposed activity. A reference site may be required at the discretion of USACE.

GP 11. FISH AND WILDLIFE HARVESTING AND ATTRACTION DEVICES AND ACTIVITIES (Authorities: §10 and §404)

Fish and wildlife harvesting and attraction devices and activities in waters of the U.S. such as pound nets, crab traps, crab and shellfish dredging, eel pots, lobster traps, duck blinds, clam and oyster digging, fish aggregating devices, and small fish attraction devices such as open-water fish concentrators (sea kites, etc.).

Not authorized under GP 11 (IP required): Artificial reefs; or new, or expansions of, impoundments and semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster with an impounded area >½ acre.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤1/2 acre, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Fish and wildlife harvesting and attraction devices and activities that do not require a PCN or IP.	1. Pound nets, impoundments or semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster with an impounded area ≤½ acre, fish aggregating devices, or small fish attraction devices. 2. Devices and activities that are located in tidal vegetated shallows, mud flats, or saltmarsh. 3. Devices and activities that do not require an IP.

Note: An SVN submittal to USACE is not required for work authorized under GP 11.

GP 12. RESPONSE OPERATIONS, OIL AND HAZARDOUS SUBSTANCES (Authorities: §10 & §404)

(a) Activities conducted in response to a discharge or release of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) including containment, cleanup, and mitigation efforts, provided that the activities are done under either: (i) The Spill Prevention, Control and Countermeasure Plan required by 40 CFR 112.3; (ii) The direction or oversight of the Federal on-scene coordinator designated by 40 CFR 300; or (iii) Any approved existing State, regional or local contingency plan provided that the Regional Response Team concurs with the proposed response efforts or does not object to the response effort; (b) Activities required for the cleanup of oil releases in waters of the U.S. from electrical equipment that are governed by EPA's polychlorinated biphenyl (PCB) spill response regulations at 40 CFR 761; (c) Booms placed in navigable waters of the U.S. for oil and hazardous substance containment, absorption and prevention; and (d) The use of structures and fills for spill response training exercises. Wetlands, vegetated shallows, mudflats, and riffle and pool complexes should be restored in place at the same elevation.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities are conducted in accordance with (a) or (b) above that are not planned or scheduled, but an emergency response (see Note 1). 2. Booms placed in navigable waters of the U.S. for oil and hazardous substance containment, absorption and prevention. 3. Temporary impacts for spill response training exercises ≤5000 SF in non-tidal waters and ≤1000 SF in tidal waters with no impacts to wetlands, saltmarsh, mudflats, or vegetated shallows. 4. Temporary structures in tidal waters with no impacts to wetlands, saltmarsh, mudflats, vegetated shallows, or riffle and pool complexes and in place ≤30 days.	1. Activities (a) or (b) above are planned or scheduled, not an emergency response; or 2. Activities that are not eligible for SV and do not require an IP.

Notes:

1. For emergency response activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, Merrimack River from the Essex Dam to the mouth, and remaining tidal waters that are not rivers, the permittee must contact the USACE at (978) 318-8338 before or as soon as possible after the work authorized under GP 12(a) - (c) commences for the USACE to address effects under the Endangered Species Act.
2. An SVN submittal to USACE is not required for booms used for spill prevention, or properly contained and cleaned de minimus oil or hazardous substance discharges into navigable waters of the U.S.

GP 13. CLEANUP OF HAZARDOUS AND TOXIC WASTE (Authorities: §10 and §404)

Specific activities required to affect the containment, stabilization, or removal of hazardous or toxic waste materials, including court ordered remedial action plans or related settlements, which are performed, ordered or sponsored by a government agency with established legal or regulatory authority.

Not authorized under GP 13: (a) Establishment of new disposal sites; or (b) Expansion of existing sites used for the disposal of hazardous or toxic waste.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in vegetated shallows and riffle and pool complexes.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, and (b) located in vegetated shallows and riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters or navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, or loss of streambed occurs. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Wetlands, vegetated shallows, mudflats, and riffle and pool complexes should be restored in place at the same elevation to the maximum extent practicable.
2. Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA, are not required to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act.

GP 14. SCIENTIFIC MEASUREMENT DEVICES (Authorities: §10 and §404)

Scientific measurement devices for measuring and recording scientific data, such as staff gauges, tide and current gauges, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Also eligible are small weirs and flumes constructed primarily to record water elevation, flow and/or velocity. Upon completion of the use of the device to measure and record scientific data, the measuring device and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.) must be removed to the maximum extent practicable and the site restored to preconstruction elevations.

Not authorized under GP 14 (IP required): (a) Permanent impacts that are >5,000 SF in tidal and non-tidal waters of the U.S.; >1000 SF in tidal saltmarsh, mud flats, riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows. 3. Temporary, non-biological sampling devices in waters that do not restrict or concentrate movement of aquatic organisms and will not adversely affect the course, condition, or capacity of a waterway for navigation. 4. Scientific measurement devices, and small weirs and flumes constructed primarily to record water quantity and velocity provided the discharge of fill is limited to 25 cubic yards. These cannot obstruct or restrict the waterway course, condition, capacity, and location. 5. Temporary measuring devices and associated structures (e.g., anchors, buoys, etc.) in tidal and non-tidal waters that do not require a PCN or IP.	1. Biological sampling devices, weirs or flumes, or the activity restricts or concentrates movement of aquatic organisms. 2. Permanent towers located in navigable waters that record and measure scientific data. 3. Devices that are not eligible for SV and do not require an IP.

Note: An SVN submittal to USACE is not required for temporary measuring devices with a footprint of <10 SF, with a profile of <3 feet high measured from the substrate and located in water deeper than -10 feet MLW.

GP 15. SURVEY ACTIVITIES (Authorities: §10 and §404)

Survey activities such as soil borings, core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, sample plots or transects for wetland delineations, and historic resources surveys.

Not authorized under GP 15 (IP required): (a) Permanent impacts that are >1 acre in tidal and non-tidal waters; >1000 SF in tidal saltmarsh, mud flats, or riffle and pool complexes; or >100 SF in tidal vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre, unless the District Engineer waives this criterion by making a written determination concluding that the discharge of dredged or fill material will result in no more than minimal adverse environmental effects; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, (b) ≤1,000 SF in mudflats and/or natural rocky habitat, (c) not located in saltmarsh and tidal vegetated shallows.	1. Exploratory trenching (see Note 2) occurs in waterways (e.g., streams, tidal waters). 2. Activities associated with the recovery of historic resources, and the drilling and discharge of excavated material from test wells for oil and gas exploration. 3. Seismic exploratory operations occur in tidal waters, the Connecticut River from the Turners Falls Dam to the MA/CT border, or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species. 4. Activities that are not eligible for SV and do not require an IP.

Notes:

1. An SVN submittal is not required for wetland delineations, and core sampling conducted for preliminary evaluation of dredge project analysis.
2. For the purposes of GP 15, the term “exploratory trenching” means mechanical land or underwater clearing of the upper soil profile to expose bedrock or substrate for the purpose of mapping or sampling the exposed material.
3. The discharge of drilling mud and cuttings may require a permit under §402 of the CWA.

GP 16. LAND AND WATER-BASED RENEWABLE ENERGY GENERATION FACILITIES (Authorities: §10 and §404), AND HYDROPOWER PROJECTS (Authority: §10 and §404)

Structures and work in tidal waters and discharges of dredged or fill material into tidal and non-tidal waters for the construction, expansion, modification or removal of: (a) Land-based renewable energy production facilities (e.g., solar, wind, biomass, geothermal) and their attendant features; (b) Water-based wind or hydrokinetic renewable energy generation projects and their attendant features; and (c) Discharges of dredged or fill material associated with hydropower projects. Attendant features may include, but are not limited to, land-based collection and distribution facilities, control facilities, and parking lots. For each single and complete project in (b) above, no more than 10 generation units (e.g., wind turbines or hydrokinetic devices) are authorized in navigable waters of the U.S. Upon completion of the pilot project (see note 2), the generation units, transmission lines, and other structures or fills associated with the pilot project must be removed to the maximum extent practicable.

Not authorized under GP 16 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters, >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in vegetated shallows; or (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) ≤5,000 SF, (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts for land-based activities are (a) >5000 SF, or (b) located in vegetated shallows or riffle and pool complexes. 2. Permanent and temporary impacts in tidal waters. 3. Water-based wind or hydrokinetic renewable energy generation projects, and hydropower projects. 4. For all activities eligible for authorization under GP 16: a. The activity occurs in tidal waters or in, over or under navigable waters. b. Stream channelization, relocation, impoundment, or loss of streambed occurs. 5. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Utility lines constructed to transfer the energy from the land-based renewable generation or collection facility to a distribution system, regional grid, or other facility may be authorized by GP 6.
2. For the purposes of this GP, the term “pilot project” means an experimental project where the renewable energy generation units will be monitored to collect information on their performance and environmental effects at the project site.

GP 17. RESIDENTIAL, COMMERCIAL AND INSTITUTIONAL DEVELOPMENTS AND RECREATIONAL FACILITIES (AUTHORITIES: §404)

Discharges of dredged or fill material into non-tidal waters for the construction or expansion of: (a) Residences and residential subdivisions; (b) Residential, commercial and institutional building foundations and building pads; and (c) Recreational facilities such as playgrounds, playing fields, bikeways, trails, etc. This GP also authorizes attendant features that include, but are not limited to, roads, parking lots, garages, yards, and utility lines, and stormwater management facilities. This GP authorizes attendant features if they are necessary for the use of the project purpose.

Not authorized under GP 17 (IP required): (a) Permanent impacts that result in loss of non-tidal waters >1/2 acre; >1000 SF in riffle and pool complexes or vegetated shallows; or (b) Subsurface sewerage disposal systems in non-tidal waters.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are (a) <5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. Stream channelization or relocation resulting in loss of streambed that is <200 LF.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) ≥5,000 SF, or (b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. Stream and wetland crossings that require a PCN per GCs 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings. 3. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind. 4. Activities on USACE properties & USACE-controlled easements. 5. Activities that are not SV eligible and do not require an IP.

Notes:

1. Stream and wetland crossings (permanent and temporary), including those built with construction mats; and modifications (including sliplining), replacements or extensions to existing crossings.
2. See GC 22 for information on temporary construction mats.
3. Subdivisions: For residential subdivisions, the aggregate total loss of waters of United States authorized by this GP cannot exceed 1/2-acre. This includes any loss of waters of the United States associated with development of individual subdivision lots.

GP 18. AQUACULTURE (Authorities: §10 and §404)

(a) The installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures into navigable waters of the U.S.; (b) Discharges of dredged or fill material into tidal and non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities; and (c) Shellfish seeding or brushing the flats projects. Any fill material imported to the project from offsite (this is limited to mineral growth medium used in culture trays) shall be clean and of comparable grain size to the native substrate. Activities authorized under this GP must have (a) their MA DMF Aquaculture Certificate letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.

Not authorized under GP 18 (IP required): (a) New, or expansions of, impoundments and semi-impoundments of tidal and non-tidal waters for the culture or holding of motile species such as lobster with an impounded area >½ acre; (b) Cultivation of a nonindigenous species (see Note 1) unless that species has been previously cultivated in the waterbody; (c) Cultivation of an aquatic nuisance species (see Note 1); (d) Attendant features such as docks, piers, boat ramps (see GP 4); (e) stockpiles, staging areas, or the deposition of shell material back into tidal and non-tidal waters as waste.

Self-Verification Eligible

1. In tidal waters, a new lease site area is (a) ≤2-acre, (b) not located in salt marsh, natural rocky habitat, or tidal vegetated shallows.

2. In tidal waters, *expansions* of existing lease sites not to exceed 2 acres for the entire site (e.g. 1 acre lease site increasing to a 2 acre lease site may qualify as SV). A PCN is required for expansions in salt marsh, natural rocky habitat, and tidal vegetated shallows.

3. Cages, racks that are elevated ≥2 feet above the ocean floor with legs within a lease site with ≤4 buoys marking the corners.

4. Floating cage strings with a single connecting line, ≤2 anchors and ≤2 end marker buoys per string within a lease site with ≤4 buoys marking the corners.

5. No activities located within 25 feet of tidal vegetated shallows.

6. Culture only indigenous species.

7. Not located in FNP or within a distance of three times the authorized depth of an FNP (see GC 15).

8. Not located in or impinge upon the value of any National Lands or Federal Properties.

9. Floating upweller docks that total ≤600 SF in area.

Pre-Construction Notification Required

1. Discharges of fill material associated with aquaculture >5,000 SF.

2. Research, educational, commercial-viability or experimental aquaculture gear activities >1,000 SF.

3. Kelp or finfish aquaculture.

4. Land-based hatchery intakes >3 inches in diameter.

5. Activities in water depths >10 feet mean low lower water (MLLW).

6. Activities with in-water lines, ropes or chains that are not SV eligible (see #3-4).

7. Activities occur in the Connecticut River from the Turners Falls Dam to the MA/CT border or the Merrimack River from the Essex Dam to the mouth. This is to protect endangered species.

8. New, or expansions of, impoundments and semi-impoundments for the culture or holding of motile species such as lobster with an impounded area ≤1/2 acre.

9. Activities that do not require an IP. Activities that do not require a PCN or an IP may be SV eligible.

Note: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines: (a) nonindigenous species as “any species or other viable biological material that enters an ecosystem beyond its historic range, including any such organism transferred from one country into another”; and (b) aquatic nuisance species as “a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.”

GP 19. MINING ACTIVITIES (Authorities: §10 and §404)

Discharges of dredged or fill material into non-tidal waters for mining activities, except for coal mining and metallic mineral mining activities.

Not authorized under GP 19 (IP required): (a) Permanent impacts >1 acre in non-tidal waters; or (b) Activities in tidal waters.

Self-Verification Eligible	Pre-Construction Notification Required
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes, non-tidal vegetated shallows, and streams.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes, non-tidal vegetated shallows, and streams. 2. The activity occurs in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or discharge of tailings into streams occurs. 4. Work on USACE properties & USACE-controlled easements. 5. Activities that are not eligible for SV and do not require an IP.

GP 20. LIVING SHORELINES[1] (Authorities: §10 and §404)

Construction and maintenance of living shorelines to stabilize banks and shores in tidal waters. In non-tidal waters that are not subject to the ebb and flow of the tide, nature-based bank stabilization techniques such as bioengineering and vegetative stabilization may be authorized by GP 9. This GP authorizes those maintenance and repair activities in-kind that are necessary to address changing environmental conditions.

The following terms must be met for both SVs and PCNs as applicable: (a) Coir logs, coir mats, stone, native oyster shell, native wood debris, and other structural materials must be adequately anchored, of sufficient weight, or installed in a manner that prevents relocation in most wave action or water flow conditions, except for extremely severe storms; (b) For living shorelines consisting of tidal fringe wetlands, native plants appropriate for current site conditions, including salinity and elevation, must be used if the site is planted by the permittee; (c) Discharges of dredged or fill material into waters of the U.S., and oyster or mussel reef structures in navigable waters, must be the minimum necessary for the establishment and maintenance of the living shoreline; (d) If sills or other structural materials per PCN #4 must be constructed to protect fringe wetlands for the living shoreline, those structures must be the minimum size necessary to protect those fringe wetlands; (e) The activity must be designed, constructed, and maintained so that it has no more than minimal adverse effects on water and sediment movement between the waterbody and the shore and the movement of aquatic organisms between the waterbody and the shore; and (f) The living shoreline must be properly maintained and monitored, which may require periodic repair of sills, bioengineered components, or replacing sand fills after severe storms or erosion events. Vegetation may be replanted to maintain the living shoreline.

Not authorized under GP 20 (IP required): (a) The activity is ≥1000 feet in length along the bank (≥2000 LF both banks) unless waived by the District Engineer; or (b) The activity is >30 feet channel ward of mean low water in tidal waters; or (c) Upland reclamation activities; or (d) Stream channelization or relocation activities; or (e) Breakwaters, groins, jetties, or artificial reefs; or (f) Permanent impacts >1,000 SF in existing saltmarsh; >100 SF in existing tidal vegetated shallows.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Tidal and non-tidal living shorelines ≤100 LF for each bank (≤200 LF for both banks). 2. Combined permanent and temporary impacts ≤5,000 SF in tidal waters, excluding existing salt marsh, tidal vegetated shallows, natural rocky habitat, and mudflats.	1. Tidal and non-tidal living shorelines >100 LF to <1000 LF (>200 LF to <2000 LF for both banks). 2. Permanent and temporary impacts in existing salt marsh, tidal vegetated shallows, or mudflats. 3. Work on USACE properties & USACE-controlled easements. 4. Use of stone sills, native oyster shell, native wood debris, or other structural materials.

Notes:

1. PCNs require monitoring for a minimum of 5 years in accordance with an approved restoration plan, unless otherwise determined by the USACE. The first year of monitoring will be the first year that the site has been through a full growing period after completion of construction and planting.
2. Applicants are encouraged to obtain a MEPA certificate prior to submitting a USACE permit application.

[1] A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural "soft" elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes. Living shorelines must have a substantial biological component, either tidal or lacustrine fringe wetlands or oyster or mussel reef structures.

GP 21. AGRICULTURAL ACTIVITIES (Authority: §404)

Discharges of dredged or fill material in non-tidal waters for agricultural activities, including the construction of building pads for farm buildings. Authorized activities include: (a) installation, placement, or construction of drainage tiles, ditches, or levees; mechanized land clearing; land leveling; the relocation of existing serviceable drainage ditches; and similar activities; (b) construction of farm ponds, excluding perennial streams, provided the farm pond is used solely for agricultural purposes; and (c) discharges of dredged or fill material to relocate existing serviceable drainage ditches constructed in non-tidal streams.

Not authorized under GP 21 (IP required): (a) Permanent impacts that are >1 acre in non-tidal waters; or >1000 SF in riffle and pool complexes, or non-tidal vegetated shallows; (b) Work in tidal waters; or (c) Construction of farm ponds in perennial streams.

Self-Verification Eligible	**Pre-Construction Notification Required**
In non-tidal waters, the combined permanent and temporary impacts are (a) ≤5,000 SF, and (b) not located in riffle and pool complexes and non-tidal vegetated shallows.	1. In non-tidal waters, the combined permanent and temporary impacts are (a) >5,000 SF, or (b) located in riffle and pool complexes and non-tidal vegetated shallows. 2. Activities occur in non-tidal navigable waters of the U.S. 3. Stream channelization, relocation, impoundment, loss of streambed, or farm ponds in non-perennial streams occurs. 4. Activities that are not eligible for SV and do not require an IP.

Note: Some discharges for agricultural activities may qualify for an exemption under Section 404(f) of the CWA (see 33 CFR 323.4). This GP authorizes the construction of farm ponds that do not qualify for the CWA §404(f)(1)(C) exemption because of the recapture provision at §404(f)(2).

GP 22. RESHAPING EXISTING DRAINAGE DITCHES, CONSTRUCTION OF NEW DITCHES, AND MOSQUITO MANAGEMENT (Authorities: §10 and §404)

Discharges to modify the cross-sectional configuration of currently serviceable drainage ditches constructed in tidal and non-tidal waters, for the purpose of improving water quality by regrading the drainage ditch with gentler slopes, which can reduce erosion, increase growth of vegetation, and increase uptake of nutrients and other substances by vegetation. Also authorized are mosquito reduction activities.

Not authorized under GP 22 (IP required): Stream channelization, relocation, impoundments, or loss of streambed.

Self-Verification Eligible	**Pre-Construction Notification Required**
≤500 linear feet of drainage ditch will be reshaped provided excavated material is deposited in an upland area.	1. >500 linear feet of drainage ditch will be reshaped, excavated material is deposited in a water of the U.S., or the reshaping of the ditch increases the drainage capacity beyond the original as-built capacity or expands the area drained by the ditch as originally constructed (i.e., the capacity of the ditch is not the same as originally constructed or drains additional wetlands or other waters of the U.S.). 2. Permanent and temporary impacts in tidal vegetated shallows. 3. New ditches or relocation of drainage ditches constructed in waters of the U.S. (i.e., the location of the centerline of the reshaped drainage ditch is not approximately the same as the location of the centerline of the original drainage ditch). 4. Activities that are not eligible for SV and do not require an IP.

Note: Some ditch activities are exempt under Section 404(f) of the CWA (see 33 CFR 323.4).

GP 23. LINEAR TRANSPORTATION PROJECTS AND WETLAND/STREAM CROSSINGS (Authorities: §10 & §404)

Activities[1] required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., driveways, roads, highways, railways, trails, airport runways, and taxiways) and attendant features. This GP also authorizes temporary structures, fills, and work, including the use of temporary mats (see Note 1), necessary to construct the linear transportation project.

Not authorized under GP 23 (IP required): (a) Permanent impacts for any single and complete project that are >1 acre in non-tidal waters; >½ acre in tidal waters; >1000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars (see GP 17); or (d) New tide gates.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, the combined permanent and temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows; and c) meet the Massachusetts River and Stream Crossing Standards 2. Existing crossings (e.g., culverts, elliptical or arch pipes, etc.) are not modified by (a) decreasing the diameter of the crossing or (b) changing the friction coefficient, such as through slip lining (retrofitting an existing culvert by inserting a smaller diameter pipe), culvert relining or invert lining. 3. Stream channelization or relocation resulting in loss of streambed that is <200 LF.	1. In non-tidal waters, the combined permanent and temporary impacts are a) >5,000 SF; b) located in vegetated shallows or riffle and pool complexes; or c) do not meet the Massachusetts River and Stream Crossing Standards (see note 4). 2. The activity occurs in tidal waters, salt marsh, or in, over or under navigable waters of the U.S. 3. Stream and wetland crossings that require a PCN per GC 20 TOY Restrictions and GC 31 Stream Work and Crossings & Wetland Crossings. 4. Stream channelization or relocation resulting in loss of streambed that is ≥200 LF. Stream impoundment activities of any kind. 5. Work on USACE properties & USACE-controlled easements. 6. Activities that are not eligible for SV and do not require an IP.

Notes:

1. See GC 22 for information on temporary construction mats.
2. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the U.S. may be authorized under GP 8.
3. Loss of streambed does not require a PCN when bridge piers or similar supports are used.
4. In their PCN application submission to the USACE, applicants must explain why they are unable to meet the Massachusetts River and Stream Crossing Standards.
5. For tidal crossings, modeling is encouraged as a method to verify the proposed crossing would not be undersized and resilient to the effects of sea level rise.

[1] Stream crossings must conform with the MA Stream Crossing Guidelines when practicable and comply with all applicable GCs of this document (Section IV).

GP 24. TEMPORARY CONSTRUCTION, ACCESS, AND DEWATERING (Authorities: §10 and §404)

Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites that are not authorized under another GP activity.

Not authorized under GP 24 (IP required): (a) Permanent structures or impacts; (b) Temporary impacts in tidal waters that are >1 acre; >5000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1000 SF in vegetated shallows; (c) Use of cofferdams to dewater wetlands or other aquatic areas to change their use; (d) Temporary stream crossings (see GPs 6, 17, 23); (e) Structures or fill left in place after construction is completed.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. In non-tidal waters, temporary impacts are a) ≤5,000 SF; b) not located in riffle and pool complexes and non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) ≤5,000 SF, b) ≤1,000 SF in mudflats and/or natural rocky habitat, and c) not located in saltmarsh and tidal vegetated shallows. 3. Structures in navigable waters of the U.S. provided impacts do not require a PCN and they are left in place ≤30 days.	1. In non-tidal waters, temporary impacts are a) >5,000 SF; b) located in riffle and pool complexes or non-tidal vegetated shallows. 2. In tidal waters, temporary impacts are a) >5,000 SF; b) >1,000 SF in mudflats and/or natural rocky habitat, or (c) located in saltmarsh and tidal vegetated shallows. 3. Activities in the Connecticut River from the Turners Falls Dam to the MA/CT border, or Merrimack River from the Essex Dam to the mouth, involving temporary impacts unless they are performed <5 feet waterward from OHW or HTL and in the dry. This is to protect endangered species; or 4. Activities not eligible for SV and do not require an IP.

Notes:

1. Turbidity or sediment resuspension is generally not considered to occur when properly using management techniques to work in dry conditions. See GC 25.
2. Total impact areas under SV Eligible 1-2 exclude use of temporary construction mats. See GC 22 for information on temporary construction mats.
3. An SVN submittal to USACE is not required for SV #3 above.

GP 25. EMERGENCY SITUATIONS (Authorities: §10 and §404)

Structures or work in or affecting navigable waters of the U.S. and the discharge of dredged or fill material into waters of the U.S., including wetlands, necessary for repair or protection measures associated with an emergency situation[1], MassDEP Emergency Declaration/Certification, or FEMA Declared Disaster. The activity shall be the minimum necessary to alleviate the immediate emergency unless that additional work would result in no more than minimal effects to aquatic environment and is necessary to reduce the potential for future failure or loss of the structure or site. Typical activities authorized under this GP include, but are not limited to, restoration of damaged areas; bank stabilization; temporary fills for staging, access, and dewatering; and, repair, replacement, or rehabilitation of existing structures and/or fills (i.e., roads, bridges, utility pipelines and flood control structures, including attendant features, and other existing structures located in waters of the U.S.).

For the restoration of areas damaged by storms floods, or other discrete events: (a) The restored area must not extend waterward of the ordinary high-water mark or high tide line that existed prior to the damage. (b) The slope of the restored area below the ordinary high-water mark or high tide line must not exceed the slope that existed prior to the damage. (c) The bottom elevation of the restored area must not exceed the bottom elevation that existed prior to the damage (i.e., the restored area must not result in a reduction in the depth of the waterbody that existed prior to the damage). (d) Except in cases of FEMA reimbursement, the activity must be initiated, under contract to commence, or funds shall be allocated for the activity within 30 days of authorization under GP 25.

Not authorized under GP 25 (IP required): (a) Permanent impacts for a single and complete project >1/2 acre in tidal waters, unless the district engineer waives this criterion by making a written determination concluding that the activity will result in no more than minimal adverse environmental effects; >1,000 SF in saltmarsh, mud flats, riffle and pool complexes, or non-tidal vegetated shallows; or >100 SF in tidal vegetated shallows; (b) Temporary impacts in tidal waters that are >5,000 SF in saltmarsh, mud flats, or riffle and pool complexes; or >1,000 SF in vegetated shallows; (c) New structures or fills that did not previously exist before the storm event or other discrete event (see other GPs).

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities that qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) and/or receive an Emergency Certification pursuant to 310 CMR 10.06 and/or meet the requirements of 314 CMR 9.12(2) or (3); and 2. Activities eligible under a FEMA Declared Disaster that also comply with #1 above.	1. Activities that are eligible under a FEMA Declared Disaster and do not qualify under SV #1. 2. Minor deviations in the structure or fill area, including those to existing structures or fills are authorized due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to alleviate the emergency. 3. Activities that are not eligible for SV and do not require an IP.

Notes:

1. Review the GCs (Section IV) to confirm if a PCN is not required elsewhere in this document.
2. If the activity is not a MassDEP Emergency Declaration/Certification, does not meet the requirements of 314 CMR 9.12(2) or (3), or is not a FEMA Declared Disaster, applicants must explain in writing why their activity qualifies as an emergency (see footnote) to be eligible under GP 25.
3. SV eligible activities qualify under the general 401 WQC MassDEP issued for the 2023 MA GPs (GC 9).

[1] An emergency, as determined by this office and 33 CFR 325.2(e)(4), is one which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a Department of the Army permit is not undertaken within a time period less than the normal time to process the request under standard processing procedures.

SECTION IV. GENERAL CONDITIONS:

To qualify for GP authorization, the applicant must comply with the following general conditions, as applicable, in addition to authorization-specific conditions imposed by the division or district engineer.

1. Other Permits
2. Federal Jurisdictional Boundaries
3. Single and Complete Projects
4. Use of Multiple General Permits
5. Suitable Material
6. Tribal Rights & Burial Sites
7. Avoidance, Minimization, and Compensatory Mitigation
8. Water Quality & Stormwater Management
9. Coastal Zone Management
10. Federal Threatened and Endangered Species
11. Essential Fish Habitat
12. National Lands
13. Wild and Scenic Rivers
14. Historic Properties
15. USACE Property and Federal Projects (§408)
16. Navigation
17. Permit/Authorization Letter On-Site
18. Storage of Seasonal Structures
19. Pile Driving and Pile Removal in Navigable Waters
20. Time of Year Restrictions
21. Heavy Equipment in Wetlands
22. Temporary Fill & Construction Mats
23. Restoration of Wetland Areas
24. Bank Stabilization
25. Soil Erosion and Sediment Controls
26. Aquatic Life Movements and Management of Water Flows
27. Spawning, Breeding, and Migratory Areas
28. Vernal Pools
29. Invasive Species
30. Fills Within 100-Year Floodplains
31. Stream Work and Crossings & Wetland Crossings
32. Utility Line Installation and Removal
33. Water Supply Intakes
34. Coral Reefs
35. Blasting
36. Inspections
37. Maintenance
38. Property Rights
39. Transfer of GP Verifications
40. Modification, Suspension, and Revocation
41. Special Conditions
42. False or Incomplete Information
43. Abandonment
44. Enforcement Cases
45. Previously Authorized Activities
46. Duration of Authorization

1. Other Permits. Authorization under these GPs does not obviate the need for the permittee to obtain other Federal, State, or local permits, approvals, or authorizations required by law. Permittees are responsible for obtaining all required permits, approvals, or authorizations. Activities that are not regulated by the State, but subject to USACE jurisdiction, may still be eligible for these GPs.

2. Federal Jurisdictional Boundaries.
a. Applicability of these GPs shall be evaluated with reference to Federal jurisdictional boundaries. Activities shall be evaluated with reference to "waters of the U.S." under the CWA (33 CFR 328) and "navigable waters of the U.S." under §10 of the Rivers and Harbors Act of 1899 (33 CFR 329). Permittees are responsible for ensuring that the boundaries used satisfy the Federal criteria defined at 33 CFR 328-329. These sections prescribe the policy, practice, and procedures to be used in determining the extent of the USACE jurisdiction. Note: Waters of the U.S. includes all waters pursuant to 33 CFR 328.3(a), and adjacent wetlands as the term is defined in 33 CFR 328.3(c).
b. Wetlands shall be delineated in accordance with the USACE Wetlands Delineation Manual and the most recent Northcentral/Northeast Regional Supplement. Wetland delineation and jurisdiction information is located at: www.nae.usace.army.mil/missions/regulatory/jurisdiction-and-wetlands and maps are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
c. Vegetated shallows shall be delineated when present on the project site. Vegetated shallow survey guidance and maps are located at: www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
d. Natural rocky habitats shall be delineated when present on the project site. The definition of natural rocky habitats is in Section VII of the MA GP. Natural rocky habitat survey guidance and maps are located at: www.nae.usace.army.mil/ missions/regulatory/state-general-permits/massachusetts-general-permit.

3. Single and Complete Projects. The MA GP shall not be used for piecemeal work and shall be applied to single and complete projects. The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers.
a. For non-linear projects, a single and complete project must have independent utility. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed, even if the other phases were not built, can be considered as separate single and complete projects with independent utility.
b. Unless USACE determines the activity has independent utility, all components of a single project and/or all planned phases of a multi-phased project (e.g., subdivisions should include all work such as roads, utilities, and lot development) shall be evaluated as one single and complete project.
c. For linear projects such as power lines or pipelines with multiple crossings, a "single and complete project" is all crossings of a single water of the U.S. (i.e., single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately. If any crossing requires a PCN review or an individual permit review, then the entire linear project shall be reviewed as one project under PCN or the individual permit procedures.

4. Use of Multiple General Permits. The use of more than one GP for a single and complete project is prohibited, except when the acreage loss of waters of the U.S. authorized by the GPs does not exceed the acreage limit of the GPs with the highest specified acreage limit. For example, if a road crossing over waters is constructed under GP 23, with an associated utility line

crossing authorized by GP 6, if the maximum acreage loss of waters of the U.S. for the total project is ≥1 acre it shall be evaluated as an IP.

5. Suitable Material & Discharge of Pollutants. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). All activities involving any discharge into waters of the U.S. authorized under these GPs shall be consistent with applicable water quality standards, effluent limitations, standards of performance, prohibitions, and pretreatment standards and management practices established pursuant to the CWA (33 U.S.C. 1251), and applicable state and local laws. If applicable water quality standards, limitations, etc., are revised or modified during the term of this GP, the authorized work shall be modified to conform with these standards within six months from the effective date of such revision or modification, or within a longer period of time deemed reasonable by the District Engineer in consultation with the Regional Administrator of the EPA. Unless monitoring data indicates otherwise, applicants may presume that their activity complies with state water quality standards provided they are in compliance with the Section 401 WQC (Applicable only to the Section 404 activity).

6. Tribal Rights & Burial Sites

a. For all SV and PCN applications, prospective permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

c. Many tribal resources are not listed on the National Register of Historic Places (NRHP) and may require identification and evaluation in collaboration with the identifying tribe and by qualified professionals. The Tribal Historic Preservation Officer (THPO) and State Historic Preservation Officer (SHPO) may be able to assist with locating information on:

i. Previously identified tribal resources; and
ii. Areas with potential for the presence of tribal resources.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the appropriate the Federal, Tribal, and state coordination required to determine if the items or remains are eligible for listing in the NRHP and warrant a recovery effort or can be avoided.

e. Burial Sites: Burial sites, marked or unmarked, are subject to state law (Massachusetts Unmarked Burial Law). Native American burial sites on federal or tribal land are subject to the provisions of Native American Graves Protection and Repatriation Act (NAGPRA). Regulated activities may not result in disturbance or removal of human remains until disposition of the remains has been determined by the appropriate authority under these laws, and the work is authorized by the USACE. Regulated activities which result in an inadvertent discovery of human remains must stop immediately, and the USACE, as well as the appropriate state and tribal authority, must be notified. Regulated work at inadvertent discovery sites requires compliance with state law or NAGPRA, as appropriate, prior to re-starting work.

7. Avoidance, Minimization, and Compensatory Mitigation. To qualify under the MA GP, activities must comply with Section V Mitigation Standards and the following as applicable:

a. Avoid and Minimize: Activities must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the U.S. to the maximum extent practicable at the project site. Avoidance and minimization are required to the extent necessary to ensure that the adverse effects to the aquatic environment (both area and function) are no more than minimal.

b. Compensatory mitigation for unavoidable impacts to waters of the U.S., including direct, indirect, secondary, and temporal loss, will generally be required for permanent impacts that exceed the thresholds identified in Section V, and may be required for temporary impacts, to offset unavoidable impacts which remain after all appropriate and practicable avoidance and minimization has been achieved and to ensure that the adverse effects to the aquatic environment are no more than minimal. Proactive restoration projects or temporary impact work with no secondary effects may generally be excluded from this requirement.
c. Mitigation proposals shall follow the guidelines found in the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule April 10, 2008; 33 CFR 332. Prospective permittees may purchase mitigation credits in-lieu of permittee-responsible mitigation as compensation for unavoidable impacts to waters of the U.S. in the Commonwealth of Massachusetts.

8. Water Quality & Stormwater Management. The 401 WQC requirement applies to all activities listed under GPs 1-25, unless determined otherwise by MassDEP. Permittees shall also satisfy stormwater management requirements in Massachusetts.

a. General 401 WQC: MassDEP issued a WQC on April 21, 2023 which conditionally certifies all activities in GPs 1 – 24 eligible for SV and PCN so long as the activity is described in 314 CMR 9.03, and is not an activity described in 314 CMR 9.04, and so long as the activity meets all other requirements, terms and conditions of the WQC. The MassDEP WQC also conditionally certifies activities described in GP 25 so long as the activity meets all other conditions of the WQC. Emergency projects described in GP 25 must obtain an emergency certification or otherwise be authorized pursuant to 310 CMR 10.06, qualify under a Severe Weather Emergency Declaration pursuant to 310 CMR 10.06(8) issued by the MassDEP, or meet the requirements of 9.12(2) or (3) in order to be certified under the WQC. Prospective permittees may refer to the following link to determine if their activity is eligible: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/ Massachusetts-General-Permit/. The General 401 WQC is located here, and it provides detailed information regarding what activities are certified and the conditions for certification. Activities listed in 314 CMR 9.03 that are not exempt from the Wetland Protection Act must have a valid Final Order of Conditions (OOC) or Final Restoration Order of Conditions pursuant to 310 CMR 10.00 to be eligible under the General 401 WQC.
b. Individual 401 WQC: Prospective permittees shall contact MassDEP and apply for an individual 401 WQC if their activity does not qualify for a General 401 WQC as outlined above. MassDEP may issue, waive, or deny the individual 401 WQC on a case-by-case basis. All activities listed in 314 CMR 9.04 must obtain an individual 401 WQC from MassDEP to be eligible under these GPs. When an Individual 401 WQC is required for *PCN activities*, the prospective permittee shall submit their Individual 401 WQC application concurrently to MassDEP and USACE to comply with 40 CFR 121.
c. The prospective permittee is responsible for determining the appropriate 401 WQC requirement and submitting this information to the USACE at the time of their PCN application or when completing their SVN. Prospective permittees that are unsure of whether their activity has been certified should contact MassDEP for a determination.
d. As applicable, all activities shall be compliant with the Massachusetts Stormwater Handbook. The Stormwater Handbook can be accessed on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. No work requiring authorization under Section 404 of the CWA may be performed unless (1) the prospective permittee qualifies for coverage under the April 21, 2023 General 401 WQC, (2) the prospective permittee receives an individual Section 401 WQC from the MassDEP, or (3) the MassDEP waives individual Section 401 WQC.

9. Coastal Zone Management. The permittee must obtain CZM consistency concurrence when an activity is located in the coastal zone in order to be eligible under the MA GP. This requirement

shall be satisfied by acquiring one of the following from the Massachusetts Office of Coastal Zone Management (MA CZM):

a. General CZM Federal Consistency Concurrence (General Concurrence): MA CZM has granted General Concurrence for all SV and PCN activities for GPs 1-25. The prospective permittee must obtain all applicable permits and approvals before construction of the authorized activity begins (e.g., before work begins on site). For SVs, General Concurrence is automatically granted and no further action is required from the prospective permittee. For PCNs, the USACE will coordinate with MA CZM to acquire General Concurrence as part of the PCN application review.
b. Individual CZM Federal Consistency Concurrence (Individual Concurrence): In certain cases, MA CZM may elevate any GP activity 1-25 and require Individual Concurrence. The prospective permittee must contact MA CZM and follow the procedures to obtain Individual Concurrence as determined appropriate by MA CZM.
c. Permittees must obtain CZM consistency concurrence as outlined above before commencing work authorized under these GPs.

10. Federal Threatened and Endangered Species

a. No activity is authorized under any GP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any GP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."
b. Other Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If a PCN is required for the proposed activity, the Federal permittee must provide USACE with the appropriate documentation to demonstrate compliance with those requirements. The USACE will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.
c. USFWS ESA-Listed Species: Non-federal applicants shall use the USFWS website, Information for Planning and Consultation (IPAC), to determine if their activity is located within the ESA-listed species range. The IPAC website can be accessed on the NAE Regulatory website: https://www. nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Applicants shall ensure they have an updated, valid species list before construction begins. This may require applicants to update their species list in IPAC before the start of construction. Note: Applicants should refer to the NAE Regulatory Website at the link above to determine if they have been designated as a non-federal representative. Applicants shall complete Section 7 consultation according to the guidance document located on the NAE Regulatory Website. After completing the Rangewide Determination Key and reaching the outcome "may affect, not likely to adversely affect", you may be required to wait up to 15 days before that outcome is final and compliance under Section 7 of the ESA is fulfilled.

i. *Self-Verification Criteria*: The activity is SV-eligible if:
   1) The activity is not located within the ESA-listed species range;
   2) Another (lead) Federal agency has completed Section 7 consultation; or
   3) The activity is located within the ESA-listed species range ***and*** USACE has designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all

species within the project's action area. As the non-federal representative, the applicant shall complete consultation through IPAC and reach the outcome of "no effect" or "not likely to adversely affect".

ii. *Pre-Construction Notification Criteria*: The activity requires a PCN if:

1) The activity is located within the ESA-listed species range ***and*** USACE has NOT designated the applicant as a non-federal representative under 50 CFR 402.08 of the ESA for all species within the project's action area;

2) The activity is located in designated or proposed critical habitat; or

3) The activity is located within the ESA-listed species range and completion of the IPAC determination key has resulted in the outcome of "may affect" or "may affect, likely to adversely affect"; or

4) A PCN is required elsewhere in this document.

d. NOAA-Listed Species: Non-federal applicants shall refer to the Section 7 Mapper for federally listed species to determine if any species are mapped as present. When NOAA-listed species are present, the applicant shall generate a species report through the mapper and submit this document as part of their PCN or SVN submission. The NOAA Fisheries' Section 7 Mapper can be accessed here on the NAE Regulatory website here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

e. Authorization of an activity by an GP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

11. Essential Fish Habitat (EFH).

a. SV eligible activities have been determined to result in no more than minimal adverse effects, provided the permittee complies with all terms and conditions of the MA GP as appliable to the activity. NMFS has granted General Concurrence [50 CFR 600.920(g)] for all SV eligible activities. These activities do not require project specific EFH consultation.

b. For PCN required activities, the applicant is required to describe and identify potential adverse effects to EFH and should refer to NOAA Fisheries' EFH Mapper (http://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper) and Omnibus Essential Fish Habitat Amendment 2 Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts (https://www.habitat.noaa.gov/application/efhmapper/oa2_efh_hapc.pdf). If an activity is located within EFH, the PCN application must contain:

1. A description of the action located in EFH.
2. An analysis of the potential adverse effects of the action on EFH and the managed Species.
3. Conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable (refer to the mitigation thresholds located in Section V).

c. Federal agencies shall follow their own procedures for complying with the EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act. For activities requiring a PCN, the applicant is responsible for furnishing documentation that demonstrates consultation for EFH has been completed.

d. For PCN activities, no work may commence until EFH consultation as required by the Magnuson-Stevens Act has been completed.

12. National Lands. Activities that impinge upon the value of any National Wildlife Refuge, National Forest, National Marine Sanctuary, National Historic Landmarks or any other area administered by the National Park Service, U. S. Fish and Wildlife Service (USFWS) or U.S. Forest Service (USFS) require a PCN or Individual Permit. Federal land managers seeking authorization for activities located in the above listed National Lands may proceed under SV, unless a PCN is required elsewhere in this document.

13. Wild and Scenic Rivers. The following activities in designated river or study river segments in the National Wild and Scenic River (WSR) System require a PCN unless the Federal agency with direct management responsibility for such river, in Massachusetts this is generally the National Park Service, has determined in writing to the proponent that the proposed work will not adversely affect the WSR designation or study status:

a. Activities that occur in WSR segments, in and 0.25 miles up or downstream of WSR segments, or in tributaries within 0.25 miles of WSR segments;
b. Activities that occur in wetlands within 0.25 miles of WSR segments;
c. Activities that have the potential to alter free-flowing characteristics in WSR segments.

No GP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

As of May 10, 2023, affected rivers in Massachusetts include: the Taunton River (40 miles), Sudbury River (16.6 miles), Assabet River (4.4 miles), Concord River (8 miles), Nashua River (27 miles), Squannacook River (16.3 miles), Nissitissit River (4.7 miles), and the Westfield River, including West Branch, Middle Branch, Gendale Brook, East Branch, Drowned Land Brook, Center Brook, Windsor Jambs Brook, Shaker Mill Brook, Depot Brook, Savery Brook, Watson Brook, Center Pond Brook (78.1 miles). The most up to date list of designated and study rivers and their descriptions may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

14. Historic Properties

a. For all SV and PCN applications, permittees shall follow the guidance set forth in Appendix A, Guidance for NHPA Section 106 Compliance in Massachusetts.

b. No undertaking authorized by these GPs shall cause effects[1] (defined in 36 CFR Part 800 and 33 CFR Part 325, Appendix C, and its Interim Guidance) on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places (NRHP)[2], including previously unknown historic properties within the permit area, unless the USACE or another Federal action agency has satisfied the consultation requirements of Section 106 of the National Historic Preservation Act (Section 106). If another Federal agency is determined the lead federal agency for compliance with Section 106, applicant must obtain the appropriate documentation and provide this information to the USACE to demonstrate compliance with Section 106. The applicant shall not begin the activity until the USACE notifies them in writing that the documentation provided satisfies Section 106 requirements.

[1] Effect means the alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register of Historic Properties.

[2] See the NAE Regulatory website, National Register of Historic Places link here: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

c. Many historic properties are not listed on the NRHP and may require identification and evaluation by qualified historic preservation and/or archaeological consultants. The State Historic Preservation Officer (SHPO), Massachusetts Board of Underwater Archaeological Resources (BUAR), local historical societies, certified local governments, general public, and NRHP may also be able to assist with locating information on:

i. Previously identified historic properties; and
ii. Areas with potential for the presence of historic properties.

d. Discovery of Previously Unknown Remains and Artifacts: If any previously unidentified human remains, cultural deposits, or artifacts are discovered while accomplishing the activity authorized by this permit, you must immediately notify the USACE of what you have found, and to the maximum extent practicable, cease work and avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The USACE will initiate the Federal, State and tribal coordination required to determine if the items or remains warrant a recovery effort and/or if the site is eligible for listing in the National Register of Historic Places.

e. Section 110k: Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. § 306113) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106, has intentionally significantly adversely effected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the USACE is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties effected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or effects historic properties on tribal lands or effects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

f. Underwater Archaeological Resources: Under Massachusetts General Law Ch. 6, s.'s 179-180, and Ch. 91, s. 63, the BUAR has statutory jurisdiction within state waters and is the sole trustee of the Commonwealth's underwater heritage, charged with the responsibility of encouraging the discovery and reporting, as well as the preservation and protection, of underwater archaeological resources. Underwater archaeological resources located within the waters of the Commonwealth of Massachusetts are property of the Commonwealth, which holds title to these resources and retains regulatory authority over their use. Under Massachusetts General Law, no person, organization or corporation may "remove, displace, damage, or destroy" any underwater archaeological resources located within the Commonwealth's submerged lands except through consultation with the BUAR and in conformity with the permits it issues. https://www.mass.gov/orgs/board-of-underwater-archaeological-resources.

15. USACE Property and Federal Projects. (33 USC §408)

a. USACE projects and property can be found at: https://www.nae.usace.army.mil/Missions/Civil-Works/.

b. In addition to any authorization under these GPs, prospective permittee shall contact the USACE Real Estate Division (https://www.nae.usace.army.mil/Missions/Real-Estate-Division/) at (978) 318-8585 for work occurring on or potentially affecting USACE properties and/or USACE-controlled easements. Work may not commence on USACE properties and/or USACE-controlled easements until they have received any required USACE real estate documents evidencing site-specific permission to work.

c. Any proposed temporary or permanent occupation or alteration of a Federal project (including, but not limited to, a levee, dike, floodwall, channel, anchorage, breakwater, seawall, bulkhead, jetty, wharf, pier, or other work built or maintained but not necessarily owned by the United States),

is not eligible for SV and requires a PCN. This includes all proposed structures and work in, over, or under a USACE federal navigation project (FNP) or in the FNP's buffer zone. The buffer zone is an area that extends from the horizontal limits of the FNP to a distance of three times the FNP's authorized depth. The activity also requires review and approval by the USACE pursuant to 33 USC 408 (Section 408 Permission). The prospective permittee may reach out to the POCs located here: https://www.nae.usace.army.mil/ Missions/Section-408/.
d. Any structure or work constructed in a FNP or its buffer zone shall be subject to removal at the owner's expense prior to any future USACE dredging or the performance of periodic hydrographic surveys.
e. Where a Section 408 permission is required, written verification for the PCN will not be issued prior to the decision on the Section 408 permission request.

16. Navigation
a. No activity may cause more than a minimal adverse effect on navigation.
b. Any safety lights and signals prescribed by the U.S. Coast Guard, must be installed, and maintained at the permittee's expense on authorized facilities in navigable waters of the U.S.
c. There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein, and no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein.
d. The permittee understands and agrees that if future U.S. operations require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from USACE, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

17. Permit/Authorization Letter On-Site. For PCNs, the permittee shall ensure that a copy of these GPs and the accompanying authorization letter are at the work site (and the project office) whenever work is being performed, and that all personnel with operational control of the site ensure that all appropriate personnel performing work are fully aware of its terms and conditions. The entire permit authorization shall be made a part of any and all contracts and sub-contracts for work that affects areas of USACE jurisdiction at the site of the work authorized by these GPs. This shall be achieved by including the entire permit authorization in the specifications for work. The term "entire permit authorization" means these GPs, including GCs and the authorization letter (including its drawings, plans, appendices, special conditions, and other attachments), and any permit modifications. If the authorization letter is issued after the construction specifications, but before receipt of bids or quotes, the entire permit authorization shall be included as an addendum to the specifications. If the authorization letter is issued after receipt of bids or quotes, the entire permit authorization shall be included in the contract or sub-contract as a change order. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions contained within the entire authorization letter, and no contract or sub-contract shall require or allow unauthorized work in areas of USACE jurisdiction. For SVs, the permittee shall ensure that a complete and signed copy of the SVN is present on site during construction and is made available for review at any time by USACE and other Federal, State, & Local regulatory agencies. A complete and signed copy of the SVN must be submitted to USACE Regulatory within 30 days of initiating construction of the authorized activity, unless stated otherwise in the applicable GP.

18. Storage of Seasonal Structures. Coastal structures such as pier sections, floats, etc., that

are removed from the waterway for a portion of the year (often referred to as seasonal structures) shall be stored in an upland location, located above MHW and not in tidal wetlands. These seasonal structures may be stored on the fixed, pile-supported portion of the structure that is seaward of MHW. This is intended to prevent structures from being stored on the marsh substrate and the substrate seaward of MHW.

19. Pile Driving and Pile Removal in Navigable Waters.
a. Derelict, degraded or abandoned piles and sheet piles in navigable waters of the U.S., except for those inside existing work footprints for piers, must be completely removed, cut and/or driven to 3 feet below the substrate to prevent interference with navigation, and existing creosote piles that are affected by project activities shall be completely removed if practicable. In areas of fine-grained substrates, piles must be removed by the direct, vibratory or clamshell pull method[1] to minimize sedimentation and turbidity impacts and prevent interference with navigation from cut piles. Removed piles shall be disposed of in an upland location landward of MHW or OHW and not in wetlands, tidal wetlands or mudflats.
b. A PCN is required for the installation or removal of structures with jetting techniques.
c. A PCN is required for the installation of >12 inch-diameter piles of any material type or steel piles of any size in tidal waters, unless they are installed in the dry. If piles are not installed in the dry:
i. Impact pile driving shall commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one minute waiting periods, before initiating continuous impact driving.
ii. Vibratory pile driving shall be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period shall be repeated two more times, followed immediately by pile-driving at full rate and energy.
iii. In addition to using a soft start at the beginning of the workday for pile driving as described in 19c(i-ii), a soft start must also be used at any time following a cessation of pile driving for a period of 30 minutes or longer.
d. Bubble curtains may be used to reduce sound pressure levels during vibratory or impact hammer pile driving.

20. Time-of-Year (TOY) Restrictions. Activities that include in-water work must comply with the TOY Restrictions below to be SV eligible, otherwise a PCN is required. PCN submittals shall contain written justification for deviation from the TOY Restrictions. The term “in-water work” does not include conditions where the work site is “in-the-dry” (e.g., intertidal areas exposed at low tide). The term “in-the-dry” includes work contained within a cofferdam so long as the cofferdam is installed and subsequently removed outside the TOY Restriction. The TOY restrictions stated in Appendix B of the MA DMF Technical Report TR-47[2] can apply instead for activities in tidal waters if (1) TOYs are provided for a specific waterbody where the activity is proposed and (2) the TOYs are less restrictive than below. The activity must also not require a PCN elsewhere in this document to be SV eligible.

[1] Direct Pull: Each piling is wrapped with a choker cable or chain that is attached at the top to a crane. The crane then pulls the piling directly upward, removing the piling from the sediment. Vibratory Pull: The vibratory hammer is a large mechanical device (5-16 tons) that is suspended from a crane by a cable. The vibrating hammer loosens the piling while the crane pulls up. Clamshell Pull: This can remove intact, broken or damaged pilings. The clamshell bucket is a hinged steel apparatus that operates like a set of steel jaws. The bucket is lowered from a crane and the jaws grasp the piling stub as the crane pulls up. The size of the clamshell bucket is minimized to reduce turbidity during piling removal.
[2] The MA DMF Technical Report TR-47: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/

	TOY Restriction (No work)
Non-tidal Waters	Defer to TR-47
Tidal Waters	January 15 – November 15

Alternate work windows proposed under a PCN will generally be coordinated with the USFWS and NMFS. Resulting written verifications may include species-specific work allowed windows.

21. Heavy Equipment in Wetlands. Operating heavy equipment (drill rigs, fixed cranes, etc.) within wetlands shall be minimized, and such equipment shall not be stored, maintained, or repaired in wetlands, to the maximum extent practicable. Where construction requires heavy equipment operation in wetlands, the equipment shall:

i. Have low ground pressure (typically ≤3 psi);

ii. Be placed on swamp/construction/timber mats (herein referred to as "construction mats" or "mats") that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation. See GC 22 for information on the placement of construction mats; or

iii. Be operated on adequately dry or frozen wetlands such that shear pressure does not cause subsidence of the wetlands immediately beneath the equipment and upheaval of adjacent wetlands. Construction mats are to be placed in the wetland from the upland or from equipment positioned on mats if working within a wetland. Dragging construction mats into position is prohibited. Other support structures that are capable of safely supporting equipment may be used with written USACE authorization.

22. Temporary Fill, Work & Construction Mats.

a. *Construction mats in non-tidal waters*: Temporary construction mats shall be in place ≤1 year *and* for one growing season or less to be SV eligible. A PCN is required if construction mats are in place >1 year *or* for more than one growing season. Construction mats can be placed in an area of any size in non-tidal waters. The activity may occur in segments to ensure the requirements for SV above are met, otherwise a PCN is required.

b. *Construction mats in tidal waters*: Temporary construction mats placed in an area <5,000 SF in tidal waters are SV eligible, provided those mats are in place ≤6 months. Temporary construction mats placed in an area ≥5,000 SF or in place >6 months in tidal waters require a PCN.

c. *Management of construction mats:* At a minimum, construction mats shall be managed in accordance with the following construction mat best management practices (BMPs):

1. Mats shall be in good condition to ensure proper installation, use, and removal.
2. As feasible, mats shall be placed in a location that will minimize the amount of mats needed for the wetland crossing(s).
3. Inspect mats prior to their re-use and remove any plant debris. Mats are to be thoroughly cleaned before re-use to prevent the spread of invasive plant species.
4. Impacts to wetland areas shall be minimized during installation, use, and removal of the mats.
5. Adequate erosion & sediment controls shall be installed at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, the mats.
6. In most cases, mats should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats. Place mats far enough on either side of the resource area to rest on firm ground.

d. A PCN is required for temporary fills in place >2 years. All temporary fills and disturbed soils shall be stabilized to prevent the material from eroding into waters of the U.S. where it is not authorized. Work shall include phased or staged development to ensure only areas under active development are exposed and to allow for stabilization practices as soon as practicable. Temporary fill must be placed in a manner that will prevent it from being eroded by expected high flows.

e. Activities that require unconfined temporary fill and are authorized for discharge into waters of the U.S. shall consist of material that minimizes effects to water quality.
f. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Materials shall be placed in a location and manner that does not adversely impact surface or subsurface water flow into or out of the wetland. Temporary fill authorized for discharge into wetlands shall be placed on geotextile fabric or other appropriate material laid on the pre-construction wetland grade where practicable to minimize impacts and to facilitate restoration to the original grade. Construction mats are excluded from this requirement.
g. Construction debris and deteriorated materials shall not be located in waters of the U.S.
h. Temporary fills, construction mats, and corduroy roads shall be entirely removed as soon as they are no longer needed to construct the authorized activity and the disturbed areas be restored to pre-construction contours and conditions.
i. Construction equipment, such as temporary barges in tidal waters, shall provide clearance above the substrate to avoid grounding onto the substrate during all tides.

23. Restoration of Wetland Areas.
a. Upon completion of construction, all disturbed wetland areas shall be stabilized with a wetland seed mix or plant plugs containing only plant species native to New England, and be appropriate for site conditions, including salinity and frequency of inundation, and shall not contain any species listed in the "Invasive and Other Unacceptable Plant Species" Appendix K of the New England District "Compensatory Mitigation Standard Operating Procedures" found at https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
b. The introduction or spread of invasive plant species in disturbed areas shall be prevented and controlled. Equipment shall be thoroughly cleaned before and after project construction to prevent the spread of invasive species. This includes, but is not limited to, tire treads and construction mats.
c. In areas of authorized temporary disturbance, if trees are cut in USACE jurisdiction, they shall be cut at or above ground level and not uprooted in order to prevent disruption of any kind to the wetland soil structure and to allow stump sprouts to revegetate the work area, unless otherwise authorized.
d. Wetland areas where permanent disturbance is not authorized shall be restored to their original condition and elevation, which under no circumstances shall be higher than the pre-construction elevation. Original condition means careful protection and/or removal of existing soil and vegetation, and replacement back to the original location such that the original soil layering and vegetation schemes are approximately the same, unless otherwise authorized.

24. Bank Stabilization.
a. Projects involving construction or reconstruction/maintenance of bank stabilization within USACE jurisdiction shall be designed to minimize environmental effects, effects to neighboring properties, scour, conversion of natural shoreline to hard armoring, etc. to the maximum extent practicable.
b. Projects involving the construction of new bank stabilization within USACE jurisdiction shall use bioengineering techniques and natural materials in the project design to the maximum extent practicable. Use of hard structures shall be eliminated or minimized unless the prospective permittee can demonstrate that use of bioengineering techniques is not practicable due to site conditions.
c. Where possible, bank stabilization projects shall optimize the natural function of the shoreline, including self-sustaining stability to attenuate flood flows, fishery, wildlife habitat and water quality protection, while protecting upland infrastructure from storm events that can cause erosion as well as impacts to public and private property.
d. No material shall be placed in excess of the minimum needed for erosion protection.
e. No material shall be placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas).

f. Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization.
g. The activity must be properly maintained, which may require repairing it after severe storms or erosion events.

25. Soil Erosion and Sediment Controls.
a. Appropriate soil erosion and sediment controls[1] (hereinafter referred to as "controls") must installed prior to earth disturbance and maintained in effective operating condition during construction. Biodegradable wildlife friendly erosion controls should be used whenever practicable to minimize effects to water quality.
b. Activities in streams (rivers, streams, brooks, etc.) and tidal waters that are capable of producing sedimentation or turbidity should be done during periods of low-flow or no-flow, when the stream or tide is waterward of the work area. Controls may also be used to obtain dry work conditions (e.g., coffer dam, turbidity curtain). The prospective permittee must demonstrate in the project plans where the controls are proposed and how these controls would avoid and/or minimize turbidity or sedimentation.
c. A PCN is required for controls that encroach: i) >25% of the stream width measured from OHW in non-tidal diadromous streams from March 15 to June 30; or ii) >25% of the waterway width measured from MHW in tidal waters from Feb. 1 to June 30, or >50% of the waterway width measured from MHW in tidal waters from July 1 to Jan. 14. This is to protect upstream fish passage. Proponents must also maintain downstream fish passage throughout the project.
d. No dewatering shall occur with direct discharge to waters or wetlands. Excess water in isolated work areas shall be pumped or directed to a sedimentation basin, tank or other dewatering structures in an upland area adequately separated from waters or wetlands. Suspended solids shall be removed prior to discharge back into waters or wetlands from these dewatering structures. All discharge points back into waters and wetlands shall use appropriate energy dissipaters and erosion and sedimentation control BMPs.
e. Temporary controls shall be removed upon completion of work, but not until all exposed soil and other fills, as well as any work waterward of OHW or the HTL, are permanently stabilized at the earliest practicable date. Sediment and debris collected by these devices shall be removed and placed at an upland location in a manner that will prevent its later erosion into a waterway or wetland. Controls may be left in place if they are biodegradable and flows and aquatic life movements are not disrupted.

26. Aquatic Life Movements and Management of Water Flows.
a. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies and wetlands shall be:
i. Suitably spanned, bridged, culverted, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species; and
ii. Properly aligned and constructed to prevent bank erosion or streambed scour both adjacent to and inside the crossing.

[1] Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

b. To avoid adverse impacts on aquatic organisms, the low flow channel/thalweg shall remain unobstructed during periods of low flow, except when necessary to perform the authorized work.
c. For work in tidal waters, in-stream controls (e.g., cofferdams) should be installed in such a way as to not obstruct fish passage.
d. Riprap and other stream bed materials shall be installed in a manner that avoids organism entrapment in rock voids or water displaced to subterranean flow with crushed stone and riprap.
e. To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity shall not restrict or impede the passage of normal or high flows unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

27. Spawning, Breeding, and Migratory Areas.
a. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized under these GPs.
b. Activities in waters of the U.S. that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
c. The applicant is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The applicant should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.
d. Information on spawning habitat for species managed under the Magnuson-Stevens Fishery Conservation and Management Act (i.e., EFH for spawning adults) can be obtained from NAE Regulatory website, Essential Fish Habitat section, at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.
e. Information regarding diadromous fish habitat can be obtained from the following DMF website at: https://www.mass.gov/info-details/massgis-data-diadromous-fish.

28. Vernal Pools.
a. A PCN is required if a discharge of dredged or fill material is proposed within a vernal pool depression that is also a water of the U.S.
b. Vernal pools must be identified on the plans that show aquatic resource delineations.
c. Adverse impacts to vernal pools shall be avoided & minimized to the maximum extent practicable.

29. Invasive Species.
a. The introduction, spread or the increased risk of invasion of invasive plant or animal species on the project site, into new or disturbed areas, or areas adjacent to the project site caused by the site work shall be avoided. Construction mats shall be thoroughly cleaned before reuse to avoid spread of invasive species.
b. Unless otherwise directed by USACE, all applications for PCN non-tidal projects proposing fill in USACE jurisdiction shall include an Invasive Species Control Plan. Additional information can be found at: https://www.nae.usace.army.mil/Missions/Regulatory/Invasive-Species/, https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/.

30. Fills Within 100-Year Floodplains. The activity shall comply with applicable Federal Emergency Management Agency (FEMA) approved, Massachusetts Emergency Management

Agency (MEMA) approved and/or local floodplain management requirements. Applicants should contact FEMA and/or MEMA regarding floodplain management requirements.

31. Stream Work and Crossings & Wetland Crossings.
a. When feasible, all temporary and permanent crossings of waterbodies and wetlands (hereinafter referred to as "crossings") shall conform to the "Massachusetts River and Stream Crossing Standards" located at: https://www.mass.gov/doc/massachusetts-river-and-stream-crossing-standards/download or https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/. Projects that do not conform to these guidelines shall be reviewed under PCN or IP procedures.
b. Crossings shall be suitably culverted, bridged, or otherwise designed to withstand and to prevent the restriction of high flows, to maintain existing low flows, maintain water quality, and not obstruct the movement of aquatic life indigenous to the waterbody beyond the duration of construction.
c. Crossings shall be installed in such a manner as to preserve hydraulic capacity and flow, sediment transport, and organism passage at its present level, between the wetlands on either side of the road. The applicant shall take necessary measures to correct any wetland damage resulting from deficiencies in hydraulic capacity, sediment transport and organism passage.
d. Stream crossings shall utilize a natural mixed grain-size streambed material composition that matches upstream and downstream substrates to create a stable streambed. Substrate should function appropriately during normal and high flows without washing out. If natural streambed material is not utilized, a PCN is required.
e. Activities involving open trench excavation in flowing waters require a PCN. Work should not occur in flowing waters (requires using management techniques such as temporary flume pipes, culverts, cofferdams, etc.). Normal flows should be maintained within the stream boundary's confines when practicable. Projects utilizing these management techniques must meet all applicable terms and conditions of the GP, including the GCs in Section IV.

32. Utility Line Installation and Removal
a. Subsurface utility lines must be installed at a sufficient depth to avoid damage from anchors, dredging, etc., and to prevent exposure from erosion and stream adjustment.
b. When utility lines are installed via horizontal directional drilling, a frac-out contingency plan shall be present on site for the duration of construction. As necessary, the applicant shall immediately contain, control, recover, and remove drilling fluids released into the environment.
c. Abandoned or inactive utility lines must be removed and faulty lines (e.g., leaking hazardous substances, petroleum products, etc.) must be removed or repaired. A written verification from the USACE is required if they are to remain in place, e.g., to protect sensitive areas or ensure safety.
d. Utility lines shall not adversely alter existing hydrology, and trenches cannot be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a French drain effect). In wetland areas, structures such as ditch plugs, cut-off walls, clay blocks, bentonite, or other suitable material shall be used within utility trenches to ensure that the trench through which the utility line is installed does not drain waters of the U.S. including wetlands.
e. Stockpiling of tree debris, to the extent where it has the effect of fill material, shall not occur in waters of the U.S. Tree debris shall be removed from waters of the U.S. and placed in uplands without causing additional disturbance to aquatic resources. Failure to meet this condition could change the bottom elevation of the wetland and be considered a discharge of fill material, and depending on the area of alteration, may require a PCN or IP.

33. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

34. Coral Reefs. Impacts to coral reefs are not authorized under these GPs. Coral reefs consist of the skeletal deposit, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of the reef.

35. Blasting. Blasting in waters of the U.S. associated with work such as dredging, trenching, pile installation, etc. is not authorized under these GPs.

36. Inspections. The permittee shall allow USACE to make periodic inspections at any time deemed necessary to ensure that the work is being or has been performed in accordance with the terms and conditions of this permit. To facilitate these inspections, for activities requiring a PCN, the permittee shall complete and return the Certificate of Compliance when it is provided with a PCN verification letter. For SV-eligible activities, the permittee shall complete and submit the SVN to USACE within 30 days of initiating project construction, at which point, USACE may opt to inspect the activity to verify compliance with the terms and conditions of the GP. Post-construction engineering drawings may be required by USACE for completed work. This includes post-dredging survey drawings for any dredging work.

37. Maintenance. The permittee shall maintain the activity authorized by these GPs in good condition and in conformance with the terms and conditions of this permit. Some maintenance activities may not be subject to federal regulation under Section 404 in accordance with 33 CFR 323.4(a)(2). This condition is not applicable to maintenance of dredging projects. Prospective permittees should contact USACE to inquire about maintenance of dredging projects, and its eligibility under these GPs. Maintenance dredging is subject to the review thresholds in GP #7 as well as any conditions included in a written USACE authorization. Maintenance dredging includes only those areas and depths previously authorized and dredged.

38. Property Rights. Per 33 CFR 320.4(g)(6), these GPs do not convey any property rights, either in real estate or material, or any exclusive privileges, nor do they authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

39. Transfer of GP Verifications. When the work authorized by these GPs is still in existence at the time the property is transferred, the terms and conditions of these GPs, including any special conditions, will continue to be binding on the entity or individual who received the GP authorizations, as well as the new owner(s) of the property. If the permittee sells the property associated with a GP authorization, the applicant may transfer the GP authorization to the new owner by submitting a letter to USACE to validate the transfer. A copy of the GP authorization letter must be attached to the letter, and the letter must include the following statement: “The terms and conditions of these general permits, including any special conditions, will continue to be binding on the new owner(s) of the property.” This letter shall be signed by both the seller and new property owner(s).

40. Modification, Suspension, and Revocation. These GPs and any individual authorization issued thereof may be either modified, suspended, or revoked in whole or in part pursuant to the policies and procedures of 33 CFR 325.7; and any such action shall not be the basis for any claim for damages against the U.S.

41. Special Conditions. The USACE may impose other special conditions on a project authorized pursuant to these GPs that are determined necessary to minimize adverse navigational and/or environmental effects or based on any other factor of the public interest. Failure to comply with all conditions of the authorization, including special conditions, constitutes a permit violation and may subject the applicant to criminal, civil, or administrative penalties or restoration.

42. False or Incomplete Information. If USACE makes a determination regarding the eligibility of a project under these GPs, and subsequently discovers that it has relied on false, incomplete, or inaccurate information provided by the applicant, the authorization will not be valid, and the U.S. Government may institute appropriate legal proceedings.

43. Abandonment. If the permittee decides to abandon the activity authorized under these GPs, unless such abandonment is merely the transfer of property to a third party, he/she/they may be required to restore the area to the satisfaction of USACE.

44. Enforcement cases. These GPs do not apply to any existing or proposed activity in USACE jurisdiction associated with an on-going USACE or EPA enforcement action, until such time as the enforcement action is resolved or USACE or EPA determines that the activity may proceed independently without compromising the enforcement action.

45. Previously Authorized Activities.

a. Completed projects that received prior authorization from USACE (SV or PCN), shall remain authorized in accordance with the original terms and conditions of those authorizations, including their terms, GCs, and any special conditions provided in a written verification.

b. Activities authorized pursuant to 33 CFR 330.3 (activities occurring before certain dates) are not affected by these GPs.

46. Duration of Authorization.

These GPs expire on June 1, 2028. Activities authorized under these GPs will remain authorized until the GPs expire, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 325.2(e)(2). Activities authorized under GPs 1-25 that have either commenced (i.e., are under construction) or are under contract to commence in reliance upon this authorization will have until June 1, 2029 to complete the work. If requested by USACE, the permittee shall furnish documentation that demonstrates the project was under construction or under contract to commence by June 1, 2028. If work is not completed before June 1, 2029, the permittee must contact USACE. The USACE may issue a new authorization provided the project meets the terms and conditions of the MA GPs in effect at the time. Activities completed under the SV or PCN authorizations of these GPs will continue to be authorized after their expiration date.

SECTION V: MITIGATION STANDARDS

1. Mitigation Types

For all activities, applicants must (a) demonstrate how the project has been designed to avoid or minimize impacts to aquatic resources; and (b) describe measures taken to avoid or minimize impacts to aquatic resources through construction techniques and/or site access. Please see https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/ for assistance with preparing mitigation in accordance with the 2008 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 CFR 332.3), hereafter referred to as "2008 Mitigation Rule."

Avoidance - Avoidance of impacts (direct and indirect) to aquatic resources means that project activities would not result in the placement of fill material or installation of a structure that could impact the resource area. Avoidance can include, but is not limited to, designing the project to avoid impacts to all or a portion of the aquatic resource areas.

Minimization - Minimization of impacts (direct and indirect) to aquatic resources means that measures are taken to ensure the amount and duration of impacts are limited to the maximum extent practicable. There are many minimization measures that could be implemented, prior to, during, or after the proposed activity, to ensure impacts are minimized. Examples include, but are not limited to:

- Permanent preservation of avoided aquatic features and buffer zone, in perpetuity. In these cases, the preserved area would be under a conservation easement and managed by conservation oriented third-party manager.
- Utilization of best management practices (BMPs) to ensure impacts are limited, and do not result in adverse impacts to the integrity and long-term functions of preserved/avoided features.

Compensatory Mitigation - Compensatory mitigation is generally required for PCN activities in which the impacts to the aquatic resources have been avoided and minimized to the maximum extent practicable but would still result in unavoidable adverse effects to the environment that are considered more than minimal or are contrary to the public interest. *Whatever the case may be, compensatory mitigation is no substitute for avoidance and minimization.*

2. Thresholds for Compensatory Mitigation

The basic objective of compensatory mitigation in the USACE Regulatory Program is to offset environmental losses resulting from unavoidable impacts to waters of the U.S. authorized by Department of the Army permits. **The following compensatory mitigation thresholds apply to all PCN activities that result in loss[1] of the resource area types listed below. Activities[2] in waters of the U.S. associated with the restoration, enhancement, and establishment of tidal and non-tidal aquatic resources are not considered loss and are not subject to the thresholds below.** Thresholds for different resource areas may not be combined to exceed 5,000 SF of total loss of all waters. The USACE will continue to evaluate projects on a case-by-case basis, and may in some cases require compensatory mitigation below these thresholds (e.g. minor impacts that add to a cumulative loss).

[1] See definition of loss in Section VII.
[2] These activities must result in net increases in aquatic resource functions and services to be exempted from the thresholds above.

Compensatory Mitigation Thresholds in Massachusetts		
Resource Area	**Non-Tidal Threshold**	**Tidal Threshold**
Stream	200 LF	200 LF
Bank Stabilization	500 LF	500 LF
Open Water	Project Dependent	Project Dependent
Wetland	5,000 SF	500 SF
Vernal Pool	All	N/A
SAV	Project dependent	25 SF
Mudflat	N/A	1,000 SF
Intertidal	N/A	1,000 SF

These thresholds can be utilized to determine at what point compensatory mitigation is required but are not used to determine how much mitigation may be needed to offset impacts to resources. Per the 2008 Mitigation Rule (33 CFR 332.3(f)(1)) "the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions. In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required. If a functional or condition assessment or other suitable metric is not used, a minimum one-to-one acreage or linear foot compensation ratios must be used."

3. Compensatory Mitigation Hierarchy

Compensatory mitigation should follow the hierarchy as outlined in 33 CFR 332.3(b)(2-6) or current regulation. This hierarchy in order of preference includes: (1) Mitigation Bank credits, (2) In-Lieu Fee program credits, (3) permittee-responsible mitigation under a watershed approach, (4) permittee-responsible mitigation through on-site and in-kind mitigation, and (5) permittee-responsible mitigation through off-site and/or out-of-kind mitigation. If the proposed mitigation deviates from this mitigation hierarchy, the applicant **must** justify in writing why the proposed mitigation is environmentally preferable to the preferred method of compensatory mitigation (See 2008 Mitigation Rule). **In order for your application to be considered complete, you must provide a statement that discusses how your project will compensate for the loss or impact to aquatic resources.** If you are proposing permittee responsible mitigation, the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14) must be addressed for your application to be considered complete. Prospective applicants are encouraged to contact USACE with questions at any time. Addressing the 12 components of a mitigation plan is commensurate with the amount of compensatory mitigation required, and USACE can assist prospective applicants with the level of information needed to satisfy each component.

For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee.

4. In-Lieu Fee (ILF)

The purchase of credits from the Massachusetts In-Lieu Fee Program (MA ILFP) is the ***preferred*** method of compensatory mitigation in Massachusetts since, as of the issuance date of this GP, there are no mitigation banks available in Massachusetts. The applicant shall develop a mitigation plan that addresses the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

The MA ILFP is administered by the Massachusetts Department of Fish & Game (DFG) in accordance with the 2008 Mitigation Rule at 33 CFR 332. The Mitigation Rule governs in-lieu fee compensatory mitigation associated with USACE permits under §404 of the Clean Water Act and/or §9 or §10 of the Rivers and Harbors Act of 1899.

MA ILFP Website: https://www.mass.gov/in-lieu-fee-program

Acceptance of an ILF payment into the ILFP established by the 2014 MA ILFP Instrument (link below) is an acknowledgement by DFG that it assumes all legal responsibility for satisfying the mitigation requirements of the USACE (i.e., the implementation, performance, and long-term management and monitoring of the compensatory mitigation project(s) approved under this Instrument and subsequent Compensatory Mitigation Plans). This transfer of legal responsibility is established by: 1) the approval of this In-Lieu Fee Instrument; 2) receipt by the district engineer of a Notice of Credit Sale and Transfer of Legal Responsibility to DFG that is signed by the DFG and the permittee and dated; and 3) the transfer of fees from the permittee to DFG.

MA ILFP Fact Sheet: https://www.mass.gov/files/documents/2017/01/sj/ilfp-fact-sheet-ma-ilfp-fees.pdf

MA ILFP Instrument: https://www.mass.gov/files/documents/2016/08/nd/ilfp-final-instrument-dfg.pdf

5. Permittee-Responsible

The USACE may determine that the proposed permittee-responsible compensatory mitigation is appropriate on a case-by-case basis. As described in the Compensatory Mitigation Hierarchy section above, applicants must justify in writing why the proposed mitigation is environmentally preferable to the purchase of ILF credits. Applicants are encouraged to contact the USACE prior to submission of a permit application to seek further guidance regarding USACE mitigation requirements.

Applicants will demonstrate their proposed compensatory mitigation in writing by addressing the 12 components of a mitigation plan (33 CFR 332.4(c)(2-14). *Please note that all elements must be addressed, or the permit application will be deemed incomplete.* In certain circumstances, the district engineer may determine that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). Guidance on how to address these components can be found on the New England District Mitigation webpage: https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/

Performance standards will be used to measure the successfulness of the mitigation project. A successful mitigation project is one that is self-sustaining. For a mitigation project that will restore, enhance, or create wetlands, proper performance standards must address hydrology, hydric soils, and hydrophytic vegetation. The mitigation proposal must include an explanation of quantitative methods used to measure the success of performance standards (i.e., percent cover may be measured using vegetation plots, hydrology may be measured using data loggers, soil cores may be taken and evaluated for hydric soil indicators).

Monitoring methods should include quantitative sampling methods following established, scientific protocols. Sampling documentation, as part of monitoring reports, should include maps and coordinates (also shapefiles, if available) showing locations of sampling points, transects, quadrats, etc. In addition, permanent photo stations should be established coincident with sampling locations.

SECTION VI: FEDERAL & STATE AGENCY CONTACT INFORMATION & ORGANIZATIONAL WEBSITES

Federal Agencies

U.S. Army Corps of Engineers
Regulatory Division
696 Virginia Road
Concord, Massachusetts 01742-2751
(978) 318-8338 (phone); (978) 318-8303 (fax)
www.nae.usace.army.mil/missions/regulatory

U.S. Army Corps of Engineers
Navigation Division – Section 408
696 Virginia Road
Concord, Massachusetts 01742-2751
See link below for contact information:
https://www.nae.usace.army.mil/Missions/Section-408/

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9300 (phone)
(*Federal endangered species & EFH)*

U.S. Fish & Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301
(603) 223-2541 (phone)
(Federal endangered species)

National Park Service
15 State Street
Boston, Massachusetts 02109
(617) 223-5191 (phone)
(*Wild and Scenic Rivers*)

Bureau of Ocean and Energy Management
1849 C Street, NW
Washington D.C. 20240
202-208-6474 (phone)
(*Offshore Wind Facilities)*

Chief, Risk Analysis Branch
FEMA Region 1
99 High Street, 6th Floor
U.S. Department of Homeland Security
Boston, Massachusetts 02110
(617) 956-7576 (phone)

Commander (dpb)
First Coast Guard District
Battery Building
One South Street
New York, New York 10004-1466
(212) 514-4331 (phone); (212) 514-4337 (fax)
(*Bridge permits*)

U.S. Environmental Protection Agency
5 Post Office Square
Suite 100 (OEP06–3)
Boston, Massachusetts 02109-3912
(617) 918-1692 (phone)

State Agencies in Massachusetts

Massachusetts Department of Environmental Protection (MassDEP)	
DEP Division of Wetlands & Waterways	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 292-5695
Northeast Region	150 Presidential Way, Suite 300 Woburn, Massachusetts 01801 (978) 694-3200
Southeast Region	20 Riverside Drive, Route 105 Lakeville, Massachusetts 02347 (508) 946-2800
Central Region	8 New Bond Street Worcester, Massachusetts 01606 (508) 792-7650
Western Region	436 Dwight Street Springfield, Massachusetts 01103 (413) 784-1100

Massachusetts Office of Coastal Zone Management (CZM) Emails may be sent to: czm@mass.gov	
MA Office of Coastal Zone Management	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1200
North Shore Region	2 State Fish Pier Gloucester, Massachusetts 01930 (978) 281-3972
South Shore Region	175 Edward Foster Road Scituate, Massachusetts 02066
Cape Cod and Islands Region	3195 Main Street, P.O. Box 220 Barnstable, MA 02630
South Coastal Region	81-B County Road, Suite E Mattapoisett, MA 02739

Massachusetts Historical Commission (MHC)	
Office Location:	220 Morrisey Boulevard Boston, Massachusetts 02125 (617) 727-8470

Massachusetts Board of Underwater Archaeological Resources (BUAR) Emails may be sent to: david.s.robinson@mass.gov	
Office Location:	100 Cambridge Street, Suite 900 Boston, Massachusetts 02114 (617) 626-1014

SECTION VII: Definitions & Acronyms

Artificial or Living Reef: A structure which is constructed or placed in waters for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities.
Attendant Features: Occurring with or as a result of; accompanying.
Biodegradable: A material that decomposes into elements found in nature within a reasonably short period of time and will not leave a residue of plastic or a petroleum derivative in the environment after degradation. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Examples of biodegradable materials include jute, sisal, cotton, straw, burlap, coconut husk fiber (coir) or excelsior. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Photodegradable, UV degradable or Oxo-(bio)degradable plastics are not considered biodegradable under this GP.
Boating facilities: These provide, rent or sell mooring space, such as marinas, yacht clubs, boat yards, dockominiums, municipal facilities, land/home owners, etc. Not classified as boating facilities are piers shared between two abutting properties or municipal mooring fields that charge an equitable user fee based on the actual costs incurred.
Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. Must comply with the applicable provisions of 33 CFR 332. See also the New England District Compensatory Mitigation Guidance at http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.
Construction mats: Constructions, swamp and timber mats (herein referred to as “construction mats”) are generic terms used to describe structures that distribute equipment weight to prevent wetland damage while facilitating passage and providing work platforms for workers and equipment. They are comprised of sheets or mats made from a variety of materials in various sizes. A timber mat consists of large timbers bolted or cabled together. Corduroy roads, which are not considered to be construction mats, are cut trees and/or saplings with the crowns and branches removed, and the trunks lined up next to one another. Corduroy roads are typically installed as permanent structures. Like construction mats, they are considered as fill whether they are installed temporarily or permanently.
Cumulative Impacts: The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.1). Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. See 40 CFR 230.11(g).
Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.
Dredging:
Improvement Dredging: For the purposes of these GPs, this is dredging deeper than previously authorized by the USACE and dredged under that authorization.
Maintenance Dredging: For the purposes of these GPs, this is dredging from an area previously authorized by the USACE and dredged under that authorization. The USACE may require proof of authorization and dredging. Maintenance dredging typically refers to the routine removal of accumulated sediment to maintain the design depths of serviceable navigation channels, harbors, marinas, boat launches and port facilities. Maintenance dredging is conducted for navigational purposes and does not include any expansion of the previously dredged area. The USACE may

review a maintenance dredging activity as new dredging if sufficient time has elapsed to allow for the colonization of SAS, shellfish, etc.

New Dredging: For the purposes of these GPs, this is a) first time the USACE authorizes dredging of a particular location or b) dredging has not occurred for an extended period of time, and this has allowed for aquatic resources (i.e., eelgrass, shellfish, etc.) to redevelop in the area.

Dredged material & discharge of dredged material: These are defined at 33 CFR 323.2(c) and (d). The term dredged material means material that is excavated or dredged from waters of the U.S.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s) but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: A stream with flowing water only during, and for a short duration, after precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Erosion Controls: Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area (33 CFR 332.2).

Expansions: Work that increases the footprint of fill, structures, depth of basin or drainage features, or floats, or slip capacity.

Essential Fish Habitat (EFH): The Federal Magnuson-Stevens Fishery Management and Conservation Act broadly defines EFH to include those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. See www.greateratlantic.fisheries.noaa.gov/habitat for more information.

Fill material & discharge of fill material: Material placed in waters of the U.S. where the material has the effect of either replacing any portion of a water of the U.S. with dry land or changing the bottom elevation of any portion of a water of the U.S. Fill material does not include any pollutant discharged into the water primarily to dispose of waste. These are defined at 33 CFR 323.2 (e) & (f).

Federal navigation projects (FNPs): These areas are maintained by the USACE; authorized, constructed and maintained on the premise that they will be accessible and available to all on equal terms; and comprised of USACE Federal anchorages, Federal channels and Federal turning basins. The buffer zone is equal to three times the authorized depth of a FNP. The following are FNPs in MA and more information, including the limits, is provided at www.nae.usace.army.mil/missions/navigation >> Navigation Projects:

- Andrews River, Harwich, MA
- Aunt Lydia's Cove
- Beverly Harbor
- Boston Harbor
- Buttermilk Bay Channel
- Canapitsit Channel
- Cape Cod Canal
- Chatham Harbor
- Cohasset Harbor
- Cross Rip Shoals, Nantucket Sound
- Cuttyhunk Harbor
- Dorchester Bay and Neponset River
- Duxbury Harbor
- Edgartown Harbor
- Essex River
- Fall River Harbor
- Falmouth Harbor
- Gloucester Harbor and Annisquam River
- Green Harbor
- Hingham Harbor
- Hyannis Harbor
- Ipswich River
- Island End River (Chelsea, MA)
- Kingston Harbor
- Lagoon Pond
- Little Harbor Woods Hole

Lynn Harbor
Malden River
Menemsha Creek
Merrimack River
Mystic River
Nantucket Harbor of Refuge
New Bedford and Fairhaven Harbor
Newburyport Harbor
Oak Bluffs Harbor
Pigeon Cove Harbor
Plymouth Harbor
Pollock Rip Shoals, Nantucket Sound
Provincetown Harbor
Red Brook Harbor
Rockport Harbor
Salem Harbor
Sandy Bay Harbor of Refuge
Saugus River
Scituate Harbor
Sesuit Harbor
Taunton River
Vineyard Haven Harbor
Wareham Harbor
Wellfleet Harbor
Westport River and Harbor
Weymouth Back River
Weymouth Fore and Town Rivers
Winthrop Harbor
Woods Hole Channel

Flume: An open artificial water channel, in the form of a gravity chute, which leads water from a diversion dam or weir alongside a natural flow. A flume can be used to measure the rate of flow.
FNP buffer zone: The buffer zone of a USACE Federal Navigation Project (FNP) is equal to three times the authorized depth of the FNP.
Frac out: During horizontal directional drilling (HDD) operations, drilling fluid travels up the borehole into a pit. When the borehole becomes obstructed or the pressure becomes too great inside the borehole, the ground fractures and fluid escapes to the surface and may affect surface waters.
Ground disturbance: Any activity that compacts, relocates, overturns, removes, mixes, or otherwise disturbs the ground, including under water. Ground disturbance can be caused by the use of hand tools (shovels, pick axe, posthole digger, etc.), heavy equipment (excavators, backhoes, bulldozers, dredgers, trenching and earthmoving equipment, etc.), and heavy trucks (large four wheel drive trucks, dump trucks and tractor trailers, etc.). Trenching, bulldozing, dredging, excavating, scraping, and plowing are typical examples of ground disturbance activities.
Height:width ratio: The height of structures shall at all points be equal to or exceed the width of the deck. For the purpose of this definition, height shall be measured from the marsh substrate to the bottom of the longitudinal support beam.
High Tide Line (HTL): The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides 58 that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds. (33 CFR 328). Refer to the highest predicted tide for the current year at the nearest NOAA tide gage. https://tidesandcurrents.noaa.gov/map/index.html
Historic Property: Any prehistoric or historic site (including archaeological sites), district, building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).
Impacts:
Direct Impacts: Effects that are caused by the activity and occur at the same time and place (40 CFR 1508.7).
Indirect impacts: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.
Secondary impacts: Effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.

Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities. Some examples of secondary effects on an aquatic ecosystem are: aquatic areas drained, flooded, fragmented; fluctuating water levels in an impoundment and downstream associated with the operation of a dam; septic tank leaching and surface runoff from residential or commercial developments on fill; and leachate and runoff from a sanitary landfill located in waters of the U.S. See 40 CFR 230.11(h).

Incidental Fallback: Incidental fallback is the redeposit of small volumes of dredged material that is incidental to excavation activity in waters of the U.S. when such material falls back to substantially the same place as the initial removal (33 CFR 323.2(d)(2)(iii)).

In the dry: Work that is done under dry conditions, e.g., work behind cofferdams or when the stream or tide is waterward of the work.

Independent utility: A test to determine what constitutes a single and complete non-linear project in the USACE Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Individual permit: A Department of the Army authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of 33 CFR 322, or a specific project involving the proposed discharge(s) in accordance with the procedures of 33 CFR 323, and in accordance with the procedures of 33 CFR 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR 320.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Intertidal: The area in between mean low water and the high tide line.

Living reef: See the definition of “artificial or living reef.”

Living shoreline: A term used to describe a low-impact approach with a substantial biological component to shoreline protection and restoration along coastal shores, riparian zones, lacustrine fringe wetlands, or oyster or mussel reef structures. This approach integrates natural features to restore, enhance, maintain, or create habitat, functions, and processes while also functioning to mitigate flooding or shoreline erosion. Living shorelines may stabilize banks and shores with small fetch and gentle slopes that are subject to low-to mid-energy waves. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some type of harder shoreline structure (e.g., oyster or mussel reefs or rock sills) for added protection and stability. Living shorelines should maintain the natural continuity of the land-water interface and retain or enhance shoreline ecological processes.

Loss of waters of the United States: Waters of the U.S. that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the U.S. is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for a GP; it is not a net threshold that is calculated after considering compensatory mitigation that maybe used to offset losses of aquatic functions and services. Waters of the U.S. temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the U.S. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the U.S.

Maintenance: The repair, rehabilitation, or in-kind replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 – "Activities occurring before certain dates," provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Maintenance includes minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make repair, rehabilitation, or replacement are authorized. Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Maintenance Exemption: In accordance with 33 CFR 323.4(a)(2), any discharge of dredged or fill material that may result from any of the following activities is not prohibited by or otherwise subject to regulation under Section 404 of the CWA: "Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design."

Mean high water: Line on the shore reached by the plane of the average high water. Where precise determination of the actual location of the line becomes necessary, it must be established by survey with reference to the available tidal datum, preferably averaged over a period of 18.6 years. Less precise methods, such as observation of the "apparent shoreline" which is determined by reference to physical markings, lines of vegetation, or changes in type of vegetation, may be used only where an estimate is needed of the line reached by the mean high water.

Mechanized land clearing: Land clearing activities using mechanized equipment such as backhoes or bulldozers with sheer blades, rakes or discs constitute point source discharges and are subject to section 404 jurisdiction when they take place in wetlands or waters of the U.S (Regulatory Guidance Letter 90-05).

Metallic mineral: Any ore or material to be excavated from the natural deposits on or in the earth for its metallic mineral content to be used for commercial or industrial purposes. "Metallic mineral" does not include thorium or uranium.

Minor deviations: Deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards, which are necessary to make repair, rehabilitation, or replacement are permitted, provided the adverse environmental effects resulting from such repair, rehabilitation, or replacement are minimal.

Natural Rocky Habitats: Intertidal and subtidal substrates of pebble-gravel, cobble, boulder, or rock ledge and outcrops. Manufactured stone (e.g., cur or engineered riprap) is not considered a natural rocky habitat. Natural rocky habitats are either found as pavement (consolidated pebble-gravel, cobble, or boulder areas) or as a mixture with fines (i.e., clay and sand) and other substrates. Rocky habitats as EFH are defined as follows: (1) All pebble-gravel, cobble, or boulder pavements; (2) Pebble-gravel mixed with fines: mixed substrate of pebble-gravel and fines where pebble-gravel is an evident component of the substrate (either through visual observation or within sediment samples). Sediment samples with a content of 10% or more of pebble-gravel in the top layer (6-12 inches) should be delineated; (3) Scattered cobble, scattered boulder, scattered cobble/boulder: mixed substate of cobble and/or boulder and other substrates. The aerial extent of cobbles and/or boulders should be delineated; and (4) All rock ledge outcrops: area should be delineated along the edge of the ledge/outcrop (as defined by NMFS Habitat and Ecosystems Services Branch, Gloucester, MA).

Navigable waters or Navigable waters of the U.S.: These waters are subject to section 10 of the Rivers and Harbors Act of 1899 and are defined as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce (33 CFR Part 329). Work or structures in navigable

waters require permits pursuant to §9 and §10 of the Rivers and Harbors Act of 1899. Also see the definition of "waters of the U.S." below.
Note: Currently the following non-tidal waters have been determined to be navigable waters of the U.S. subject to permit jurisdiction in Massachusetts: Merrimack River, Connecticut River, and Charles River to the Watertown Dam.
Nearshore disposal: This is defined in the USACE Coastal Engineering Manual as "(1) In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20m." A nearshore berm is an artificial berm built in shallow water using dredged material. Often, the berm is intended to renourish the adjacent and downdrift shore over time under the influence of waves and currents.
Non-regulated activity: Only structures or fills that were previously authorized and are in compliance with the terms and condition of the original authorization can be maintained as a non-regulated activity under 33 CFR 323.4(a)(2). Minor deviations from the previously authorized footprint do not qualify as a non-regulated activity and require new authorization from the USACE. The state's maintenance provisions may differ from the USACE and a project may require reporting and written authorization from the state.
Non-tidal wetlands: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the HTL (*i.e.,* spring HTL). Also see the definition of "Waters of the U.S." below.
Oil or natural gas pipeline: Any pipe or pipeline for the transportation of any form of oil or natural gas, including products derived from oil or natural gas, such as gasoline, jet fuel, diesel fuel. heating oil, petrochemical feedstocks, waxes, lubricating oils, and asphalt.
Ordinary High Water Mark (OHWM): A line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas. See 33 CFR 328.3(e).
Overall project: The overall project, for purposes of these GPs, includes all regulated activities that are reasonably related and necessary to accomplish the project purpose. Also see the definition of "single and complete linear project."
Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.
Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.
Permanent impacts: Permanent impacts means waters of the U.S. that are permanently affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent impacts include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody.
Preconstruction notification (PCN): A request submitted by the applicant to the USACE for confirmation that a particular activity is authorized by these GPs. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Preconstruction notification may be required by the terms and conditions of these GPs. A PCN may be voluntarily submitted in cases where PCN is not required and the applicant wants confirmation that the activity is authorized under these GPs.
Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions (33 CFR 332.2).
Real estate subdivision: Includes circumstances where a landowner or developer divides a tract of land into smaller parcels for the purpose of selling, conveying, transferring, leasing, or

developing said parcels. This would include the entire area of a residential, commercial or other real estate subdivision, including all parcels and parts thereof

Reconfiguration zone: A USACE authorized area in which permittees may rearrange pile-supported structures and floats without additional authorizations. A reconfiguration zone does not grant exclusive privileges to an area or an increase in structure or float area.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in again in aquatic resource area and functions (33 CFR 332.2).

Reference Site: Reference sites - Compensatory restoration, rehabilitation, and creation mitigation projects should seek to duplicate the features of reference aquatic resources or enhance connectivity with adjacent natural upland and aquatic resource landscape elements. Performance standards related to reference sites are encouraged. Mitigation project sites must be selected based on their ability to be, and continue to be, resistant to disturbance from the surrounding landscape, by locating them adjacent to refuges, buffers, green spaces, and other preserved natural elements of the landscape. In general, aquatic resource mitigation projects must be designed to be self-sustaining, natural systems within the landscape and climate in which they are located, with little or no ongoing maintenance and/or hydrologic manipulation.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area (33 CFR 332.2).

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation (33 CFR 332.2).

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Sedimentation: Sedimentation is defined as the process of deposition of a solid material from a state of suspension. Deposited sediments may accumulate and have temporal impacts to aquatic resource areas. See secondary effects definition above. For the purposes of this document, “greater than minimal sedimentation” is generally not considered to occur when using proper erosion controls (GC 25) or when sedimentation is considered “de minimis” 33 CFR 323.2(d)(5).

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term “single and complete project” is defined as that portion of the total linear project proposed or accomplished by one owner/ developer or partnership or other association of owners/developers that includes all crossings of a single water of the U.S. (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for the purposes of these GPs. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete

non-linear project must have independent utility (see the definition of “independent utility”). Single and complete non-linear projects may not be “piecemealed” to avoid the limits in a GP authorization.

Special aquatic sites (SAS): These include inland and saltmarsh wetlands, mud flats, vegetated shallows, sanctuaries and refuges, coral reefs, and riffle and pool complexes. These are defined at 40 CFR 230.3 and listed in 40 CFR 230 Subpart E.

Streambed: The stream substrate between the OHW marks on each side. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the streambed, but outside of the OHW marks, are not considered part of the streambed.

Stream channelization: The manipulation of a stream’s course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the U.S.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Temporal loss: The time lag between the loss of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site(s) (33 CFR 332.2).

Temporary impacts: Temporary impacts include, but are not limited to, jurisdictional waters that are temporarily filled, flooded, excavated, or drained because of the regulated activity. Impacts are considered temporary when they are removed immediately upon completion of the activity. Note: An impact is considered temporary when the aquatic resource is restored to pre-project conditions, but effects to archaeological and/or cultural resources may be permanent in duration.

Tidal wetlands: A wetland that is subject to the ebb and flow of the tide. See the definition of “Waters of the U.S.” below.

Tide gates: Structures such as duckbills, flap gates, manual and self-regulating tide gates, etc. that regulate or prevent upstream tidal flows.

Turbidity: A measure of the level of particles such as sediment, plankton, or organic by-products, in a body of water. As the turbidity of water increases, it becomes denser and less clear due to a higher concentration of these light-blocking particles. Suspended solids are more likely to carry toxic chemicals, and can also negatively affect aquatic organisms, water temperature, and dissolved oxygen levels.

Utility line: Any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. A utility line also includes any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term ‘utility line’ does not include activities that drain a water of the U.S., such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.

Vegetated shallows: Permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as eelgrass *(Zostera marina)* and widgeon grass (*Rupia maritima*) in marine systems (does not include salt marsh) as well as a number of freshwater species in rivers and lakes. These are a type of SAS defined at 40 CFR 230.43. Vegetated shallows are commonly referred to as submerged aquatic vegetation or SAV. Vegetated shallow survey guidance is located at www.nae.usace.army.mil/missions/regulatory /jurisdiction-and-wetlands. Maps of vegetated shallows in Massachusetts are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.

Vernal pools: For the purposes of these GPs, vernal pools are depressional wetland basins that typically dry up in most years and may contain inlets or outlets, typically of intermittent flow. Vernal pools range in both size and depth depending upon landscape position and parent material(s). In

most years, vernal pools support one or more of the following obligate indicator species: wood frog, spotted salamander, blue-spotted salamander, marbled salamander, Jefferson's salamander and fairy shrimp. However, they should preclude sustainable populations of predatory fish.

Water diversions: Water diversions are activities such as bypass pumping (e.g., "dam and pump") or water withdrawals. Temporary flume pipes, culverts or cofferdams where normal flows are maintained within the stream boundary's confines aren't water diversions. "Normal flows" are defined as no change in flow from pre-project conditions.

Waters of the United States (U.S.) These waterbodies are the waters where permits are required for the discharge of dredged or fill material pursuant to §404 of the CWA. These waters include but are not limited to navigable waters of the U.S. and tidal wetlands and include many non-tidal wetlands and other waterbodies. See definitions for navigable waters of the U.S., tidal wetlands, waterbody, and non-tidal wetlands. (33 CFR 328)

Waterbody: Examples of "waterbodies" include oceans, coastal waters, rivers, streams, ditches, lakes, ponds, and wetlands. If a wetland is adjacent to a waterbody determined to be a water of the U.S., that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

Weir: A barrier across a river designed to alter the flow characteristics. In most cases, weirs take the form of a barrier, smaller than most conventional dams, across a river that causes water to pool behind the structure and allows water to flow over the top. Weirs are commonly used to alter the flow regime of a river, prevent flooding, measure discharge and help render a river navigable.

Wetland: Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. The Corps of Engineers Wetlands Delineation Manual in conjunction with the associated regional supplement should be used to determine if a wetland is present and delineate wetland boundaries.

Acronyms

BMPs	Best Management Practices
BUAR	Massachusetts Board of Underwater Archaeological Resources
CWA	Clean Water Act
CZM	Coastal Zone Management
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EFH	Essential Fish Habitat
FNP	Federal Navigation Project
GC	General Condition
GP	General Permit
HTL	High Tide Line
IP	Individual Permit
LID	Low impact development
MassDEP	Massachusetts Department of Environmental Protection
MA DMF	Massachusetts Division of Marine Fisheries
MHC	Massachusetts Historical Commission
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
OHW	Ordinary High Water Mark
PCN	Preconstruction Notification
SAS	Special Aquatic Sites
SF	Square Feet
SV	Self-Verification
SHPO	State Historic Preservation Officer
THPO	Tribal Historic Preservation Officer
USFWS	U.S. Fish and Wildlife Service
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USGS	U.S. Geological Service
WQC	Water Quality Certification

Appendix A: Guidance for NHPA Section 106 Compliance in Massachusetts

1. Purpose & Applicability

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S.C § 306108), requires Federal agencies to take into account the effects of their undertakings on Historic Properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Therefore, in order for an activity to be eligible for authorization under the 2023 Massachusetts General Permit, the USACE must consider the effect the activity may have on historic properties. Historic properties may include, but are not limited to, historic districts, archaeological districts, sites, buildings, structures, objects, sacred sites, traditional cultural places, and traditional cultural landscapes that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

This guidance applies to projects that require authorization under Section 404 of the Clean Water Act (33 U.S.C. § 1344) and/or Section 10 of the Rivers and Harbors Act (33 U.S.C. §403) and will assist applicants when evaluating and documenting the presence of historic properties within or near their project site(s). The prospective applicant will evaluate their proposed project using the criteria below to determine if their project has the potential to affect historic properties and if so, whether or not historic properties are present or are likely to be present. All activities authorized under these GPs shall follow the terms outlined in General Condition 14: Historic Properties and General Condition 6: Tribal Rights & Burial Sites. Prospective applicants shall complete their due diligence according to the procedures below for their application to be deemed complete.

2. No Potential to Affect Historic Properties

Certain activities do not have the potential to cause effects on historic properties, assuming such historic properties were present, based on the nature of the activity and site-specific conditions. Therefore, these activities **do not** require historic property identification efforts or notification of the SHPO, THPOs, and/or BUAR under Section 106. The USACE has determined the following activities within the stated parameters have no potential to affect historic properties:

General Permit	Activity Parameters
1	Temporary buoys, markers and similar structures that are placed during winter events on ice and removed before spring thaw.
2	Repair or rehabilitation of structures that are less than 45 years in age. Any temporary structures or fills or work necessary to complete repairs or rehabilitation must not result in any ground disturbance.
3	Maintenance and replacement of moorings that are less than 45 years in age.
6	Maintenance, repair, replacement, or removal of utility lines, oil or natural gas pipelines, outfall or intake structures, and/or appurtenant features that are less than 45 years in age when all access, staging, and ground disturbance is strictly limited to previously disturbed areas (including any previous ground disturbance). Replacement must be in kind or smaller in size. Installation of tide gates on outfall structures that are less than 45 years in age.
7	Maintenance dredging of previously dredged areas where dredging does not extend beyond the original bottom elevations.

	Disposal of dredged material at an existing established and USACE-approved confined aquatic disposal cell. Beach nourishment in ongoing existing nourishment areas.
11	Fish and wildlife harvesting and attraction devices and activities.
13	Cleanup of hazardous and toxic waste materials, including contaminated sediments, that are less than 45 years in age.
16	Removal of land-based and water-based renewable energy generation facilities and hydropower projects that are less than 45 years in age.
18	Installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures for previously authorized by the USACE and ongoing aquaculture activities. Discharges of dredged or fill material into tidal or non-tidal waters necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities for previously authorized and ongoing aquaculture activities.
20	Maintenance activities for existing living shorelines excluding maintenance activities that require new ground disturbance such as excavation or re-sloping of the bank/shoreline.
22	Reshaping or maintenance of existing drainage ditches less than 45 years in age excluding ditch enlargement.
23	Placement of temporary and removable linear transportation and wetland/stream crossings that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
24	Placement of temporary and removable crossings and cofferdams that have no ground disturbance prior to placement, during placement, and during removal (i.e., placed on the surface and subsequently removed within one year of placement).
25	Emergency repair of existing structures and/or fills less than 45 years in age.

3. Historic Property Identification

If the activity does not fit under the criteria above, the following historic property identification efforts must be completed to demonstrate compliance with Section 106 of the NHPA. This includes documenting previously identified and unidentified historic properties in the project area.

a. Previously Identified Historic Properties: The prospective applicant shall document if previously identified historic properties are present on or adjacent to the project site by notifying the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (BUAR), as appropriate, of the proposed project. The MHC and BUAR will check their records for the presence of any previously identified historic properties. The following outlines how prospective applicants should notify the MHC and BUAR.

i. The prospective applicant will notify the SHPO and BUAR to identify any previously recorded cultural resources. Applicants shall mail a completed Project Notification Form[18], project narrative, location (coordinates), plans, soil maps, and information on known cultural resources to the MHC. The MHC does not accept submissions via email. Applicants shall email or mail this information to the BUAR when the activity is located in lakes, ponds, rivers, and/or navigable waters in MA. Emailed file attachments should be <10MB. Any files >10MB shall be delivered via a file exchange system or the hard copy documents shall be mailed. Preferred contact information is listed below.

ii. **When sending this information, applicants must also document proof of receipt OR proof the information was delivered.** Proof of receipt constitutes a certified mail receipt, read email receipt, or other mail/email/online tracking services that document the information has reached the intended recipient(s). Proof the information was delivered constitutes a certificate of mailing, email delivery receipt, or other mail/email/online services that document the information was sent at a particular time. When using proof of delivery such (e.g., certificate of mailing), applicants should add 5 days to the 30-day notification period so the mail has time to reach its intended recipient. When using proof of receipt, the applicant may begin the 30-day notification period from the date received by the intended recipient.

iii. When mailing or emailing the application materials, applicants should include the following statement: "Please send responses to this notification directly to the USACE via email: cenae-r-ma@usace.army.mil or address regular mail responses to: Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, Massachusetts 01742-2751." Email responses to the USACE are strongly preferred. The SHPO and BUAR will contact the USACE and cc the applicant(s) within 30 days of receiving the notification if their records indicate that historic properties are located in the project vicinity, and if additional review and/or surveys are recommended to ensure NHPA compliance. If the SHPO and/or BUAR do not respond within 30 days of receiving the notification, is it presumed that no known historic properties are present.

b. Previously Unidentified Historic Properties: The prospective applicant shall evaluate the project site and determine the sensitivity for the presence of historic properties if the project site has not been previously surveyed for cultural resources within the last 10 years. If the sensitivity is determined to be moderate to high, an intensive archaeological and/or architectural survey is required to investigate the potential presence of historic properties. The individual conducting this survey must meet the Secretary of the Interior's Standards for Professional Qualifications (48 FR 44738-44739) in the discipline relevant to a particular resource type. For example, archeologists should not document and evaluate buildings or structures and architectural historians should not document and evaluate archaeological sites. The identification and qualifications for those participating in any survey and evaluation of resources should be included with the survey results. The criteria listed below are indicators of low sensitivity for the presence of historic properties for consideration when determining if an archaeological or architectural survey is needed.

Low sensitivity indicators:

- Previous archaeological and/or architectural survey within the last 10 years with negative results.
- In a location created in modern times (i.e., built on fill placed within the last 45 years or within an area excavated within the last 45 years).
- USACE has reviewed the project description and determined that a survey is not warranted based on the proposed activity and its location.

State survey guidance and standards are provided in the September 1995 Historic Properties Survey Manual Guidelines for the Identification of Historical and Archaeological Resources in Massachusetts available. State survey guidance and standards for underwater surveys are provided

[18] https://www.sec.state.ma.us/mhc/mhcform/formidx.htm

in the Board of Underwater Archaeological Resources' 2022 Policy Guidance on Archaeological Investigations and Related Survey Standards for the Discovery of Underwater Archaeological Resources. This guidance is available on the NAE Regulatory website: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Massachusetts-General-Permit/.

Please note, a negative result from MHC and/or BUAR does not necessarily mean no historic properties are present. Often proposed project sites have not been previously subject to a survey, so historic properties which may be present have not been previously recorded.

4. Tribal Coordination

Prospective applicants shall mail the Project Notification Form, project narrative, location (coordinates), plans with locus map, soil maps, and information on cultural resources to the Wampanoag Tribe of Gay Head (Aquinnah), Mashpee Wampanoag Tribe, Narragansett Indian Tribe, and/or Stockbridge-Munsee Community Band of Mohican Indians with interests in the project location. Preferred tribal contact information, including their respective areas of interest, can be found below. Applicants shall follow the same procedures as identified in Section 3(a)i-iii above when notifying Tribes of the proposed activity. Applicants shall provide the USACE with any responses received from the tribe(s) with their PCN application. If a tribe does not respond within 30 days of receiving the notification, the applicant shall provide USACE with all documentation of tribal outreach with their SV or PCN submission (e.g., emails, letters, phone call log, etc.). If the tribe indicates the presence of a previously unrecorded cultural resource, including a traditional cultural property (TCP) or traditional cultural landscape (TCL), a PCN is required.

5. Effect Determination

The project may have the potential to affect historic properties and/or tribal resources if 1) notification recipients respond within 30 calendar days of notification with concerns, 2) historic properties eligible for listing, or potentially eligible for listing in the NRHP, are present or 3) tribal resources are known to be present. The USACE may need to further review the project to confirm potential effects to historic properties and/or tribal resources. A PCN is required for any activity that may affect a historic property.

The USACE may determine the project will have 'no effect' on historic properties (i.e., no historic properties affected) when procedures outlined in Section 3 above are followed and no cultural resources are identified. Similarly, if historic properties are identified and will be completely avoided, the USACE may determine 'no effect.'

6. Contact Information:

Massachusetts Historical Commission

The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

No email. Applicants or their representatives must send project information via certified mail and submit the certified mail receipt to the USACE or send via regular mail and submit proof of delivery.

Area of concern: All of Massachusetts.

Massachusetts Board of Underwater Archaeological Resources (BUAR)

100 Cambridge Street, Suite 900
Boston, Massachusetts 02114
Email: david.s.robinson@mass.gov

Applicants or their representatives must send project information via email (***strongly preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All waterbodies in Massachusetts.

Wampanoag Tribe of Gay Head (Aquinnah)

Bettina Washington
Tribal Historic Preservation Officer (THPO)
20 Black Brook Road
Aquinnah, Massachusetts 02535
Email: thpo@wampanoagtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Mashpee Wampanoag Tribe

ATTN: David Weeden
Tribal Historic Preservation Officer (THPO)
483 Great Neck Road South
Mashpee, Massachusetts 02649
Email: 106review@mwtribe-nsn.gov
Cc: David.weeden@mwtribe-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: All of Massachusetts.

Narragansett Indian Tribe

ATTN: John Brown
Tribal Historic Preservation Officer (THPO)
Narragansett Indian Longhouse
4425 South County Trail
Charlestown, Rhode Island 02813
Email: tashtesook@aol.com

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: Massachusetts east of the Connecticut River.

Stockbridge-Munsee Community Band of Mohican Indians

ATTN: Jeff Bendremer
Tribal Historic Preservation Manager
Stockbridge-Munsee Community
Tribal Historic Preservation Extension office
86 Spring Street
Williamstown, Massachusetts 01267
Email: thpo@mohican-nsn.gov

Applicants or their representative must send project information via email (***preferred***) or regular mail and provide proof of receipt or proof of delivery.

Area of concern: West of the Connecticut River and Northfield, Montague, Miller's Falls, Turner's Falls, Sunderland, Amherst, Hadley, South Hadley, Chicopee, Springfield and Longmeadow.

APPENDIX B PRE-CONSTRUCTION NOTIFICATION

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
6. APPLICANT'S ADDRESS:	9. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
7. APPLICANT'S PHONE NOs. with AREA CODE	10. AGENT'S PHONE NOs. with AREA CODE
a. Residence b. Business c. Fax d. Mobile	a. Residence b. Business c. Fax d. Mobile

STATEMENT OF AUTHORIZATION

11. I hereby authorize, _____ to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

_____ _____

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)	14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)	City: State: Zip:
Latitude: °N Longitude: °W	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: Municipality:

Section: Township: Range:

17. DIRECTIONS TO THE SITE.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

25. Is Any Portion of the General Permit Activity Already Complete? ☐ Yes ☐ No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? ☐ Yes ☐ No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a

Department of the Army

General Permit (GP) Pre-Construction Notification (PCN)

Blocks 1 through 4. To be completed by the U.S. Army Corps of Engineers.

Block 5. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the PCN, please attach a sheet of paper with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the PCN. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by the applicant, if an agent is to be employed.

Block 12. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 13. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Activity Street Address. If the proposed GP activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. Location of Proposed Activity. Enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area requiring evaluation. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality where the site is located.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide a description of the location of the proposed GP activity, such as lot numbers, tract numbers, or you may choose to locate the proposed GP activity site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed GP activity site if known. If there are multiple locations, please indicate directions to each location on a separate sheet of paper and mark as Block 17.

Block 18. Identify the Specific General Permit(s) You Propose to Use. List the number(s) of the General Permit(s) you want to use to authorize the proposed activity (e.g., GP 4).

Block 19. Description of the Proposed General Permit Activity. Describe the proposed GP activity, including the direct and indirect adverse environmental effects of the proposed activity. The description of the proposed activity should be sufficiently detailed for USACE to determine that the adverse environmental effects of the activity will be no more than minimal. Identify the materials to be used in construction, as well as the methods by which the work is to be done.

Provide drawings to show that the proposed GP activity complies with the terms of the applicable GP(s). Drawings should contain sufficient detail to provide an illustrative description of the proposed GP activity, but do not need to be detailed engineering plans. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 19.

Block 20: Description of Proposed Mitigation Measures. Describe any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed GP activity. The description of any proposed mitigation measures should be sufficiently detailed for USACE to determine how the measures would avoid and minimize adverse environmental effects. If adverse effects exceed the New England District compensatory mitigation thresholds, you must document how compensatory mitigation would be satisfied in Block 24.

Block 21. Purpose of General Permit Activity. Describe the purpose and need for the proposed GP activity. What will it be used for and why? Also include a brief description of any related activities associated with the proposed project. Provide the approximate dates you plan to begin and complete all work.

Block 22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by the Proposed General Permit Activity. For discharges of dredged or fill material into Waters of the U.S., provide the amount of wetlands, streams, or other types of waters filled, flooded, excavated, or drained by the proposed GP activity. For structures or work in Navigable Waters of the U.S. subject to Section 10 of the Rivers and Harbors Act of 1899, provide the amount of navigable waters filled, dredged, occupied by one or more structures (e.g., aids to navigation, mooring buoys) by the proposed GP activity. The area of impact includes the structures or fills with direct or indirect effects to waters of the U.S. The length of impact includes the length of a stream, including is banks, that are directly affected by the structures or fills. The duration of impact should be identified as temporary (xx days) or permanent. The impact purpose should briefly describe what structure or fill is responsible for the impact.

Block 23. Identify Any Other General Permit(s), Regional General Permit(s), or Individual Permit(s) Used to Authorize Any Part of Proposed Activity or Any Related Activity. List any other GP(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. For linear projects, list other separate and distant crossings of waters and wetlands authorized by these GPs that do not require PCNs. If more space is needed, attach an extra sheet of paper marked Block 23.

Block 24. Compensatory Mitigation Statement for Losses Greater Than the New England District Compensatory Mitigation Thresholds. New England District requires compensatory mitigation at a minimum one for one replacement ratio or greater for all aquatic resource losses that require a PCN and exceed the New England District Compensatory Mitigation Thresholds, unless USACE determines in writing that either some other form of mitigation is more environmentally appropriate or the adverse environmental effects of the proposed GP activity are no more than minimal without compensatory mitigation, and provides an activity specific waiver of this requirement. Describe the proposed compensatory mitigation for wetland losses greater than the New England District Compensatory Mitigation Thresholds or provide an explanation of why USACE should not require wetland compensatory mitigation for the proposed GP activity. If more space is needed, attach an extra sheet of paper marked Block 24.

Block 25. Is Any Portion of the General Permit Activity Already Complete? Describe any work that has already been completed for the GP activity.

Block 26. List the Name(s) of Any Species Listed As Endangered or Threatened under the Endangered Species Act that Might be Affected by the General Permit Activity. If you are not a federal agency, and if any listed species or designated critical habitat might be affected or is in the vicinity of the proposed GP activity, or if the proposed GP activity is located in designated critical habitat, list the name(s) of those endangered or threatened species that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 7 of the Endangered Species Act.

Block 27. List Any Historic Properties that Have the Potential to be Affected by the General Permit Activity. If you are not a federal agency, and if any historic properties have the potential to be affected by the proposed GP activity, list the name(s) of those historic properties that have the potential to be affected by the proposed GP activity. Provide all relevant documentation about these historic properties in the PCN submittal. If you are a Federal agency, and the proposed GP activity requires a PCN, you must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

Block 28. List the Wild and Scenic River or Congressionally Designated Study River if the General Permit Activity Would Occur in such a River. If the proposed GP activity will occur in a river in the National Wild and Scenic River System or in a river officially designated by Congress as a "study river" under the Wild and Scenic Rivers Act, provide the name of the river. For a list of Wild and Scenic Rivers and study rivers, please visit http://www.rivers.gov/

Block 29. General Permit Activities that also Require Permission from the USACE Under 33 U.S.C. 408. If the proposed GP activity also requires permission from the USACE under 33 U.S.C. 408 because it will temporarily or permanently alter, occupy, or use a USACE federal authorized civil works project, indicate whether you have submitted a written request for section 408 permission from the USACE district having jurisdiction over that project.

Block 30. 401 Water Quality Certification. As described above, specify if the activity requires a 401 WQC from the certifying authority.

Block 31. Other Information Required For General Permit Pre Construction Notifications. The terms of some of the General Permits include additional information requirements for preconstruction notifications:

* Maintenance – information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals.
* Temporary Construction, Access, and Dewatering – a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions.
* Repair of Uplands Damaged by Discrete Events – documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration.
* Commercial Shellfish Aquaculture Activities – (1) a map showing the boundaries of the project area, with latitude and longitude coordinates for each corner of the project area; (2) the name(s) of the species that will be cultivated during the period this GP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area (a detailed survey is not required).Dredging – (1) a proposed sampling and analysis plan shall be provided to USACE for approval prior to its execution. Pre-application meetings are encouraged.
* Beach Nourishment – sediment grain size should be determined for the length of the beach where nourishment is proposed. The frequency and locations of sediment sampling shall be sufficient to identify the sediment composition of the beach profile. This data shall be consolidated to generate a sediment gradation curve for each sampled transect. Each sampled transect should also be identified on the project plans (drawings).

If more space is needed, attach an extra sheet of paper marked Box 31.

Block 32. Signature of Applicant or Agent. The PCN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the PCN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the PCN possesses the requisite property rights to undertake the GP activity (including compliance with special conditions, mitigation, etc.).

DELINEATION OF WETLANDS, OTHER SPECIAL AQUATIC SITES, AND OTHER WATERS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by the USACE. The permittee may ask the USACE to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the USACE does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. The 60-day PCN review period will not start until a delineation has been completed.

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross Section Map. Identify each illustration with a figure or attachment number. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings should also be included. Please submit one copy of all drawings on 8½ x 11 inch plain white paper (electronic submissions preferred). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

ADDITIONAL INFORMATION AND REQUIREMENTS

For proposed GP activities that involve discharges into waters of the United States, water quality certification from the State, Tribe, or EPA must be obtained or waived. Some States, Tribes, or EPA have issued water quality certification for one or more GPs. Please check the New England District website to see if water quality certification has already been issued for the GP(s) you wish to use. For proposed GP activities in coastal states, state Coastal Zone Management Act consistency concurrence must be obtained, or a presumption of concurrence must occur. Some States have issued Coastal Zone Management Act consistency concurrences for one or more GPs. Please check the New England District website to see if Coastal Zone Management Act consistency concurrence has already been issued for the GP(s) you wish to use.

APPENDIX C SELF-VERIFICATION NOTIFICATION

U.S. Army Corps of Engineers (USACE)

SELF-VERIFICATION NOTIFICATION (SVN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose This information will be used in evaluating activities under Self-Verification procedures within Massachusetts.

Routine Uses Routine uses will include: (1) Documenting compliance with the terms and conditions of the General Permit (GP) for activities that may require authorization pursuant to one or more of USACE's Regulatory authorities. (2) Records may be referred to other Federal, State, and local agencies for evaluation and enforcement purposes.

Disclosure Failure to fully comply and abide by the GP terms and conditions prior to commencing work and after completion project may result in formal enforcement action, up to and including monetary penalties and/or legal action, pursuant to 33 CFR Part 326.

Instructions The permittee must complete ALL required sections of this document before commencing USACE-regulated activities. A copy of this completed SVN must be kept on site during construction and be made available for review by USACE and other Federal, State, & Local regulatory authorities at any time. Within 30 days of initiating project construction, the permittee shall submit the completed SVN to USACE. The SVN shall be submitted to USACE as **ONE signed document** that includes project plans and documentation that supports each field (e.g., emails, letters, description, phone calls, surveys). Electronic submissions to the following address are strongly preferred: cenae-r-ma-sv@usace.army.mil. The email subject line shall contain the following: GP #, SVN, City/Town, and date submitted.

(ITEMS 1 THRU 3 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED

APPLICANT AND AGENT INFORMATION

4. APPLICANT'S NAME	7. AGENT'S ADDRESS:
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
5. APPLICANT'S ADDRESS:	8. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
6. APPLICANT'S PHONE NOs. w/AREA CODE	9. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax	a. Residence b. Business c. Fax

NAME, LOCATION, AND DESCRIPTION OF PROJECT SITE

10. PROJECT NAME OR TITLE

11. FILE NUMBER(S) OF PREVIOUS USACE ACTIONS ON THE SITE (if applicable)	12. NAME OF WATERBODY
13. PROJECT COORDINATES (in decimal degrees)	14. PROJECT STREET ADDRESS (if applicable)
Latitude: ◦N Longitude: ◦W	Address
	City - State - Zip -

ACTIVITY TYPE, PROJECT IMPACTS, AVOIDANCE & MINIMIZATION

15. GENERAL PERMIT ACTIVITIES (CHECK ALL THAT APPLY)

1 ☐	6 ☐	11 ☐	16 ☐	21 ☐
2 ☐	7 ☐	12 ☐	17 ☐	22 ☐
3 ☐	8 ☐	13 ☐	18 ☐	23 ☐
4 ☐	9 ☐	14 ☐	19 ☐	24 ☐
5 ☐	10 ☐	15 ☐	20 ☐	25 ☐

16. SUMMARY OF PROJECT IMPACTS (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration

17. PROJECT PLANS (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE ITEMS ARE COMPLETE) (*see instructions*)

- ☐ a. Plans shall at least contain the following: Vicinity Map, Plan View, and Typical Cross Section View of the proposed activity.
- ☐ b. All direct, indirect and secondary impacts from USACE regulated activities are shown on the project plans.
- ☐ c. The size of the impact area for each activity (acre, square feet, linear feet) are shown on the project plans.
- ☐ d. For discharges of fill material (§404), the volume of fill material is identified on the project plans.
- ☐ e. The duration of each impact, permanent or temporary (X days), is identified on the project plans.
- ☐ f. Do activities with permanent impacts result in the loss of waters? If so, this is identified on the project plans.
- ☐ g. All aquatic resources in the vicinity of the USACE regulated activities are delineated on the project plans.

18. AVOIDANCE & MINIMIZATION (BY CHECKING THE BOXES BELOW, YOU CERTIFY THESE CRITERIA ARE MET) (*see instructions*)

- ☐ a. The project has been designed to avoid and minimize impacts to aquatic resources.
- ☐ b. The footprint of activities in waters of the U.S. has been reduced to only what is necessary to achieve the overall project purpose.
- ☐ c. All practicable measures have been taken to avoid and minimize impacts to aquatic resources through construction techniques and site access (e.g., Best Management Practices, Time of Year Restrictions).
- ☐ d. All temporary impacts from USACE regulated activities will be restored upon completion of construction and the project area will be returned to pre-construction contours and conditions.

COMPLIANCE WITH FEDERAL REGULATIONS & SUPPLEMENTAL INFORMATION

19. DUE DILIGENCE (*see instructions*)

Complete the entries below to document compliance with the following Federal requirements. Construction may NOT begin if a PCN is/may be required, and you must contact USACE to determine permitting requirements. Documentation that demonstrates how the activity complies with each field below shall be submitted to the USACE as noted in the instructions block. See each General Condition (GC) in the GP for how to comply with each requirement.

a. State Historic Preservation Officer	Select Option
b. Massachusetts BUAR	Select Option
c. Tribal Historic Preservation Officers	Select Option
d. Endangered Species Act - NOAA	Select Option
e. Endangered Species Act - USFWS	Select Option
f. Northern Long Eared Bat (ESA)	Select Option
g. Essential Fish Habitat	Select Option
h. Wild & Scenic Rivers	Select Option
i. 401 Water Quality Certification 401	Select Option
	401 WQC/OOC File Number: OOC issued: 401 issued:
j. Section 408 Permission	Select Option
k. Coastal Zone	Select Option
l. Construction Mats	Select Option
m.Time of Year Restrictions	Select Option
n. Vernal Pools	Select Option
o. Sediment & Erosion Controls	Select Option
p. Stream/Wetland Crossings	Select Option

20. AQUACULTURE ACTIVITIES - GP 18 (*see instructions*)

- ☐ a. If required, an Aquaculture Certification from the Massachusetts Division of Marine Fisheries was obtained prior to commencing work.
- ☐ b. Coordination with the U.S. Coast Guard pursuant to Private Aids to Navigation has occurred prior to commencing work.
- ☐ c. If required, a MEPA Certificate was obtained from the Massachusetts Environmental Protection Agency prior to commencing work. Select Option
- ☐ d. The prospective permittee contacted local authorities (e.g. harbormaster, select board, shellfish constable) for authorization of their facility prior to commencing work.

21. ADDITIONAL INFORMATION/ATTACHMENTS (*see instructions*)

- ☐ a. The project plans are enclosed in this SVN submittal (see block 17).
- ☐ b. The activity Select Option funded through the Bipartisan Infrastructure Bill (also known as the Infrastructure Investment and Jobs Act).
- ☐ c. All required state, local and federal approvals were acquired prior to starting construction in USACE jurisdiction.
- ☐ d. After construction of the activity is completed, a complete Certificate of Compliance will be submitted to USACE.

22. IS THERE ANOTHER LEAD FEDERAL AGENCY:

☐ YES ☐ NO

23. STATEMENT OF AUTHORIZATION *(see instructions)*

I certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

24. SIGNATURES *(see instructions)*

I hereby certify that the information in this Self-Verification Notification is complete and accurate. As the applicant or their duly authorized agent, I certify the activity was completed in accordance with the terms and conditions of the GP. This includes all applicable terms, general conditions, and activity-specific GP criteria. I agree to allow the duly authorized representatives of the Corps of Engineers Regulatory Program and other regulatory or advisory agencies to enter upon the premises of the project site at reasonable times to evaluate inspect and photograph site conditions. This consent to enter the property is superior to, takes precedence over, and waives any communication to the contrary. For example, if the property is posted as “no trespassing” this consent specifically supersedes and waives that prohibition and grants permission to enter the property despite such posting.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a
Department of the Army
General Permit (GP) Self-Verification

Blocks 1 through 3. To be completed by the Corps of Engineers.

Block 4. Applicant' Name. Enter the name and the e-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the self-verification, please attach a sheet of paper with the necessary information marked Block 4.

Block 5. Address of Applicant. Please provide the full address of the party or parties responsible for the self-verification. If more space is needed, attach an extra sheet of paper marked Block 5.

Block 6. Applicant Telephone Number(s). Please provide the telephone number where you can usually be reached during normal business hours.

Blocks 7 through 9. To be completed, if you choose to have an agent.

Block 7. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, consultant, or any other person or organization. Note: An agent is not required.

Blocks 8 and 9. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where they can be reached during normal business hours.

Block 10. Proposed General Permit Activity Name or Title. Please provide a name identifying the proposed GP activity, e.g., Windward Marina, Rolling Hills Subdivision, or Smith Commercial Center.

Block 11. File Number(s) of Previous USACE Actions on the Site Please provide any known USACE file number. If the activity does not have a known USACE file number, you may state N/A.

Block 12. Name of Waterbody. Please provide the name (if it has a name) of any stream, lake, marsh, or other waterway to be directly impacted by the GP activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 13. Proposed Activity Coordinates. Please enter the latitude and longitude of where the proposed GP activity is located. Indicate whether the project location provided is the center of the project or whether the project location is provided as the latitude and longitude for each of the "corners" of the project area. If there are multiple sites, please list the latitude and longitude of each site (center or corners) on a separate sheet of paper and mark as Block 13.

Block 14. Proposed Activity Street Address. If the proposed activity is located at a site having a street address (not a box number), enter it in Block 14.

Block 15. General Permit Activity Type. Please select all GP activity types that apply to the proposed activity. A list of GP activity types can be found in Section III of the GP.

Block 16. Summary of Project Impacts. Please provide ALL proposed impacts, both temporary and permanent in duration, that are located in Waters of the United States. The area of impact shall be provided in square feet (SF). When applicable, impacts that result in conversion of stream bank or shoreline must also be identified in linear feet (LF). Dredging or the discharge of dredged or fill material shall also include the volume, cubic yards (CY), of material removed from or placed into Waters of the U.S. If more entries are required, please attach a table matching the desired format in Block 16.

Block 17. Project Plans. Please verify that items a-g are included in the project plans. Three types of illustrations are necessary to properly depict the proposed work. These illustrations or drawings are identified as a Vicinity Map, a Plan View (Aerial view) and a Cross Section Map. For linear projects (e.g. roads, subsurface utility lines, etc.) gradient drawings (longitudinal profile) should also be included. Plans must accurately depict the existing conditions and all aspects of the proposed activity located in waters of the U.S. Please submit one copy of all drawings formatted to print on 8½ x 11 inch or 11 x 17 inch plain white paper. Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross section). While illustrations need not be certified engineering sheets; they should be clear, accurate, contain all necessary information, and depict all proposed work. Each submission must also include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current wetland delineation manual and regional supplement published by USACE.

Block 18. Avoidance & Minimization. Please verify that items a-d have been implemented for the proposed activity.

Block 19. Due Diligence. Please complete all the fields and submit documentation to USACE to demonstrate compliance with the above requirements. This Documentation may include emails, letters, meeting notes, phone call log, project narrative, project plans, a species list from the NOAA Section 7 Mapper, a completed copy of the IPAC determination keys, etc. Documentation should be limited to what is necessary to demonstrate how the proposed activity meets each requirement. Refer to the MA GP, Appendix A, for specific guidance on the identification of previously identified historic properties and previously unidentified historic properties. Endangered Species: *The applicant must be designated as the non-federal representative for the purposes of Section 7 consultation to select the Rangewide D-Key options. Otherwise, the applicant shall select the following option when IPAC indicates the NLEB is present: "The activity IS located within the NLEB Species Range (PCN Required)."

Block 20. Aquaculture Activities. Please verify that items a-d have been obtained or completed prior to commencing work in waters of the U.S.

Block 21. Additional Information/Attachments. Please verify that items a-d have been completed prior to commencing work in waters of the U.S.

Block 22. Lead Federal Agency. Please identify if there is another lead federal agency involved with the proposed activity. Enter the lead federal agency name (e.g., the Federal Emergency Management Agency, FEMA) and the agency's designated person of contact for the activity.

Block 23. Statement of Authorization. The applicant shall sign this section for all activities. If an agent is to be employed, the agent shall sign this section.

Block 24. Signatures. The SVN must be signed by the person proposing to undertake the GP activity, and if applicable, the authorized party (agent) that prepared the SVN. The signature of the person proposing to undertake the GP activity shall be an affirmation that the party submitting the SVN possesses the requisite property rights to undertake the GP activity.

US Army Corps of Engineers®
New England District

APPENDIX D: PCN APPLICATION CHECKLIST

The following information shall be submitted for all PCNs for USACE to properly evaluate your application. Some applications may require more information and this checklist is offered as a tool to assist applicants with submitting a complete application.

SECTION 1: GENERAL APPLICATION INFORMATION

1. ☐ Complete the Pre-Construction Notification document (Appendix B).
2. ☐ Specify which local/state/federal authorizations are required for the project and if any have been obtained or applied for at the time of USACE application submittal.
3. ☐ Identify all funding sources the project will receive or has received to date. Provide any relevant information in the application submission.
4. ☐ Is this part of a larger project that is being implemented in phases? If so, describe the project schedule and how each phase will be implemented.
5. ☐ Describe the existing conditions on the site and the general land use in the vicinity of the project at the time application submittal.
6. ☐ Provide any historic information available that you may have of project area, e.g., existing USACE permit numbers, the names under which the permits were obtained if the permit numbers are unknown, construction dates and proof of prior existence (aerials, photos, town hall records, affidavits, state or local permits, etc.) to verify that the project predates regulation and is "vested".[19]
7. ☐ The anticipated start and end dates for construction.

SECTION 2: WETLAND DELINEATION

8. ☐ Data used to support aquatic resource boundary determinations (delineation forms, delineation map(s) that show the locations of each aquatic resource in the project area, aerial and ground photographs, LIDAR imagery, national wetland inventory maps, soil maps, national hydrography dataset maps, floodplain maps, historical imagery, etc.).
9. ☐ Photographs of the wetland(s) and/or waterway(s) where impacts are proposed. Photos at low tide are preferred for work in tidal waters.
10. ☐ Indicate the relationship of the project area to waters of the U.S., i.e., adjacent wetlands, tidal influence or hydraulic connectivity through culverts, or other conveyances, etc.
11. ☐ At minimum the delineation map/figure should include the following:
    a. Contour lines showing topography.
    b. North arrow.
    c. Bar and text scale.
    d. Legend.
    e. Drawn project boundary.
    f. High tide line, mean high water, mean low water, ordinary high water mark, and/or wetland boundaries.
    g. Captions with a unique name for each aquatic resource and the area or length of the aquatic resource within the project area.

[19] Vested is exempt (someone or something) from a new law or regulation.

h. Appropriate landmarks and features (e.g., culverts, special aquatic sites, etc.).
i. Points showing the paired upland and wetland delineation locations for tidal and non-tidal wetlands only.

SECTION 3: AVOIDANCE & MINIMIZATION

12. ☐ Describe specific measures taken to avoid impacts to aquatic resources or describe why aquatic resources could not be avoided while achieving the project purpose and need.
13. ☐ For impacts to aquatic resources that could not be avoided, describe specific considerations/ measures taken to minimize the area of proposed impacts to aquatic resources in designing the project.
14. ☐ Describe specific measures taken to avoid and minimize the proposed direct, indirect, and secondary impacts to aquatic resources and their functions through construction techniques and timing.
15. ☐ If applicable, provide a restoration plan that describes how all temporary fills and structures will be removed and the area restored to pre-impact conditions (see GC 22).
16. ☐ If applicable, provide an Invasive Species Control Plan (see GC 29). For sample control plans, see www.nae.usace.army.mil/missions/regulatory/invasive-species.
17. ☐ If applicable, describe how the proposed wetland/waterbody crossing is compliant with GC 31, Stream Work and Crossings, and Wetland Crossings.

SECTION 4A: PROJECT IMPACTS

18. ☐ Describe the overall project and the activities located in Waters of the U.S. (WOTUS) that you are seeking authorization for.
19. ☐ Identify the following for project impacts in WOTUS:
    a. ☐ Direct, indirect, secondary impacts[20] within WOTUS.
    b. ☐ The size of each impact (square feet or acres, or linear feet).
    c. ☐ For discharges of fill material (§404), specify the volume of fill material to be discharged (cubic yards).
    d. ☐ The impact duration from each activity, permanent or temporary (X days).

SECTION 4B: PROJECT PLANS

20. ☐ Submit project plans that depict all impacts in WOTUS. On the project plans, applicants shall provide:

    General Information

    a. ☐ Plan view and typical cross-section view sheets that show the existing and proposed conditions. These illustrations should each be identified with a figure number, date of the map, the project title, the name of the applicant and the type of illustration (vicinity map, plan view, or cross section).
    b. ☐ Drawings, sketches, or plans that are legible, reproducible (color is encouraged, but features must be distinguishable in black and white), drawn to scale, and no larger than 11”x17” and 10 MB when submitted in digital format. Numeric and graphic/bar scales must agree, and plan details must be measurable using a standard engineer’s scale on printed plans. Reduced plans are not acceptable.
    c. ☐ The north arrow and remove miscellaneous non-wetland or water project related features such as conduits, utility poles, guardrails, etc.

[20] See definitions section for the definitions of direct, indirect, secondary impacts.

d. ☐ Clearly draw the overall limits of work, staging areas, disposal sites, access routes, and any permittee responsible mitigation sites. These areas may include both aquatic resources and upland areas.
e. ☐ Names or numbers of all roads in the site's vicinity and ownership and numbers of abutting parcels.
f. ☐ Datum in plan and elevation views. The horizontal datum shall be in the NAD 83 Massachusetts State Plane Coordinate System (INSERT) in U.S. survey feet. The vertical data in coastal projects shall be referenced to either MLLW or the North American Vertical Datum of 1988 (NAVD 88). Both the distance and depth units shall be U.S. survey feet and specified on the project plans.

Aquatic Resources & Project Impacts

g. ☐ Delineation of all aquatic resource types on site including salt marsh; other special aquatic sites (vegetated shallows, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges); other waters, such as lakes, ponds, vernal pools, natural rocky habitat (tidal only), and perennial, intermittent, and ephemeral streams.
h. ☐ Identify the substrate type (cobble/gravel, organic detritus, sand/shell, silt, mud) and the approximate percentage of each substrate type on site. Grain sizes shall be based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders. Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.
i. ☐ The direction of ebb and flood in tidal waters and direction of flow in non-tidal waters.
j. ☐ In tidal waters, the project boundary distance from special aquatic sites identified in 20g above if within 25 feet from that resource.
k. ☐ USACE jurisdictional boundaries including ordinary high-water mark (OHWM), high tide line (HTL), mean high water (MHW). Other boundaries include mean low water (MLW), mean lower low water (MLLW), as applicable.
   - Non-tidal: OHWM and/or wetland boundaries.
   - Tidal (structures/work only): MHW, MLW.
   - Tidal (Fill and Structures/work): HTL, MHW, MLW.
   - Tidal (Dredging/Beach Nourishment): HTL, MHW, MLW, MLLW.
l. ☐ Identification of each aquatic resource with a unique name (ex. Wetland 1, Wetland 2, Tributary 1, Beaver Brook, Atlantic Ocean) and the size of each aquatic resource within the project area (square feet or acres).
m. ☐ Impacts to each aquatic resource with captions denoting the size of each impact (square feet, acres, or linear feet) and the duration of the impact (ex. Permanent, Temporary (X days).

SECTION 4C: PROJECT PLANS - SPECIFIC PROJECT INFORMATION

21. ☐ For projects involving Navigation, Structures, Dredging, and/or Beach Nourishment, the applicant shall also address the following:

Navigation

a. ☐ Identify the locations of adjacent Federal navigation project (FNP) and/or state/local navigation projects on the project plans.
b. ☐ Specify the distance between the FNP and proposed project boundary, the authorized depths of the FNP, and state plane coordinates of seaward end(s) of project structures near an FNP.

Structures

a. ☐ Identification of the piling type (steel, timber, concrete) and diameter to be removed and/or installed.
b. ☐ Specify the minimal height of the structures' frame over saltmarsh. To meet the SV threshold, piers must be ≤4 feet in width and this minimal height must achieve a 1.5:1 ratio (i.e., a 4-foot-wide pier is 6 feet above a saltmarsh).
c. ☐ For floats, the methods of securing them (piles, bottom anchors) and for keeping them off substrate (skids, stops) at low water. To meet the SV threshold, a minimum depth of 18-inches of water should be maintained below a floating dock/structure at lower tide levels.

Dredging

a. ☐ The area (SF, acre) and volume (CY) of material to be dredged waterward of MHW for each dredge location.
b. ☐ Dredge boundaries.
c. ☐ Bathymetry for existing, proposed, and historical (include dates and USACE permits) dredge depths.
d. ☐ The likely final angle of repose of the side cuts based on the physical characterization of the material to be dredged and based upon the high/ medium/low, wave or current energy of the location.
e. ☐ Label area whether the dredging is new, maintenance, improvement, or a combination.
f. ☐ Location of the disposal site (include location sheet). NOTE: For projects proposing open water, nearshore disposal, or beach nourishment, contact USACE as early as possible for sampling and testing protocols. Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing may be required. Sampling/testing of sediments without such contact should not occur and if done, will be at the applicant's risk.
g. ☐ The methods and areas used to retain or prevent dredged material from running back into the wetland or waterway. Provide the capacity of the storage area and points of runback, including the overflow route, into the aquatic system.
h. ☐ For open-water disposal, explain why inland or beneficial reuse sites are not practicable.
i. ☐ Show the finished top elevation of the disposal site.

Beach Nourishment

a. ☐ For beach nourishment, identify the disposal footprint, existing and proposed nourishment profiles (multiple profiles are appropriate if the site is more than 150 feet long or non-contiguous), total fill area (SF) and volume (CY), fill area and volume waterward of the HTL, and delineation of dunes, banks, existing beach vegetation, and contours.
b. ☐ For beach nourishment identify the substrate type (fine sand, sand, cobble, boulder) and/or grain-size of existing material.

SECTION 5: STRUCTURES

22. ☐ For projects with the removal of existing pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be removed and the methodology for removal (cut off at mud line, pulling, vibratory, etc.).
23. ☐ For projects with the installation of new pilings identify the number, type (steel, timber, concrete) and diameter of pilings to be installed and the methodology for installation (vibratory hammer, impact hammer etc.).
24. ☐ Identify any existing structures and moorings in waters adjacent to the proposed activity, their dimensions, and the distance to the limits and coordinates of any proposed mooring field or reconfiguration zone. For reconfiguration zone and mooring fields, provide the coordinates for all

corners based on the Massachusetts State Plane Coordinate System. Specify the maximum number of slips and/or moorings within proposed reconfiguration zones or anchorage areas.

25. ☐ The dimensions of the structure or work and extent of encroachment waterward of MHW and from affixed point on the shoreline or upland.
26. ☐ Shoreline of adjacent properties and property boundary offset for structures. In narrow waterbodies, the distance to opposite shoreline, waterway width, and structures across from proposed work.
27. ☐ For new commercial boating facilities, anchorage areas or reconfiguration zones, provide a description of the type of vessels that would use the facility, and any plans for sewage pump-out facilities, fueling facilities and contingency plans for oil spills.
28. ☐ See Sections 4A-C above.

SECTION 6: AQUACULTURE

29. ☐ Identify the coordinates for lease area corners and gear configuration area on the project plans.
30. ☐ Identify the proposed aquaculture gear type (buoys, floats, racks, trays, nets, lines, tubes, cages, containers, and other structures). Provide the impacts for each aquaculture gear type (see Section 4A 19a-d).
31. ☐ For a GP 18 to be valid, applicants must have (a) their MA DMF Aquaculture Certification letter for licensed shellfish aquaculture sites, (b) documentation that the applicant has coordinated with the U.S. Coast Guard regarding USCG Private Aids to Navigation standards, (c) their MEPA Certificate (if required), and (d) documentation that the applicant has contacted their local authorities (ex. harbormaster, select board, shellfish constable) for authorization of their facility.
32. Provide information on site the operation, maintenance, and access. Will the site be accessed via boat, kayak, etc.? Will cages be removed in the winter? How often will gear be checked on? Is there an operations plan for the proposed aquaculture area?
33. ☐ See Sections 4A-C above.

SECTION 7: DREDGING

34. ☐ Sampling plan requests for new, improvement or maintenance dredging must submit completed **Dredged Material Evaluation checklist found at Dredged Material Evaluation Checklist, Sampling and Analysis Plan Requirements from Applicant (army.mil)** and identify the method of handling/transporting the dredged material.
35. ☐ Identify grain-size of material to be dredged (e.g., silty sand) and provide any existing sediment grain size and bulk sediment chemistry data from the proposed project or nearby projects. Include information on any recent spills of oil and/or other hazardous materials and/or nearby outfalls. Document the information source, e.g., EPA database, the harbormaster or fire chief. If there are none, state “none”.
36. ☐ See Section 4A, 4B and 4C, Dredging 21(a-i) above.

SECTION 8: WETLAND/WATERBODY CROSSINGS

37. ☐ For the stream crossing, identify the crossing methodology on the project plan (e.g., dam and pump, dry, wet, etc.). Submit a waterway crossing sequencing plan with the application.
38. ☐ If the project includes a permanent crossing of a tidal waterway, your project design should be modified to match the velocity, depth, cross-sectional area, and substrate of the existing waterbody adjacent to the crossing and provide documentation (hydraulic analysis including low lying property analysis) that the size of the crossing will not restrict tidal flow over the full natural tide range and will not adversely affect abutting infrastructure.

39. ☐ If the work includes a permanent crossing of a non-tidal stream, your project design should be modified to match the culvert gradient of the existing stream channel profile, provide clearance for ≥1.2 times bank full width and conveyance should be embedded ≥1-2 feet for box culverts and pipe arches or ≥1-2 feet and at least 25 percent for rounded pipes/culverts in accordance with the Massachusetts Stream Crossing Standards. Provide the basis for any variation to this requirement.
40. ☐ If the work includes a permanent crossing of a non-tidal stream, the structure should be designed to include a natural bottom substrate within the conveyance that matches the characteristics of the substrate in the natural stream channel and the character of the banks (mobility, slope, stability, confinement, grain and rock size). The conveyance should be designed with a minimum openness ratio ≥0.82-feet (0.25-meters). For how to calculate openness ratio and stream simulation ecological approach for road and stream crossings, see https://www.nae.usace.army.mil/Missions/Regulatory/Stream-and-River-Continuity/.

SECTION 9: COMPENSATORY MITIGATION

41. ☐ Does the project require Compensatory Mitigation[21] for impacts to Waters of the U.S.? (See Section V in the 2023 Massachusetts General Permit)
42. ☐ If the project requires mitigation, does the selected compensatory mitigation option (i.e., In-Lieu Fee, permittee-responsible mitigation) deviate from the order of the options presented in §332.3(b)(2)-(6)? If so, please explain why. https://www.ecfr.gov/current/title-33/chapter-II/part-332/section-332.3
43. ☐ For any compensatory mitigation that involves preservation, the applicant must use a site protection instrument to preserve the parcel in perpetuity. (Conservation Easement, Deed Restriction, etc.) https://www.mass.gov/service-details/conservation-restriction-review-program.

SECTION 10: HISTORIC PROPERTIES & NOTIFICATIONS TO SHPO, THPOs, BUAR

44. ☐ Notify the SHPO, Massachusetts Historical Commission, of the Project via Certified Mail and include proof of delivery or receipt in the application package (See Appendix A).
45. ☐ As applicable, notify the THPOs, Narragansett Indian Tribe, Wampanoag Tribe of Gay Head (Aquinnah), and Mashpee Wampanoag Tribe, of the Project via email OR mail and include proof of delivery or receipt in the application package (See Appendix A).
46. ☐ As applicable, notify the BUAR via email (*strongly preferred*) OR mail and include proof of delivery or receipt in the application package (See Appendix A).
47. ☐ Include responses to this notification in the permit application.
48. ☐ As applicable, information on historic properties (Tribal and Archaeological) within the project area should be provided in the permit application.

SECTION 11: ENDANGERED SPECIES & ESSENTIAL FISH HABITAT

49. ☐ Provide a USFWS Information for Planning and Consultation (IPaC) Official Species List from https://ecos.fws.gov/ipac and the email of the individual who generated the list (see GC 10 of the 2023 Massachusetts General Permit for more information).
50. ☐ Provide a species list from the NMFS Section 7 Endangered Species Act mapper at https://noaa.maps.arcgis.com/apps/webappviewer/index.html.
51. ☐ Provide a species list from the NMFS Essential Fish Habitat Mapper at https://www.habitat.noaa.gov/apps/efhmapper/?page=page_3.

[21] Your mitigation proposal must be consistent with the December 29, 2020 Compensatory Mitigation Standard Operating Procedures at https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/Compensatory-Mitigation-SOP-2020.pdf and 2008 Mitigation Rule.

52. ☐ If the project will generate turbidity, describe the extent of turbidity and if erosion controls will be used to contain turbidity. If turbidity controls are not operationally feasible, explain the basis for your conclusion and identify any other measures that you will implement to minimize resuspension of sediment.
53. ☐ Identify the substrate type and any aquatic resources that will be affected by the proposed action. (SAV, salt marsh, sand, silt/clay, rocky/hard bottom)
54. ☐ For projects which will include the installation of pilings/sheet-piles, identify the substrate at the project site (sand, cobble, silt/mud/clay), the installation method (vibratory hammer, impact hammer, combination) and indicate whether the following "soft start" procedures at beginning of the workday and after a 30-minute period of rest will be deployed:
    a. ☐ Vibratory Pile Installation: pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
    b. ☐ Impact Pile Installation: pile driving will commence with an initial set of three strikes by the hammer at 40% energy, followed by a one-minute wait period, then two subsequent 3-strike sets at 40% energy, with one-minute waiting periods, before initiating continuous impact driving.
55. ☐ If the project involves dredging, describe any dredge history, number of dredge events to be covered by the permit, erosion/sediment controls, dredge type, intake structures (mesh screen size), dredged material disposal site.
56. ☐ For project activities associated with structures, identify the number, type (drill barge, work boat, tugboat, etc.), and size of any temporary vessels that will be used. Specify measures that will be implemented to ensure vessels are not berthed in shallow water or will "ground out" at low tide.
57. ☐ For aquaculture projects identify whether any component of the gear is seasonal (will be removed annually) or will be in place year-round. If gear will be present year-round and will be variably managed (e.g., floating in summer, bottom in winter) identify month/date for such configurations.
58. ☐ For aquaculture projects identify whether the project will involve use of an existing vessel or new vessel. Identify the length for all work vessels and identify the distance round trip from vessel berthing location and aquaculture area.
59. ☐ For project activities associated with docking structures (either commercial, industrial, or recreational) identify the number, type (motorized/non-motorized, jet-ski, sailboat, kayak, canoe, other that will be berthed there and the sizes of each.
60. ☐ Information required for Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act:
    a. Results of an eelgrass survey completed per the INSERT.
    b. Essential Fish Habitat Assessment to determine project-related impacts to essential fish habitat, using guidance developed by the National Marine Fisheries Service.
61. ☐ A document containing the following information (requirements of 50 CFR §600.920(e)(3)):
    a. Description of proposed action.
    b. Analysis of potential adverse effects on essential fish habitat.
    c. Conclusions regarding the effects of the action on essential fish habitat.
    d. If applicable, proposed mitigation.
    e. Analysis of alternatives to the proposed action.
    f. Other:

DOCUMENT A00896

MASSDOT MW - 1

THIS PAGE INTENTIONALLY LEFT BLANK

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

Rev. 1 - July 2018

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

Document No. _____

Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

Director of Railroad Properties
Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

Effective July 1, 2018

Chalita Belfield

Chalita Belfield
Director of Railroad Properties

Date: July 1, 2018

This page intentionally left blank

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

This Manual belongs to:

Name: _____

Employee #: _____

Address: _____

_____

_____

Phone:_____

If this Manual is found,
please return it to the address below:

Director of Railroad Properties
Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

This page intentionally left blank

MassDOT MW-1

MANUAL REVISIONS

We welcome your comments on the MassDOT Manual. Please send all suggestions to:

Director of Railroad Properties
Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116

Suggested revisions to this Manual should be submitted in writing in accordance with the following format.

Section/Paragraph Number _____

Page Number _____

Recommended Changes, Corrections, or Questions:

_____

_____

_____

Submitted by:

Name _____

Operating Railroad Company _____

Address _____

_____

_____

Phone _____

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

The Massachusetts Department of Transportation (MassDOT) is committed to providing the safest and most efficient rail service to our customers by maintaining and upgrading the Commonwealth's track infrastructure and assets using best industry recommended practice.

MassDOT has sought to contract with Operating Railroad Companies that will work cooperatively with MassDOT, and that will maintain the Commonwealth's track system at the required standards with competent and dedicated employees.

MassDOT requires their designated Operating Railroad Companies to perform diligent inspections, prepare maintenance and repair programs, and ensure the proper maintenance of track in accordance with the governing operating agreements.

Recommended Practice is based on the best practice developed by and in current use on the United States and Canadian passenger and freight railroads. They allow for a common language amongst railroad administrators, maintenance personnel, contractors, material and equipment suppliers and all others concerned with railroad safety.

Each of the Operating Railroad Companies are currently under agreement with MassDOT. The information found in this Manual contains tables, instructions, and references designed for track and special trackwork as a guide for maintenance personnel in their everyday efforts to maintain a safe and efficient plant.

The MassDOT Manual is a manual of recommended practice. We recognize that best practice of maintenance of way (MOW) continues to change due to the location, environment, operation, and geographic conditions of individual railroads.

The MassDOT Recommended Practice Manual is meant to aid and assist the Operating Railroad Companies to maintain MassDOT-owned tracks in a safe and efficient manner at a reasonable cost. Performing maintenance in accordance with the recommended practice in the MW-1 will meet the expectations of the Commonwealth and provide uniform practice between the different properties of the Operating Railroad Companies.

As of July 2018, the Operating Railroad Companies operate rail freight service and maintain the MassDOT-owned track infrastructure pursuant to License and Operating Agreements with MassDOT on the following line segments:

- Adams Industrial Track: MP 0.0 to MP 5.2
- Conn River Main Line: MP 0.38 to MP 49.7
- Housatonic Railroad: MP 50.0 to MP 85.9
- Massachusetts Central Railroad: MP 1.6 to MP 25.0
- Framingham Secondary: MP 0.0 to MP 21.05
- Middleboro Subdivision:
    - Attleboro Secondary: MP 0.0 to MP 8.6
    - New Bedford Secondary: MP 8.6 to MP 13.3
    - Middleboro Branch: MP 13.3 to MP 21.1
- New Bedford Secondary: MP 13.3 to MP 31.8
- Fall River Secondary: MP 0.0 to MP 12.0
- Cape Main Line:
    - Buzzards Bay Secondary: MP 36.3 to MP 54.7
    - Hyannis Secondary: MP 55.0 to 78.5
- Falmouth Secondary: MP 0.0 to MP 6.8
- South Dennis Secondary: MP 0.0 to MP 2.8
- Dean Street Industrial Track: MP 0.0 to MP 1.5
- Watuppa Branch: MP 6.0 to MP 8.0

MassDOT MW-1

PURPOSE AND USE

The MassDOT MW-1 was developed for MassDOT Rail and Transit Division and selected Operating Railroad Companies who have contracted with MassDOT Rail and Transit Division to operate and maintain lines of track owned by the Commonwealth, as a manual of best practice for the maintenance of track and associated trackwork components. Materials presented in this handbook establish and define MassDOT Rail and Transit Division recommended practice for maintenance of track owned by MassDOT Rail and Transit Division and operated by Operating Railroad Companies under contractual agreements with MassDOT Rail and Transit Division. These practices have been developed to meet the needs of the MassDOT Rail and Transit Division and may be used exactly as presented or modified as is necessary and desirable to meet the present and future needs of the Railroads operating and maintaining MassDOT Rail and Transit Division rail lines, in accordance with the terms of the governing License and Operating Agreements.

In all cases, inspection and restoration of track must be performed in accordance with Federal Railroad Administration (FRA) Part 213, Track Safety Standards.

The intent of the recommended practice is not to establish artificially rigid procedures governing track maintenance but rather to serve as guidelines for prudent track maintenance practice. These guidelines must be used in concert with proper exercise of judgment based upon experience and knowledge of service requirements.

The maintenance limits in the MassDOT MW-1 are unique and are intended to supersede the inspection and restoration limits given in FRA Part 213, provided that the more restrictive practices should be followed. For example, the track gage limits given in the MassDOT MW-1 (53.0(M)) are more restrictive than the track gage limits found in FRA Part 213 (§213.53).

Track maintenance limits and recommended practice in the MassDOT MW-1 are to be used for everyday maintenance activities. The limits act as a trigger to prompt the maintenance or reconstruction of track. The track and related rail infrastructure must be maintained in accordance with the requirements of the relevant License and Operating Agreement between MassDOT Rail and Transit Division and the Operating Railroad

Company. The Commonwealth expects that wherever possible, track shall be maintained so that the track structure does not fall below track maintenance limits established in the MassDOT MW-1.

In all cases, MassDOT Operating Railroad Companies will strive to restore track, make track repairs, and maintain track at or above the respective maintenance limits given in the MassDOT MW-1.

The development of the MassDOT MW-1 involved many hours of input from railroad professionals, and represents the latest recommended practice approved by the MassDOT Director of Railroad Properties. It is understood that these practices are subject to revisions as new technology and improved techniques are established. Other practices may be found to be equally acceptable and, as a result, the materials contained in the MassDOT MW-1 may be modified from time to time to promote the understanding of and efficiency and economy of maintenance of MassDOT-owned rail lines.

The MW-1 is an interactive document. It is expected that every individual that has reason to use this document will constantly strive to offer suggestions and constructive criticism to improve the overall understanding, use, and quality of this Manual.

Modifications to these recommended practice materials must be made in writing, and incorporated into the Manual following approval by MassDOT Rail and Transit Division.

MassDOT MW-1

TABLE OF CONTENTS

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF TRACK

SUBPART A	GENERAL	1
SUBPART B	ROADBED AND RIGHT-OF-WAY	4
SUBPART C	TRACK GEOMETRY	11
SUBPART D	TRACK STRUCTURE AND MATERIALS	26
SUBPART E	TOOLS	69

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF SPECIAL TRACKWORK

SUBPART A	GENERAL	81
SUBPART B	MAINTENANCE PROGRAM	84
SUBPART C	SCHEDULED SITE MAINTENANCE ACTIVITIES	85
SUBPART D	MAINTENANCE LIMITS	86
SUBPART E	GENERAL MAINTENANCE REQUIREMENTS	87
SUBPART F	SCHEDULED MAINTENANCE ACTIVITIES	95
SUBPART G	TURNOUTS IN SIGNALIZED TRACK	99
SUBPART H	MECHANISMS, APPLIANCES, AND DEVICES	100
SUBPART I	SCHEMATICS / PHOTOGRAPHS	104

APPENDIX A	CONTINUOUS WELDED RAIL (CWR) PROCEDURES
APPENDIX B	UNDERBALANCE TABLES – MAXIMUM ALLOWABLE OPERATING SPEED ON CURVES (3" UNDERBALANCE)
APPENDIX C	GLOSSARY
APPENDIX D	PLACEMENT OF TEMPORARY SPEED SIGNS
APPENDIX E	WEIGHTS AND MEASURES
APPENDIX F	FORMS

This page intentionally left blank

MassDOT MW-1

RECOMMENDED PRACTICE

FOR THE

MAINTENANCE OF TRACK AND SPECIAL TRACKWORK

This page intentionally left blank

SUBPARTS A-E

RECOMMENDED PRACTICE
FOR THE
MAINTENANCE OF TRACK

This page intentionally left blank
.

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF TRACK SUBPARTS A-E

TABLE OF CONTENTS

Page

SUBPART A GENERAL....1
1.0(M) SCOPE....1
3.0(M) APPLICATION....1
5.0(M) MAINTENANCE....1
7.0(M) DESIGNATION OF QUALIFIED PERSONS TO SUPERVISE CERTAIN RENEWALS AND INSPECT TRACK....2
8.0(M) QUALITY CONTROL....3
10.0(M) SIDINGS....3

SUBPART B ROADBED AND RIGHT-OF-WAY....4
31.0(M) SEASONAL PREPARATION AND MAINTENANCE....4
33.0(M) DRAINAGE....4
33.1(M) Culverts....5
35.0(M) CROSS SECTION (ROADWAY)....5
37.0(M) VEGETATION....5
39.0(M) SIGNS....6
41.0(M) HIGHWAY GRADE CROSSINGS....7
41.1(M) Placement of Devices at Grade Crossings....7
41.2(M) Highway Grade Crossing Maintenance....7

SUBPART C TRACK GEOMETRY....11
53.0(M) GAGE....11
53.1(M) Standard for Gage....11
53.2(M) Maintenance of Gage....11
55.0(M) ALIGNMENT....11
55.1(M) Maintenance of Alignment....12
55.2(M) Stringlining Curves....13
55.2.1(M) Stringline Procedures: Road Worker Protection (RWP) and Personal Protection Equipment (PPE)....13
55.2.2(M) Stringline Procedures: Items/Tools Required....14
55.2.3(M) Stationing Curves and Obtaining Stringline Data....14
55.2.4(M) Stringline Data Form....17
57.0(M) CURVES: ELEVATION AND SPEED LIMITATIONS....19
57.1(M) General....19
57.2(M) Superelevation....19
57.3(M) Superelevation Tags....19
59.0(M) Elevation of Curved Track; Runoff....19
61.0(M) CLEARANCES AND TRACK CENTERS....20
61.1(M) Track Centers....20
61.2(M) Horizontal Clearances....21
61.3(M) Vertical Clearances....21
61.4(M) Clearance Limiting Objects....22
62.0(M) GRADES....22
62.1(M) Grade Limitations....22
62.3(M) Horizontal Curves/Minimum Tangent Lengths....23

63.0(M) TRACK SURFACE 23
63.1(M) General 23
63.2(M) Maintenance of Track Surface 23
63.3(M) Surfacing Areas That Require Special Attention 25
63.4(M) Surfacing Track 25

SUBPART D TRACK STRUCTURE AND MATERIALS 26
100.0(M) MATERIALS 26
100.1(M) Handling and Care of Materials 26
100.2(M) Classification of Materials 26
100.3(M) Removal and Disposition of Materials 26
103.0(M) BALLAST; GENERAL 27
103.1(M) Ballast Characteristics 27
103.2(M) Ballast Unloading 27
103.3(M) Ballast Section 27
103.4(M) Fouled Ballast 28
103.5(M) Ballast Cleaning 29
103.6(M) Ballast Gradation 29
109.0(M) CROSSTIES 29
109.1(M) Dimensions of Crossties 30
109.2(M) Use of Crossties 30
109.3(M) Placement of Crossties 31
109.4(M) Preventing Crosstie Damage 31
110.0(M) Switch Timber 32
111.0(M) Bridge Timber 32
113.0(M) RAIL 32
113.1(M) Branding and Stamping 32
113.2(M) Rail End Drilling and Bolt Hole Sizes 33
113.3(M) Recommended Maintenance Wear Limits for Rail 37
113.3.1(M) Maximum Head and Gage Face Wear or Rail (In and Out of Track) 37
113.3.2(M) Railway Limits for the Welding of Relay Rail 37
113.3.3(M) Classification and Identification of Rail for Reuse (In and Out of Track) 40
113.3.4(M) Transposing and Turning Rail on Curves 41
113.3.5(M) Gage Face Angle (Worn Rail) 41
113.4(M) Rail Classifications 42
113.4.1(M) Defective Rails 42
113.4.2(M) New Rails 43
113.4.3(M) Cropped or Relay Rails 43
113.5(M) Disposition and Shipment of Rails 43
113.6(M) Distributing Rail 43
113.7(M) Preparation and Care 44
113.8(M) Laying Jointed Rails 44
113.9(M) Rail End Bolt Holes 46
113.10(M) Cutting and Electric Arc Welding of Rail 46
113.11(M) Bonding Rails for Track Circuits 47
113.12(M) Maintenance of Rail By Grinding 47
113.13(M) Repair of Welds and Rail Head Depressions by Welding or Grinding 48
113.13.1(M) Cross Cutting (Slotting) of Bolted Joints 48
113.14(M) Passing Trains Over Broken Rails and/or Pull-Aparts 48
115.0(M) RAIL END MISMATCH 49
117.0(M) RAIL END BATTER/BEVELING OF RAIL ENDS 49

118.0(M) RAIL LUBRICATION....52
119.0(M) CONTINUOUS WELDED RAIL PROCEDURES....52
121.0(M) RAIL JOINTS....52
121.1(M) Field Welding of Rail Joints....52
121.1.1(M) Thermite Field Welding....53
121.1.2(M) Electric Flash Butt Welding....55
121.2(M) Bolted Rail Joints....55
121.3(M) Insulated Rail Joints....58
123.0(M) TIE PLATES....59
124.0(M) TIE PADS....61
125.0(M) RAIL ANCHORS/ELASTIC FASTENERS....61
125.1(M) Anchor Placement....61
125.2(M) Fasteners Required....61
125.3(M) Anchor Maintenance....63
125.4(M) Anchor Use....64
127.0(M) RAIL FASTENING SYSTEMS....64
127.1(M) Number Required....64
127.2(M) Installation of Fasteners....64
127.2.1(M) Elastic Fasteners/Clips....64
127.2.2(M) Screw Spikes....65
127.2.3(M) Cut Track Spikes....65
127.3(M) Rail Fasteners Required....66
129.0(M) TRACK SHIMS....67
145.0(M) BRIDGE GUARD RAILS....67
145.1(M) Location....67
145.2(M) Materials....67
145.3(M) Application....68
145.4(M) Inspection and Maintenance....68

SUBPART E TOOLS....69
150.0(M) TOOL REQUIREMENTS....69
150.1(M) Inspection Tools....69

This page intentionally left blank.

Subpart A - General

§1.0(M) SCOPE

(a) Maintenance is both spot and out-of-face replacement of components of the track structure such as laying new or relay rail or installing ties so as to maintain the infrastructure in a state-of-good repair.

(1) Maintenance limits are to be used as a triggering mechanism that prompts maintenance or reconstruction.

(2) It is MassDOT's policy to have a track structure that stays between new construction and maintenance limits.

(3) As the track structure wears, maintenance should be programmed before the track reaches the MassDOT maintenance limits.

(4) Should these maintenance limits be exceeded, maintenance must be completed prior to reaching the limits found in FRA Part 213.

(5) Whenever possible, track should be repaired or reconstructed to new track tolerances.

(b) This subpart provides practices that will be used for the maintenance of track. It is for the guidance of Operating Railroad Companies that maintain and repair track.

(c) This subpart contains "maintenance limits" that are to be used when maintaining track and are not to be confused with the minimum limits found in FRA Part 213 or with new track tolerances.

§3.0(M) APPLICATION

The MW-1 applies to all operating railroads that have maintenance and compliance responsibility on MassDOT-owned railroad property.

§5.0(M) MAINTENANCE

(a) The responsible personnel in charge of performing the maintenance work for the Operating Railroad Companies shall be qualified to maintain, restore, or renew trackwork in accordance with FRA §213.7(a), (b), (c) and (d).

(b) The person responsible for the work shall coordinate and report all maintenance work on the appropriate form to the Operating Railroad Company and MassDOT Rail and Transit Division.

(c) A record of all maintenance performed and all required inspection reports shall be maintained by the Operating Railroad Company for the duration of their operating contract. Reports to be provided are as follows:

(1) Track Inspection Reports (planned and special)

(2) Switch Inspection Reports (planned and special)

(3) Rail Defect Inspection Reports:

- Detector Car Report (car to be ridden by Operating Railroad Company Official)
- Rail Failure Report

(4) Reports included in CWR procedures section (see Appendix A, "Continuous Welded Rail (CWR) Procedures").

§7.0(M) DESIGNATION OF QUALIFIED PERSONS TO SUPERVISE CERTAIN RENEWALS AND INSPECT TRACK

(a) Each Operating Railroad Company to which this Part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated shall have:

(1) At least:

(i) 1 year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he or she:

(i) Knows and understands the requirements of this Part that apply to the restoration and renewal of the track for which he or she is responsible;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this Part.

(b) Each Operating Railroad Company to which this Part applies shall designate qualified persons to inspect track for defects. Each person designated shall have:

(1) At least:

(i) 1 year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he or she:

(i) Knows and understands the requirements of this Part that apply to the inspection of track for which he or she is responsible; and

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this Part, pending review by a qualified person designated under Paragraph (a) of this section.

(c) Individuals designated under Paragraphs (a) or (b) of this section that inspect continuous welded rail (CWR) track or supervise the installation, adjustment, and maintenance of CWR track in accordance with the written procedures of the track owner shall have:

(1) Current qualifications under either Paragraphs (a) or (b) of this section;

(2) Successfully completed a comprehensive training course specifically developed for the application of written CWR procedure issued by the track owner;

(3) Demonstrated to the Operating Railroad Company that the individual:

(i) Knows and understands the requirements of those written CWR procedures; and

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(4) Written authorization from the Operating Railroad Company to prescribe remedial actions to correct or safely compensate for deviations from the requirements in those procedures and successfully completed a recorded examination on those procedures as part of the qualified process.

(d) Persons not fully qualified to supervise certain renewals and inspect track as required in Paragraphs (a) through (c) of this section, but with at least one year of maintenance of way (MOW) or signal experience, may pass trains over broken rails and pull-aparts provided that:

(1) The Operating Railroad Company determines the person to be qualified and, as part of doing so, trains, examines, and re-examines the person periodically within two years after each prior examination on the following topics as they relate to the safe passage of trains over broken rails or pull-aparts: rail defect identification, crosstie condition, track surface and alignment, gage restraint, rail end mismatch, joint bars, and maximum distance between rail ends over which trains may be allowed to pass. The sole purpose of the examination is to ascertain the person's ability to effectively apply these requirements and the examination may not be used to disqualify the person from other duties. A minimum of four hours training is required for initial training;

(2) The person deems it safe and train speeds are limited to a maximum of 10 MPH over the broken rail or pull apart;

(3) The person shall watch all movements over the broken rail or pull apart and be prepared to stop the train if necessary; and

(4) Person(s) fully qualified under FRA §213.7 are notified and dispatched to the location promptly for the purpose of authorizing movements and effecting temporary or permanent repairs.

§8.0(M) QUALITY CONTROL

(a) The person in charge of performing the maintenance activity or repair shall be responsible for the overall quality of the work performed.

(b) All maintenance work shall be performed in accordance with this Part.

(c) The Operating Railroad Company shall review the work performed for quality, consistency, and compliance to this Part.

(d) Trackwork repairs that are deficient:

(1) Shall be brought to the attention of the Operating Railroad Company.

(2) May be cause for remedial action.

(e) The Operating Railroad Company shall see that any additional work necessary is performed to bring the repair into compliance with this Part.

(f) The Operating Railroad Company shall be responsible to re-inspect the corrected work to ensure that it is in compliance with this Part.

(g) The Operating Railroad Company is encouraged to make recommendations to the MassDOT Rail and Transit Division as to required modifications to methods, procedures, and practice to improve the overall quality of the work.

§10.0(M) SIDINGS

Maintenance of Way (MOW) forces maintain up to the derail and/or property line on industrial siding tracks.

Subpart B - Roadbed and Right-of-Way

§31.0(M) SEASONAL PREPARATION AND MAINTENANCE

(a) Fall/Winter

(1) Dig out switch (gas, electric) rods

(2) Check heaters

(3) Before winter, clean sand out of flange ways at all highway grade crossings

(4) Keep crossing ends and flanges clear of snow and ice

(5) Ensure adequate supplies of materials/tools and snow equipment

(6) Order frost spikes/shims

(7) Order rope and drift pins from approved supplier and prepare for usage (to heat rail)

(8) Clean snow from switches at switch points, frog points and guard rails

(9) Obtain cleaner and lubricate Sargeant and Greenleaf switch locks

(b) Spring/Summer (Special Inspections after Acts of Nature)

(1) Verify proper neutral temperature of rail installed at less than the desired neutral temperature range and adjust as required (see Appendix A, "Continuous Welded Rail (CWR) Procedures").

(2) Plan vegetation control.

(3) Remove temporary shims/spikes.

(4) Bring winter equipment back to central headquarters.

(5) Perform heat patrol (kinks).

(6) Perform rain storm patrols – inspection and cleaning of culverts.

(7) Check and cross-cut joints in track.

(8) Lubricate main line hand throw and yard switches.

§33.0(M) DRAINAGE

(a) Drainage is of prime importance for the maintenance of track. Water mixing with materials in the roadbed tends to make the entire track structure unstable.

(b) Water seeping or flowing toward the track should be carried across and off the roadbed or be intercepted and diverted before it reaches the roadbed.

(c) Water falling upon the roadbed should be quickly drained off to side ditches or drainage structures.

(d) Every effort should be made to see that water from adjacent property does not drain on the MassDOT right-of-way. In areas where this condition is observed the MassDOT Rail and Transit Division shall be notified.

(e) Cross drains should be installed and maintained, particularly where bridges, road crossings, and sags interfere with longitudinal drainage.

(f) Maintenance of drainage systems must satisfy the requirements of FRA §213.33.

(g) Distribution of track or construction materials, and the disposal of fouled ballast and ditch materials, should be handled in such a manner that they no longer interfere with track drainage.

(h) Operating Railroad Company shall notify the MassDOT Rail and Transit Division any time debris is dumped on MassDOT property by abutters.

§33.1(M) Culverts

(a) Culverts require regular inspection and maintenance as do other railroad structures. When making inspections of track and roadway, MassDOT' s Operating Railroad Companies should:

(1) Railroad shall have and maintain an updated list of all culvert locations within the right-of-way. Inspectors should be aware of the location of culverts within the right-of-way.

(2) The tie over the culvert should be painted white and web of rail shall be marked with mile post location.

(3) Be aware that culverts must not only support the live load of trains but the dead load of the track structure.

(4) Report the backup of water near culverts or any abnormal conditions around the ends of culverts (e.g., water seeping through ballast structure).

(5) Report any abnormal conditions found in the track structure at a culvert (e.g., loss of ballast). Operating Railroad Company shall then notify the MassDOT Rail and Transit Division.

(6) If unusual conditions are found at culvert locations, take appropriate remedial action. Appropriate remedial action shall be taken by a Operating Railroad Company qualified individual.

(7) For additional information on culverts, see American Railway Engineering and Maintenance Association (AREMA), Chapter I, Part 4, "Culverts."

§35.0(M) CROSS SECTION (ROADWAY)

Wherever possible, roadbeds, embankments, and excavations should be maintained in accordance with the Massachusetts Bay Transportation Authority (MBTA) Book of Standard Plans. Deviation from approved cross sections should not be made without authorization from the MassDOT Rail and Transit Division.

§37.0(M) VEGETATION

(a) Growth of vegetation should be encouraged on slopes of embankments, cuts, and deep ditches to prevent erosion and to maintain stability.

(b) Vegetation growth must be controlled in accordance with the requirements of FRA §213.37.

(c) The goal of MassDOT is to have the right-of-way cleared of both brush and vegetation in the track and to within 25' of the track centerline. This should be accomplished using a combination of brush cutting and weed spraying.

(d) Vegetation on railroad property, which is on or immediately adjacent to roadbed, must be controlled so that it does not:

(1) Become a fire hazard to track-carrying structures;

(2) Obstruct visibility of railroad signs and signals;

(i) Along the right-of-way

(ii) At highway-rail crossings

(3) Interfere with railroad employees performing normal trackside duties;

(4) Prevent proper functioning of signal and communication lines; or

(5) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

(e) The Operating Railroad Companies shall develop and carry out vegetation management programs as required by MassDOT.

(f) The Operating Railroad Companies shall provide copies of their approved management programs to the MassDOT Rail and Transit Division.

§39.0(M) SIGNS

(a) Track signs and posts must be placed and maintained in accordance with either the MBTA Book of Standard Plans and/or AREMA Chapter 1, Part 7 Roadway Signs and operating special instructions. They should not be installed so as to interfere with signals or safety appliances.

(b) The following is a list of the common signs, which are maintained by the Operating Railroad's Maintenance of Way Department:

(1) Whistle Posts (see Paragraph (c) for placement)

(2) Permanent Speed Restriction Signs (see Operating Railroad Company Time Table Special Instructions) (MBTA Standard Plan No. 3304)

(3) Temporary Speed Signs (see Appendix D)

(4) Mile Posts (see appropriate Track Charts) (MBTA Standard Plan No. 3302)

(5) Station Markers (see Operating Railroad Company Time Table Special Instructions)

(6) End of Block (see Operating Railroad Company Time Table)

(7) Stop Boards (see Operating Railroad Company Time Table)

(8) Clearance Marker (fouling point) painted rail or ties in yellow

(9) Close Clearance Markers (MBTA Standard Plan No. 3312)

(10) Yard Limit Signs (see Operating Railroad Company Time Table) (MBTA Standard Plan No. 3304)

(11) Switch Targets (MBTA Standard Plan No. 3030)

(12) Spring Switch Markers (SS) (MBTA Standard Plan No. 3304)

(13) No Trespassing/No Dumping Signs (MBTA Standard Plan No. 3208)

(14) Cross Bucks (Passive) (MBTA Standard Plan No. 3388)

(15) Crossing Approach Circuit Signage (XC) at Highway Grade Crossing

(16) Emergency Notification Sign at all Public and Private Grade Crossings (as per FRA Requirements) (Manual on Uniform Traffic Control Devices (MUTCD) Figure 8B-5)

(17) Bridge Markers (undergrade and overhead bridges)

(18) Culvert Markers (mark on web of rail and paint ties white)

(19) Track Lubricator Signage

(20) Buried Cable Signs (MBTA Standard Plan No. 3344)

(21) Low Ground Clearance at Grade Crossings (MUTCD Figure W10-5 and W10-5P)

(22) Snow Flanger Sign (MBTA Standard Plan No. 3304)

(23) Will Not Clear Man on Side of Car (MBTA Standard Plan No. 3314)

(c) Whistle post placement:

(1) Whistle posts are placed 1,320' in advance of a public grade crossing so as to comply with Massachusetts General Law (MGL), Chapter 160 "Railroads," Section 138 "Warning to Public."

§41.0(M) HIGHWAY GRADE CROSSINGS

(a) Typical grade crossing surfaces found on the MassDOT are as follows (see also MBTA Standard Plan Nos. 3100, 3106, 3108, 3120):

(1) Timber

(2) Timber and asphalt

(3) Asphalt with cut flangeways

(4) Asphalt with rubber rail seal

(5) Full depth rubber

(6) Full depth concrete

(7) Full depth rubber on the gage and rail seal and asphalt on the field side

(8) Special products as approved by the MassDOT Rail and Transit Division at grade crossings or at pedestrian crossings

§41.1(M) Placement of Devices at Grade Crossings

(a) Whistle signs shall be installed in accordance with Commonwealth of Massachusetts requirements (see §39.0(M)(c)).

(b) The design and placement of grade crossing signage, roadway signage, and appliances at both public and private grade crossings are governed by the Manual on Uniform Traffic Control Devices (MUTCD, see Part 8).

(c) Low ground clearance at grade crossings (see the MUTCD).

§41.2(M) Highway Grade Crossing Maintenance

(a) All roadway signs, highway traffic signal systems, and pavement markings are maintained by the municipality and/or Commonwealth.

(b) The railroad warning devices whether passive or active are maintained by the Operating Railroad Companies.

(c) At private grade crossings, any paving markings or highway signage is the responsibility of the roadway owner. The Emergency Notification Sign is the responsibility of the Operating Railroad Companies.

(d) Crossings should be kept clean and attention given to the following:

(1) Drainage: sloping the surface, if necessary, and constructing underground drains, as required.

(2) Surface water flowing along the highway toward the railroad should be diverted before it reaches the tracks.

(3) The ends of the crossing shall extend at least 2' beyond the width of the highway. Crossing surface installed in a gated pedestrian walkway area should be restricted to the width of the sidewalk gate.

(4) It is recommended that the ends of the crossing surfaces be protected by either end deflector plate/ballast or asphalt to prevent against dragging equipment.

(5) Flangeways shall be 2-1/2" wide and not less than 2" deep. They must be kept clean at all times and free of debris, ice, and snow.

(6) Crossing surface materials and components should be inspected, aligned, and properly secured to the track structure so that the materials cannot damage rolling stock and/or motor vehicles. Crossing surface material that cannot be properly secured and/or repaired shall be removed and temporarily replaced with cold patch or asphalt.

(7) The four quadrant site distances for vehicles approaching the highway grade crossing shall be kept as clear as practicable.

(8) When installing or making general repairs to crossings, track alignment should be established by transit and/or mechanical lining devices.

(9) The condition of crossing approaches is vital to the performance of a grade crossing. Special attention should be paid to the surface and alignment on the crossing approaches so that the ties are tamped and there is a smooth transition into the crossing area.

(10) Special attention should be paid to the maintenance of joints and welds at crossing ends. This includes insulated and conventional track joints, as well as field and plant welds. When performing maintenance, track joints should be eliminated as soon as possible.

(11) Joints must be avoided within the area of the crossing panel.

(12) When working at a crossing, rail should be observed under load to determine if there is excessive rail movement. As track deflects under load, cut spikes tend to loosen. Loose and worn fastening systems should be repaired and/or replaced as necessary to minimize all track and crossing surface movement.

(13) In an emergency (broken weld or rail), when welding joints within the limits of the crossing panel, closure welds may be made by the thermite process.

(14) When changing a broken rail in a crossing, ensure that all clips, spikes, plates, and excessively worn components are replaced and secured. Galvanized clips should be installed. Ties should be tamped. Rails temporarily joined with joint bars should be field welded as soon as practicable. If the broken rail is replaced in CWR territory refer to Appendix A, “Continuous Welded Rail (CWR) Procedures” for proper rail adjustment procedures.

(15) Use of gage rods in crossings is prohibited.

(16) Fastening and clipping devices shall be used that do not interfere with the installation of the crossing surface materials.

(17) Galvanized clips should be used in crossings with an elastic fastening system.

(18) Seasonal clearing of silt and other debris from both crossing approaches.

(19) Clean out flangeways in the Fall (e.g., sand and dirt).

(e) All new crossings must be complaint with the Americans with Disabilities Act (ADA).

(f) MassDOT has a number of different types of highway grade crossings types. Pictures of the more common types are shown below:

(1) Asphalt With Cut Flangeway (not recommended for mainline track except overnight during crossing renewals or for emergency repairs).

(2) Timber and Asphalt

(3) Timber

(4a) Full Depth Rubber with Rail Seal

(4b) Full Depth Rubber with Rail Seal

(5) Full Depth Concrete on Wood or Concrete Ties

(6) Rubber Flangeway and Asphalt

Subpart C - Track Geometry

§53.0(M) GAGE

§53.1(M) Standard for Gage

(a) The standard gage for track, measured between the running rails at right angles to the track, 5/8" below the top of rail, is 56-1/2".

(b) Gage will be 56-1/2" unless specified by the MassDOT Rail and Transit Division.

(c) When gaging is required, care should be taken to not adversely affect the alignment of the track. Changes in prescribed gage should be made in uniform increments as given in §53.2(M).

(d) Gage shall be changed by adjustment of the rail opposite the line rail (preferred method).

(e) In some cases, gage may be adjusted on the line rail only if the adjustment will improve line and ride quality (e.g., joint elbowed out on the line rail).

(f) In cases where the line rail is re-aligned, re-spike line high rail and then re-gage the low rail.

§53.2(M) Maintenance of Gage

(a) Gage shall be measured with a standard track gauge or other authorized devices. These devices must be checked daily prior to use for accuracy.

(b) Maintenance shall be performed when gage reaches the following limits:

Gage Maintenance Limits			
Class of Track	**Minimum (Inches)**	**Maximum (Inches)**	**Maximum Rate of Change in Gage per 31' (Inches)**
1	56-1/8	57-1/2	1
2	56-1/8	57-1/4	3/4
3	56-1/4	57-1/4	3/4
4	56-1/4	57	1/2
5	56-1/4	57	1/2

(c) Gage rods shall be applied only in emergency situations for temporary repair. Permanent repairs to gage should be completed as soon as possible. On main line tracks, gage rods shall only be installed in an emergency and removed as soon as possible.

(d) When using gage rods in signal territory, insulated rods are to be tested by the Signal Maintainer prior to installation. When permanent repairs are completed, gage rods are to be completely removed.

§55.0(M) ALIGNMENT

Alignment is the horizontal location of a railroad as described by curves, spirals, and tangents.

§55.1(M) Maintenance of Alignment

(a) Outer rails of curves and field side rails on tangents should be selected as the line rails. On single tangent track, either rail may be used as the line rail, however, the north or east rail is the preferred line rail. The same line rail shall be used for the full length of the track tangent.

(b) In general, alignment information may be obtained using the following:

(1) The stringline method.

(2) Surveying equipment or a rail-mounted laser.

(3) The automatic geometry system on an approved tamper.

(4) Track geometry car.

(c) Maintenance shall be performed when alignment values reach the limits given in the table below.

(1) Alignment deviation in curves, as defined in this table, is the difference in mid-ordinate value between adjacent stations and not the average of multiple stations (uniformity) as defined in FRA §213.55.

(2) The definition of alignment deviation used in this paragraph, allows the maintainer to achieve alignment tolerances that are more restrictive than those defined in FRA §213.55.

Alignment Maintenance Limits			
	Tangent Track	**Curved Track**	
Class of Track	**The deviation of the mid-offset from a 62' chord[(1)] may not be more than (Inches):**	**The deviation of the mid-ordinate from a 31' chord[(2)] may not be more than (Inches):**	**The deviation of the mid-ordinate from a 62' chord[(2)] may not be more than (Inches):**
1	3-3/4	N/A[(3)]	3-3/4
2	2-1/4	N/A[(3)]	2-1/4
3	1-1/4	7/8	1-1/4
4	1	3/4	1
5	1/2	3/8	1/2

Notes:

[(1)] The ends of the line shall be at points on the gage side of the line rail, 5/8" below the top of the railhead. Either rail may be used as the line rail; however, the same rail shall be used for the full length of that tangential segment of track.

[(2)] The ends of the line or chord must be at points on the gage side of the line rail, 5/8" below the top of the rail head. Use line rail in accordance with §55.1(M).

[(3)] N/A – Not Applicable.

(d) Designation of line rail:

(1) On tangent track in single track either rail or rail on the mile post side.

(2) On tangent track and multiple tracks the field side rail.

(3) In single or multiple tracks in curves on the high/outer rail.

(e) Curve realignment changes in CWR territory must be made in accordance with Appendix A, "Continuous Welded Rail (CWR) Procedures."

(f) Alignments must be maintained within the prescribed limits given above. Roadway clearances are prescribed in AREMA, Chapter 28 (see Table 28-3-3, "Legal Clearance Requirements by State" (in English Units)).

§55.2(M) Stringlining Curves

(a) Stringlining of curves is a method for determining the most advantageous alignment that can be obtained with reasonable amounts of throw.

(b) Any of the established numerical or mathematical methods, such as the automated geometry system on tampers, the "Bartlett Method" or "Bracket Method," may be used to calculate the throws of curves.

(c) The practical relationship between station and chord length, mid-ordinate value, and degree of curvature for station lengths most commonly used is shown below:

Degree of Curve	Mid-Ordinate	Station Length	Chord Length
1°	1"	31'	62'
1°	1/4"	15'-6"	31'

(d) In higher degree curves, shorter station lengths and chords are to be used. It may be desirable to use longer station lengths and chords for curves less than 30 minutes.

(e) Basic stringlining principles:

(1) The mid-ordinates of a curve are indicative of its degree of curvature.

(2) The mid-ordinates of a uniform circular curve are equal when measuring offsets using chords of equal length.

(3) The mid-ordinate varies directly with the degree of curvature.

(4) Where track is thrown in or out at any single station on the curve, the mid-ordinate of the curve at the station is affected by the amount of the throw and the mid-ordinates at the adjacent stations are affected by half the throw amount, but in the opposite direction.

(5) All calculations should be checked to ascertain that the calculated throws will actually produce the required changes in mid-ordinates.

§55.2.1(M) Stringline Procedures: Road Worker Protection (RWP) and Personal Protection Equipment (PPE)

(a) Ensure area to be stringlined has the proper RWP Procedures in effect.

(b) A minimum of three people is required when using conventional stringline equipment.

(c) Many curves have grease on the rails with residual amounts on the ties and ballast so caution needs to be taken when walking in areas to be stringlined.

(d) Wear Operating Railroad Company's designated PPE, to include gloves that protect hands from getting dirty.

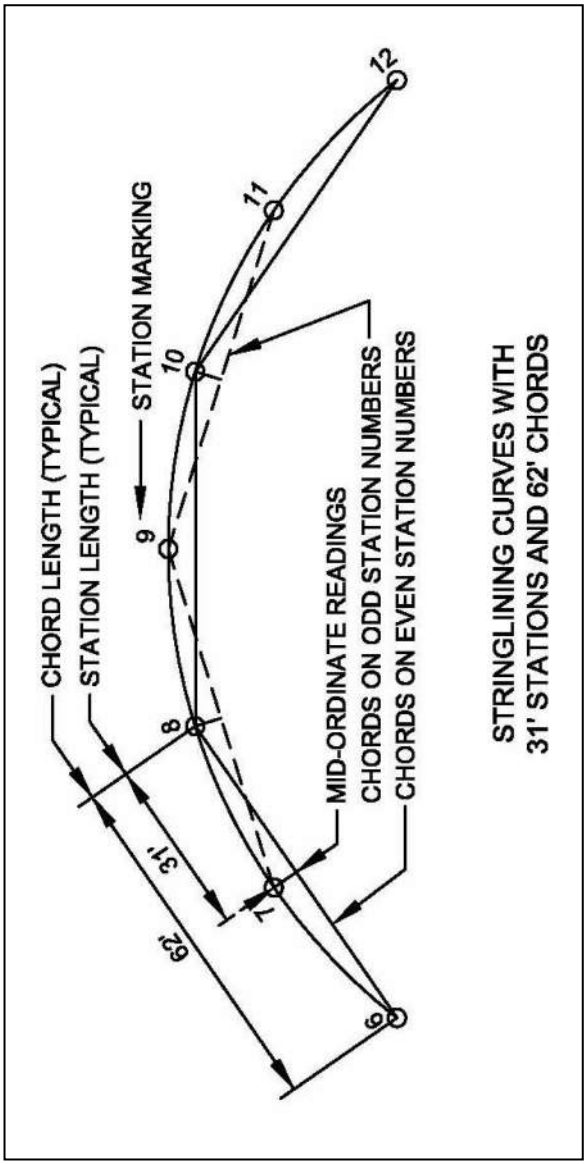
(e) Ensure that all stringline equipment is cleaned after use.

§55.2.2(M) Stringline Procedures: Items/Tools Required:

(a) Keel or crayon marker
(b) Writing instrument
(c) Stringline data sheet (as given below) with clip board
(d) 100' cloth tape with 6' folding wood ruler
(e) Stringline paddles with string
(f) Ordinate ruler
(g) Level board

§55.2.3(M) Stationing Curves and Obtaining Stringline Data

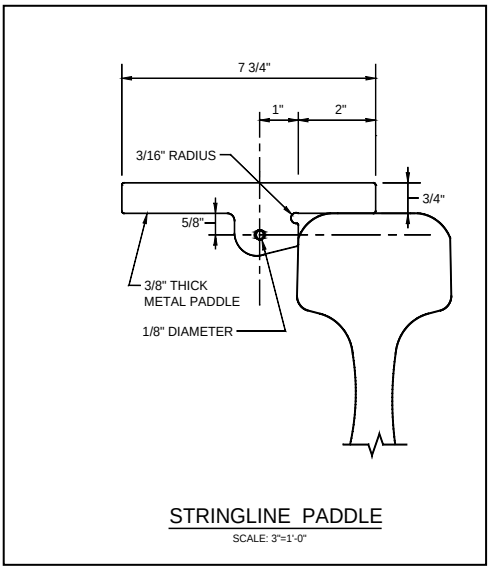
(a) The figure below shows a typical curve with stationing marked out in keel and the chords in place for measurement of mid-ordinates.
(b) Ordinate readings are taken at odd and even stations.
(c) A chord length of 62' is the chord used for this stationing.



Stringlining of Curves

(d) Stationing shall begin at a point on the tangent far enough ahead of the curve to permit the measurement of any reverse curvature or “dog-leg.” Stationing shall continue throughout the curve to a point on the tangent five stations beyond the tangent point to permit measurement of any reverse curvature. Mark stations on rail web with keel.

(e) When obtaining mid-ordinate date, stringline paddles should be used to position the string a distance of 1" away from the gage line of the rail, so as to locate and permit measurement of any local deviations in the curve. A typical stringline paddle is shown below.



Note: In curved track, measurements are taken on the gage side of the high rail (line rail) if possible. If not, field side of low rail may be used.

(f) The Stringline Data Form should be used to record field measurements and for making mathematical calculation (see §55.2.4(M)).

(g) When a conventional ruler is used to measure the mid-ordinate, the actual scale reading should be recorded and a correction made to the mid-ordinate value to compensate for any offset of the stringline from the rail. Conventional stringline paddles require that 1" be subtracted from the readings taken to give the correct mid-ordinate value.

(h) Mid-ordinate measurements should be taken (with an accuracy of 1/16"+/-) with the stringline pulled taut, not affected by the wind, and with the stringline paddles and the scale held horizontal and perpendicular to the gage face of the rail.

(i) Track center lines should be measured and recorded at every station in a two or more track territory. The distance from centerline of track to any obstruction that might interfere with the lining of the curve should be measured and recorded so that limiting throws for these tight spots may be determined.

(j) The apparent location of the curve points Tangent to Spiral (TS), Spiral to Curve (SC), Curve to Spiral (CS) and Spiral to Tangent (ST) should be noted when stationing the curve as appropriate so that the relationship between alignment and required superelevation can be determined.

(k) At all station locations record:

(1) Crosslevel as read by a level board.

(2) Gage as read from the 6' ruler (or calibrated level board).

(3) Track centers if in multiple track territory.

(4) Physical features in the field such as crossings, turnouts, field or plant welds, joints, curve tags, bridge girders, grease pots, impedance boxes, etc., that may affect the ability to throw a curve.

55.2.4(M) Stringline Data Form

(a) Below is an example of a Stringline Data Form to be filled out when stringlining a curve.

CURVE ID. _____

MassDOT RAILROAD STRINGLINE DATA FORM

BRANCH _____ MP_____ TRACK _____ CHORD (Ft.) _____ STATION (Ft.) _____ ORDINATE _____

DEGREE: _____ **PRES. ELEV: _____** **PROP. ELEV: _____**	**DATE MEASURED: _____** **DATE LINED: _____**	**DATE TAGGED: _____** **COMPUTED BY: _____**	**APPROVED BY: _____** **DATE: _____** **STATION 0 AT _____ END**

STA. NO.	TRACK CENTERS	EXIST. GAGE	EXIST. ELEV.	EXIST. ORD.	NOTES	CLEARANCE TO FIXED OBJECT	FINAL ORD.	PROP. ELEV.	THROW	STA.

§57.0(M) CURVES: ELEVATION AND SPEED LIMITATIONS

§57.1(M) General

(a) Elevation, or superelevation, is the vertical distance of the outer rail of a curve above the inner rail. It is provided to overcome or partially overcome the effects of curvature and speed.

(b) Passenger railroads primarily elevate curves to provide adequate ride quality.

(c) Freight railroads primarily elevate curves to provide ride quality and reduce rail wear.

(d) Maximum authorized speed (MAS) for a curve is that specified in the current Operating Railroad Company's Employee Timetable.

§57.2(M) Superelevation

(a) The MassDOT Rail and Transit Division shall establish the amount of superelevation and underbalance to be placed and maintained on each curve.

(b) The superelevation should not exceed values given in Appendix C, "Underbalance Table - Maximum Allowable Operating Speed On Curves."

(c) MAS shall be determined using 3" of unbalance (E_u).

§57.3(M) Superelevation Tags

(a) Curves should be tagged in the field. Points to be marked or tagged on the curves are: TS, SC, CS, and ST.

(b) Information on curve tags shall include the maximum design superelevation and the date the curve is elevated.

(c) Superelevation tags are placed as follows:

(1) The TS and the ST tags are placed 1" off the tie plate and/or elastic fastener perpendicular to the high rail.

(2) The SC and CS tags are placed 1" off the tie plate and/or elastic fastener parallel to the high rail.

§59.0(M) Elevation of Curved Track; Runoff

(a) If a curve or segment of a compound curve is elevated, the full elevation must be provided between points of full curvature throughout the curve, unless physical conditions do not permit. If the elevation does not extend throughout the curve, or segment of a compound curve, the minimum elevation must be used in determining the maximum allowable operating speed under FRA §213.57(b).

(b) Elevation runoff must be at a uniform rate, within the limits of track surface deviation prescribed in FRA §213.63 and it must extend at least the full length of the spiral. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, a maximum of 1" elevation may be run off in tangent track.

Maximum Authorized Speed (MAS)	Maximum Rate of Change in 31'
Up to 59 MPH	1/2"
60 to 90 MPH	3/8"

(3) At least 100' of tangent track, with zero crosslevel, shall be provided between the zero superelevation points in adjacent curves of opposite direction, or facing same hand turnouts, where practicable.

§61.0(M) CLEARANCES AND TRACK CENTERS

§61.1(M) Track Centers

(a) In maintaining alignment, the existing track centers, including equivalent centers on curves, must not be reduced below the minimum established for the territory.

(b) When surfacing track, any changes in track centers must be immediately reported to the Operating Railroad Company and the MassDOT Rail and Transit Division.

(c) In maintaining alignment, existing track center distances, including equivalent distances on curves, should not be decreased without the authority of the MassDOT Rail and Transit Division.

(d) If the measured track center in tangent track is less than 12'-6" notify the MassDOT Rail and Transit Division for guidance.

(e) On curves, the tangent track center must be increased as follows (see MassDOT MBTA Plan 1018):

(1) Where the amount of superelevation is the same on adjacent tracks or the superelevation of the inner track is greater than the superelevation of the outer track, increase the tangent track center distance at a rate of 2" per degree of curve (CRDS(6)(D)(2)).[1]

(2) Where the amount of the superelevation of the outer track is greater than the superelevation of the inner track:

(i) Increase the tangent track center distance at a rate of 2" per degree of curve and 3-1/2" for each 1" difference in elevation between the outer and inner tracks (and/or tracks under consideration) (CRDS(6)(D)(4)).[1]

(3) When aligning and super-elevating curves, the required increase in track centers should be as given in Paragraphs (e) (1) and (2) of this Part.

(4) Track centers that do not meet the requirements of the MBTA Plan 1018 should be reported to the MassDOT Rail and Transit Division.

(f) Standard Tangent Track Center Dimensions:

(1) The standard track center for tangent main line tracks is 14'-0".

(2) Track centers of 13'-0" are permissible where 14'-0" centers are not possible as approved by the MassDOT Rail and Transit Division (CRDS (6)(D)(1)).[1]

(g) Track clearance information is given in the MBTA Book of Standard Plans. See:

(1) Dwg. No. 1012: "Standard Clearances General Roadway Obstructions – Tangent Track"

(2) Dwg. No. 1013: "Standard Clearances at Stations – Tangent Track"

(3) Dwg. No. 1014: "Standard Clearances Tangent Track Signal Equipment & Utility Crossings"

(4) Dwg. No. 1015: "Clearances for New Overhead Bridges"

(5) Dwg. No. 1017: "Standard Clearances Tangent Track Bridges"

(6) Dwg. No. 1018: "Standard Track Centers & Side Clearance Increases for Curved Track"

(7) Dwg. No. 1019: "Clearances at Passenger Platforms"

[1] MBTA Commuter Rail Design Standards Manuals, Vol. I, Revision 1, April 19, 1996.

§61.2(M) Horizontal Clearances

(a) Side Clearance Increase Because of Curvature:

(1) Side clearances must be increased on both the inside and outside of curves. This is to maintain equivalent tangent clearance on curves which is decreased due to:

(i) End overhang of equipment on the outside of curves, and;

(ii) Mid-ordinate swing-in on the inside or curves.

(2) Required side clearances increase on both inside and outside of curves:

(i) 1.5" per degree of curve (AREMA Chapter 28, Section 1.1).

(3) On curved track, side clearances shall be increased 1" per degree of curve. As recommended by AREMA Chapter 28, Section 1.1., Special Notes (1984), clearances to fixed obstructions should be increased within 80' of the curve (from TS and/or ST):

(i) Clearances to fixed objects within 80' of a curve should be increased at least as given in the table below:

Distance from Fixed Obstruction to Curve (TS and/or ST) (Feet)	**Increase in Clearance Per Degree of Curve (Inches)**
20	1-1/2
40	1-1/8
60	3/4
80	3/8

(4) Also see MBTA Standard Plan No. 1018.

(b) Side Clearance Increase Because of Superelevation:

(1) Side clearances on the inside or low side of the curve must be increased to compensate for the inward lean of the equipment when a curve has superelevation.

(2) The increased side clearance amount required to clear an object and/or obstruction is:

(i) Increased side clearances required in inches

$$= h/5 \times E_A,$$

Where:

h = height of obstruction/object in feet above top of rail.

E_A = actual elevation in curve at point in question in inches.

(3) See MBTA Standard Plan No. 1018.

§61.3(M) Vertical Clearances

(a) The minimum preferred vertical clearance required by the Commonwealth of Massachusetts is 22'-6" above top of rail.

(1) See AREMA, Section 3.6, “Legal Clearance Requirements by State.”

(2) See Table 28-33, for Massachusetts for both horizontal and vertical clearances.

(b) Compensation for Superelevation:

(1) If tracks are superelevated under an overhead (OH) structure:

(i) Vertical clearance must be increased to accommodate the required vertical clearance out to a point 7'-0" from the centerline of track on a plane parallel to the top of rail of the superelevated track (CRDS (6)(B)(3)).[2]

(2) Relative to the low rail and/or grade rail, the required vertical clearance in superelevated curves is increased by the amount (inches) calculated below:

(i) Increase in Vertical Clearance Required = 143 E_A

Where:

E_A = Superelevation in curve at point of interest

(c) Compensation in Vertical Clearance for Vertical Curves:

(1) When a vertical curve exists under an overhead structure and/or obstruction, additional clearance is required to:

(i) Accommodate the vertical mid-ordinate of railway equipment (cars and locomotives)

(2) For railway equipment up to 90' in length, the required increase in vertical clearance can be calculated as follows (CRDS(6)(B)(4)).[2]

(i) Increase in Vertical Clearance Required = $\frac{0.90 \times G_1 - G_2}{8}$

Where:

G_1 = Grade at point on vertical curve (PVC) in percent

G_2 = Grade at point on vertical tangent (PVT) in percent

§61.4(M) Clearance Limiting Objects

(a) For clearance limiting objects, see AREMA, Chapter 28, Table 28-3-3 "Legal Clearance Requirements by State" and the MBTA Book of Standard Plans.

(b) The clearance from the center line of track to objects within the right-of-way such as: signal appliances, signal bridge foundations, bridge abutments and platforms shall not be reduced without ascertaining that the final clearance to the object is no less than given in AREMA, Chapter 28, Table 28-3-3, "Legal Clearance Requirements by State" and the MBTA Book of Standard Plans.

§62.0(M) GRADES

§62.1(M) Grade Limitations

(a) The maximum design gradient shall be 1-1/2% and may be exceeded only with the approval of the MassDOT Rail and Transit Division.

(b) Storage and/or yard track grades shall be level where existing grades and obstructions permit.

(c) When reconstructing track, the existing profile must be retained except where it is possible to reduce the severity, length or the number of grades.

(d) Frequent changes in gradient shall be avoided as this introduces more vertical curves into the geometry and may degrade ride quality and increase train resistance.

(e) The preferred minimum length of vertical tangent is 300'**.**

(f) However, an absolute minimum length of 100' is required (unless approved by the MassDOT Rail and Transit Division).

[2] MBTA Commuter Rail Design Standards Manuals, Vol. I, Revision 1, April 19, 1996.

§62.3(M) Horizontal Curves/Minimum Tangent Lengths

(a) For spiraled compound or reverse curves, the above minimum tangent length between spirals and/or curves is as follows:

(1) A minimum tangent length of 100' on main tracks.

(2) A minimum tangent length of 85' on secondary tracks.

(3) An absolute minimum tangent length of 65', if approved by the MassDOT Rail and Transit Division.

§63.0(M) TRACK SURFACE

§63.1(M) General

(a) Track surface is the relationship of opposite rails to each other in profile and crosslevel.

(b) Track profile is the running surface along the top of the grade rail.

(c) Crosslevel is the difference in elevation across opposite rail heads measured at right angles to the track alignment.

(d) The ideal surface is a uniform profile consisting of constant grades connected by vertical curves, with zero crosslevel on tangents and predetermined crosslevel on curves.

(e) The profile of track being surfaced should not be raised above established grades, except as approved by the MassDOT Rail and Transit Division, who will give consideration to the required elevations and clearances:

(1) In tunnels; and

(2) Under overhead bridges/structures; and

(3) At interlocking plants; and

(4) Highway grade crossings.

(f) Any encroachment upon the published minimum overhead or side clearances from a track will not be permitted.

(1) See AREMA, Chapter 28, Table 28-3-3, “Legal Clearance Requirements by State.”

§63.2(M) Maintenance of Track Surface

(a) The following criteria will serve as a practical guide for maintaining smooth riding conditions on existing tracks.

(b) The basic tools for determining correct track surface are the standard track level and stringline. The track level should be checked by the employee inspecting the track prior to use. If found to be incorrect, it must be accurately adjusted or replaced. Other approved devices may be used for determining crosslevel, but their accuracy should be determined by comparison with a standard track level in correct adjustment.

(c) When surfacing or raising track, one rail, which shall be the low rail on curves and usually the line rail on tangents, shall be selected as the grade rail. The other rail must be brought to surface by adjusting the crosslevel as required.

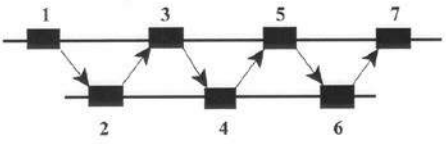
(d) For Track Classes 1-5 track, surface may not deviate more than the amount prescribed in the following table.

Surface Maintenance Limits					
Track Surface	**Class of Track**				
	1	**2**	**3**	**4**	**5**
The runoff in any 31' of rail at the end of a raise may not be more than (inches):	2-5/8	2-1/4	1-1/2	1-1/8	3/4
The deviation from uniform profile on either rail at the mid-ordinate of a 62' chord may not be more than (inches):	2-1/4	2	1-5/8	1-1/2	1
The deviation from zero crosslevel at any point on a tangent or the reverse elevation on curves may not be more than (inches):	2-1/4	1-1/2	1-1/4	1	3/4
The difference in crosslevel between any two points less than 62' apart may not be more than (inches):*(1, 2)	2-1/4	1-1/2	1-1/4	1	3/4
*Where determined by engineering decision prior to June 22, 1998 due to physical restrictions on spiral length and operating practices and experience, the variation in crosslevel on spirals per 31' may not be more than (inches):	2	1-3/4	1-1/4	1	

Notes:

(1) Except as limited by Part I, FRA §213.57(a), where the elevation at any point in a curve equals or exceeds 6", the difference in crosslevel within 62' between that point and a point with greater elevation may not be more than 1-1/2".

(2) However, to control harmonics on Track Classes 2-5 jointed track with staggered joints, the crosslevel differences shall not exceed 1-1/4" in all of six consecutive pairs of joints, as created by seven low joints (see diagram below). Track with joints staggered less than 10' shall not be considered as having staggered joints. Joints within the seven low joints outside of the regular joint spacing shall not be considered as joints for purposes of this footnote.



§63.3(M) Surfacing Areas That Require Special Attention

(a) Special attention must be given to the surface and line of track at the ends and approaches of bridges, crossings, and platforms.

(b) When surfacing, installing or tamping ties, particularly in interlocking plants, care must be taken to avoid breaking or damaging bond wires, pipes, cables or wire connections to the tracks. The Signal Maintainer must be notified prior to any work and all signal appliances are to be marked with high-visibility paint. Notify the Signal Maintainer immediately if damage occurs. Care shall be exercised to avoid the dropping or laying of metal tools or objects across the rails and causing a shunt of the signal circuits.

(c) In hot weather when surfacing track, the requirements of FRA §213.119 and Appendix A, “Continuous Welded Rail (CWR) Procedures” must be followed.

(d) During freezing and thawing weather, attention must be given to the surface of track likely to be affected by heaving due to frost action. Surface irregularities due to frost action that cannot be corrected by usual procedures may be temporarily corrected by use of track shims or by de-icing the ballast. Shimming must be performed in compliance with FRA Part 213 and §129.0(M).

(e) Undercutting, out-of-face track surfacing, and out-of-face tie renewal shall be performed in accordance with Appendix A, “Continuous Welded Rail (CWR) Procedures.”

§63.4(M) Surfacing Track

(a) When track is given a general raise, both rails should be raised at the same time. When track jacks are used, they should be placed opposite each other on the field side of the rail and must not be placed between the rails, except when absolutely necessary.

(b) Surfacing track with automated tamping equipment causes ballast breakdown and, therefore, should only be performed where it is determined to be an effective solution to correct track geometry defects or to raise the track to a required profile. Surfacing work shall be executed in a manner that assures maximum durability of the track raise and the ballast materials.

(c) When track is given a general raise, it is important to consider the relationship between the amount of lift and durability of results. In general, average lifts between 1" to 2" are desirable. Higher raises may be performed, with multiple passes, under the authority of the MassDOT Rail and Transit Division.

(d) Adequate ballast for dressing to the required ballast cross section should be distributed in advance of surfacing and aligning track.

(e) CWR track that has been surfaced and aligned and is being returned to service will be inspected by a qualified person before releasing and in accordance with Appendix A, “Continuous Welded Rail (CWR) Procedures.”

(f) Track should not be raised in interlockings or in signal territory until advance notice has been given to the Signal Maintainer so that switches, or other appliances, can be protected and then re-inspected when the work is completed.

Subpart D - Track Structure and Materials

§100.0(M) MATERIALS

"Track structure" materials include: sub-ballast, ballast, ties, rails, rail fastenings, and other track materials (OTM).

§100.1(M) Handling and Care of Materials

(a) Moving materials from place to place and caring for materials on hand is costly and requires careful planning. Therefore, the amount of material on hand and the number of handlings should be kept to a minimum.

(b) Threaded and/or insulated materials and parts should be kept under cover and protected from the weather.

(c) Materials should be distributed in such a manner so as not to become a tripping hazard or be lost prior to installation in track.

(d) Whenever possible, CWR distributed for installation should be distributed clear of the track.

  (1) When necessary to be placed in the center line of the track, the rail ends should be protected by bending them towards the center line of track (proper nosing).

  (2) When unloaded, CWR should be secured and insulated in such a manner as to prevent shunting of the signal system.

  (3) The top of the CWR, when distributed in the center line of track, should not exceed the height of the running rails.

§100.2(M) Classification of Materials

(a) Materials are classified as follows:

  (1) New: Unused, as manufactured.

  (2) Rehabilitated: Worn materials removed from track and repaired to a relay condition for reuse (e.g., rebuilt frogs).

  (3) Relay: Usable (second-hand) material removed from track to be reused with no required work to be performed before re-installation into track, such as:

    - relay ties,
    - relay rail,
    - relay frogs,
    - relay joints,
    - relay fasteners,
    - relay turnouts, and
    - other special trackwork.

  (4) Scrap: Materials removed from tracks that are not suitable for reuse.

§100.3(M) Removal and Disposition of Materials

(a) Materials removed from track shall be classified as relay or scrap (see §100.2(M)).

(b) Relay materials shall be sorted and stored properly and safely at the Operating Railroad Company's designated MOW materials area for reuse.

(c) Scrap materials shall be disposed of by the Operating Railroad Company in accordance with MassDOT, local, State, and Federal regulations.

(d) Reroller materials are used to fabricate other steel products (see §113.4.1(M)).

(e) Materials shall be removed from the work area as quickly as practicable so as to provide for a clean, safe, right-of-way, and stored securely.

§103.0(M) BALLAST; GENERAL

§103.1(M) Ballast Characteristics

(a) Unless supported by a structure, all track must be supported on a material that will:

(1) Transmit and distribute the load of the track and railroad rolling equipment to the sub-ballast and then to sub-grade.

(2) Provide lateral, longitudinal, and vertical restraint for the track.

(3) Provide drainage for the track structure.

(4) Facilitate the maintenance of track elevation, crosslevel, surface, and alignment.

(b) Ballast shall conform to the AREMA recommended practice Chapter 1 and Part 2, Section 2.4 to include Tables 2-1 and 2-2. Ballast may be obtained only from MassDOT Rail and Transit Division approved quarries.

(c) When ballast received is of inferior quality, has improper grading, or contains quantities of screenings, dirt, or foreign matter, it shall be rejected and shall be reported to the Track Supervisor, so that corrective action may be taken.

§103.2(M) Ballast Unloading

(a) To the extent practicable, ballast should be unloaded in position for use with a minimum of rehandling and dressing.

(b) Ballast must be distributed and immediately dressed so that adequate clearance below top of rail is provided for the movement of rolling stock and track equipment. Switches are not to be fouled and guard rails are not to be obstructed.

(c) When unloading ballast cars, caution should be used to ensure that both sides of the car are unloaded equally to maintain the stability of the car while unloading.

(d) Use the table given below to determine typical ballast quantities for track panels and special trackwork renewals.

Renewal Type	Number of Ballast Cars
Track Panels (3 each)	1
Crossing Frogs	1
No. 7, 8, 9, 10 Turnouts	2
No. 15 Turnouts	3
No. 20 and 24 Turnouts	4

§103.3(M) Ballast Section

(a) Ballast and sub-ballast cross sections should conform to AREMA, Chapter 1, Section 2.1, “Design,” Figures 1-2-1 through 1-2-4.

(b) Minimum ballast shoulder widths are:

Jointed Rail 12" shoulder	2:1 slope
CWR Rail 12" shoulder	2:1 slope
CWR on curves 16" shoulder	2:1 slope

(c) On CWR track, take remedial action where there is insufficient ballast (see Appendix A, "Continuous Welded Rail Procedures").

§103.4(M) Fouled Ballast

(a) Ballast may consist of crushed slag, crushed stone, screened gravel, pit-run gravel, chat, cinders, scoria, pumice, sand, mine waste, or other native material, and is an integral part of the track structure.

(b) Ballast, regardless of the material, must satisfy all four of the requirements stated in the FRA Track Safety Standards.

(c) The sole appearance of fouled ballast (ballast contaminated with broken down ballast particles, mud, coal dust, or any foreign particles), does not warrant a defect or violation to be written, if the ballast section is properly transmitting the load, restraining the track, providing adequate drainage, and maintaining proper geometry.

(d) However, fouled ballast that is unable to provide adequate drainage is of particular concern because it compromises the ability of ballast to meet its other three functions (i.e., to distribute load, restrain track, and maintain proper geometry).

(e) When fouled ballast with inadequate drainage is present, wheel loads are likely to be concentrated, rather than distributed, causing deterioration of components and instability in the area of the defective ballast.

(f) This deterioration of components and instability increases the risk of track shift (such as a track buckle), and also increases the rate of degradation of geometry, and may result in a derailment.

(g) Factors that affect the rate of degradation of components and geometry include the tonnage, traffic density, and operating speeds, as higher tonnage, traffic density, and operating speeds increase the amount and/or frequency the forces exerted on the components

(h) Operating Railroad MOW personnel should look for indicators that the ballast is not performing its four functions, such as the existence of a crosstie and/or geometry condition.

(1) The term "geometry condition" used here means a track surface, gage, or alignment irregularity that does not exceed the allowable threshold for the designated track class in the Track Safety Standards.

(2) Operating Railroad MOW personnel are encouraged to use their technical knowledge and professional experience in recognizing fouled ballast, and should take into account the severity of a geometry condition along with the following factors when considering the action and/or remedial action required:

- Track class and operating speed
- Traffic density and wheel loads
- Adequacy of shoulder ballast and crib ballast
- Track type: route for passenger and/or hazardous materials
- Potential that the track may deteriorate very rapidly following heavy rains
- Center-bound cross ties, if observable
- Rail and fastener conditions
- Sub-grade condition, if observable
- Surrounding track structure (embankment or cut, obvious/observable variation of track stiffness of the left from right side of the track, and from the adjacent areas along the track)

- Proximity of the defective ballast locations to switches (special work), joints, bridges, or grade crossings
- Existence of standing water or indications that water had been standing (as water sometimes get trapped beneath the ties and may not be visible on the surface)

§103.5(M) Ballast Cleaning

(a) When ballast in track becomes fouled, it should be mechanically cleaned, or removed, and then replaced to restore performance and proper drainage.

(b) The type of cleaning procedure employed should depend on the nature and extent of the fouling.

(c) Types of ballast cleaning and/or removal activities are described below:

(1) Shoulder ballast cleaning promotes lateral drainage of the track structure. A proper cycle of shoulder cleaning can aid in extending the cycle between undercutting operations.

(2) Undercutting cleans the ballast under the track to include the ties, cribs, and shoulders.

(3) A portion of the ballast removed may be returned to the track for reuse if approved by the MassDOT Rail and Transit Division.

(4) See Appendix A, "Continuous Welded Rail (CWR) Procedures," for the proper procedures for shoulder cleaning and undercutting of track with CWR.

§103.6(M) Ballast Gradation

(a) The nominal size of crushed stone used for ballast in maintenance and new construction shall be as follows (unless otherwise directed by the MassDOT Rail and Transit Division):

All tracks:

Ballast Size AREMA No. 4 3-4" to 1-1/2"

§109.0(M) CROSSTIES

(a) Crossties shall be made of a material for which rail can be securely fastened. A crosstie must have effective rail fasteners on both the gage and field side of both rails to be considered an effective tie.

(b) Each 39' segment shall have:

(1) A sufficient number of cross ties which in combination provide effective support that will:

(i) Hold gage within limits prescribed in FRA §213.53(b);

(ii) Maintain service within the surface limits prescribed in FRA §213.63; and

(iii) Maintain alignment within the limits prescribed in FRA §213.55.

(2) The minimum number and type of crossties specified in this section must be effectively distributed to support the entire segment; and

(3) At least one non-defective crosstie of the type specified in this section that is located at a joint.

(4) The minimum number of effective crossties as listed in the table below:

Minimum Number of Effective Crossties			Maximum Distance Between Effective Ties (Center to Center) (Inches)	Maximum Number of Successive Defective Ties (Normal Spacing)
Class of Track	**Tangent Track and Curves ≤ 2°**	**Turnouts and Curve Track > 2°**		
1	5	6	100	3
2	8	9	74	2
3	8	10	74	2
4 and 5	12	14	50	1

§109.1(M) Dimensions of Crossties

(a) Wood crossties are 7" in depth, 9" in width and 8'-6" in length (unless otherwise authorized by the MassDOT Rail and Transit Division).

(b) Timber crossties shall be of the following sizes:

Type of Track	Size
Main Line Track	7" grade (7"x9" x 8'-6")
Other Than Main Track and Yard Tracks	6" grade (6"x8" x 8'x6")
Grade Crossings	7" x 9" x 9', 7" x 9" x 10'(1)
Note: (1) Or as recommended by manufacturer.	

(c) The specifications for wood crossties shall be in accordance with AREMA, Chapter 2.

(d) Wooden transition ties may be used at open deck bridge approaches. Transition tie layout is to be approved by the MassDOT Rail and Transit Division.

(e) Concrete and steel ties may be used with the approval of MassDOT Rail and Transit Division.

(1) Concrete ties shall be sized according to MBTA Standard Plan 1120.

§109.2(M) Use of Crossties

(a) The use of crossties, other than those described in §109.1(M), shall be approved by the MassDOT Rail and Transit Division.

(b) The type and spacing of ties for each line and class of track shall be designated by MassDOT.

(c) The number of ties and tie spacing for each line and class of track shall be designated by the MassDOT Rail and Transit Division in accordance with the service requirements. Center to center tie spacings are given in the table below:

Type of Track	Distance (Inches)
Main Tracks	19-1/2"
Within Grade Crossing[(1)]	18"
Other Tracks	22"
Concrete Ties	24"
Steel Ties[(1)]	20"-24"
Note: [(1)] Or as recommended by the manufacturer.	

(d) It is recognized that ties will not normally be re-spaced except during reconstruction.

(e) However, when ties are installed out-of-face, ties should be re-spaced wherever practicable.

§109.3(M) Placement of Crossties

(a) Wood Crossties

(1) Ties should be placed in track with the wider heart wood face down and square to the line of the rail.

(2) The ends of standard 8'-6" ties should be brought to a uniform line 18" from the edge of the base of rail on the line side as follows:

(i) On single tangent track, line the ties to the mile post side of the track.

(ii) On roads with two or more main tracks, line the field ends of ties.

(iii) On all curved track, ties shall be lined to the high rail.

(iv) When necessary to install non-standard length ties, they shall be centered in the track.

(b) Any Crossties

(1) Ties shall be kept sufficiently spaced and square to the line of rail to permit proper tamping and distribution of load.

(2) When necessary, ties should be re-set to standard spacing.

(3) Ties shall be square to the line of rail so that fastening systems are not subjected to a torsional load because of tie skewing.

(4) When installed, crossties shall be properly tamped 12" on both sides of the base of rail.

§109.4(M) Preventing Crosstie Damage

(a) General:

(1) When handling or spacing ties, care shall be taken not to damage them with MOW equipment, picks, and spiking hammers.

(2) Tie tongs, lining bars and other suitable tools or tie spacing equipment shall be used, so as to prevent tie damage.

(3) For additional information on fastener application see §127.0(M).

(b) Wood Crossties:

(1) Adze ties as required to obtain a sound and true bearing to support the tie plate.

(2) If a tie will be reused, cedar tie plugs or an approved hole filler must be used to fill holes where spikes, pins and lag screws have been removed. The tie shall be installed with hole side up.

(3) Square tie plugs (5/8") are used with spikes and pins, round tie plugs (3/4" diameter) are used with lag screws.

§110.0(M) Switch Timber

(a) Timber switch ties shall be 7" grade (7" x 9"), except for power switch machine timbers, which shall be a cross section of 9" x 10", with lengths as shown on the standards plans.

(b) Use of switch timbers of other material must be approved by the MassDOT Rail and Transit Division.

§111.0(M) Bridge Timber

(a) Oak or Southern Yellow Pine Timber, or approved equal by the MassDOT Rail and Transit Division, shall be used on all open deck bridges.

(b) Bridge ties shall be adzed, framed, and sized according to framing plans prior to treatment. Suitable holes must be bored for drive spikes that fasten tie spacing bars on timbers.

(c) Where ties are bored or adzed in the field, they shall be treated with an appropriate preservative.

(d) Bridge ties shall be fastened to the structure with galvanized hook bolts as follows:

- On tangent track every 4th tie shall have two hook bolts to connect the tie to the deck, or
- On curved track every 3rd tie shall have two hook bolts to connect the tie to the deck; or
- The MassDOT Rail and Transit Division shall specify how many ties shall have hook bolts that connect ties to the deck on any and all spans.

(e) Lag screws shall be used in holes bored to size to fasten galvanized tie spacing bars on timber (see MBTA "Standard Book of Plans").

(f) Tie spacing bar, spacer block, and hook bolt details are given on MBTA Standard Plan No. 1236 "Bridge Timber Anchoring Detail."

(g) All open deck bridges shall have spacer blocks between all timber (see MBTA "Standard Book of Plans").

§113.0(M) RAIL

§113.1(M) Branding and Stamping

(a) Branding shall be rolled in raised characters on the side of the web of each rail at a minimum of every 16' in accordance with the following requirements:

(1) The data and order of arrangement of the branding shall be as shown in the following typical brand:

136	RE	Manufacturer	2003	III or 3
(Weight)	(Section)	(Mill Brand)	(Year Rolled)	(Month Rolled)

(2) The method of hydrogen elimination shall be located in the brand when a hydrogen elimination method other than Vacuum Treated (VT) is used.

(b) The web of each rail shall be hot stamped a minimum of three times per rail (short rails must contain a minimum of one full stamp) on the side opposite the brand, and shall not occur within 2' of either end of rails, and in accordance with the following requirements:

(1) The data shall be shown in the following typical stamping. The height of the letters and numerals shall be 5/8".

SS, HH, LA, IH or LH	297165	PSTU	12	BC
(Rail Type)	(Heat Number)	(Rail Letter)	(Strand and Bloom Number)	(Method of Hydrogen Elimination, if indicated in stamping)
Notes: SS = Standard Strength HH = Head-Hardened LA = Low Alley Standard Strength IH = Low Alloy Intermediate LH = Low Alloy Head-Hardened				

(2) Rails from continuous cast blooms shall be identified by a designation for heat number, strand number, and bloom number. The rail shall be identified by an alphabetical designation beginning with “P”, and succeeding “S”, “T”, “U”, etc., consecutively, or any other identification of the position of the rail within the cast, as agreed between the purchaser and manufacturer.

(c) Markings:

(1) High-strength rails shall be marked by either a metal plate permanently attached to the neutral axis, hot stamped, or in the brand which gives the manufacturer, type, and/or method of treatment. Heat-treated rail shall be paint-marked orange. Alloy rail shall be paint-marked aluminum color.

(2) Non-AREMA (Industrial Quality) rails shall be paint-marked yellow.

(3) Short rails (less than 80') shall be paint-marked green.

(4) Trackwork rails shall be paint-marked white.

(5) Rail length shall be painted on the end faces or in a manner acceptable to the purchaser or manufacturer.

(6) Individual rails shall be paint-marked only one color, according to the order listed above.

(7) Industrial Quality (IQ) rails shall be permanently identified by grinding diagonally through every “RE” or other designation within the rails’ branding. Each designation brand shall be ground or milled diagonally from the top right hand corner to the bottom left hand corner, a minimum of 1/4" in width and to within 0.010" of the parent rail web surface.

(d) For further information on this subject see AREMA 2.1.6.

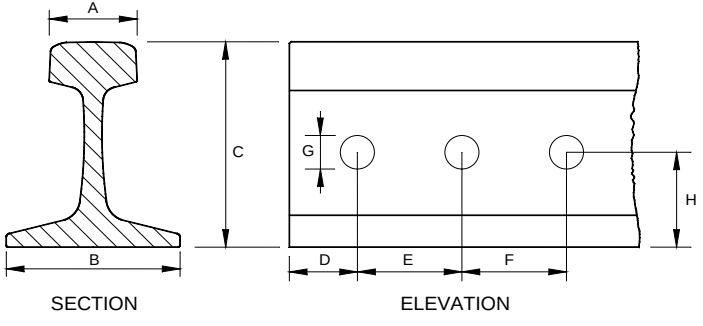
§113.2(M) Rail End Drilling and Bolt Hole Sizes

(a) Jointed rails consist of conventional length rails of 400' or less which are bolted together.

(b) CWR is continuous welded rail in strings of greater than 400' where the rails are welded by the flash butt process or by other methods as approved by MassDOT.

(c) Rail size dimensions and bolt hole drilling for typical rail sections are given in the following table.

(d) A rail and joint dimension table with some typical MassDOT rail sections is contained below.



RAIL DATA

Rail Data (Inches)														
Rail Section Dimensions In Inches	**80# A.S.**	**85# A.S.**	**100# NH**	**105# DY**	**107# NH**	**112# R.E.**	**115# R.E.**	**119# R.E.**	**130# R.E.**	**131# R.E.**	**132# R.E.**	**136# R.E.**	**140# R.E.**	**141# R.E.**
A - Head Width	2-1/2	2-9/16	2-3/4	3	2-3/4	2-23/32	2-23/32	2-21/32	2-15/16	3	3	2-15/16	3	3-1/16
B - Base Width	5	5-3/16	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	6	7	6	6	6	6
C - Height	5	5-3/16	6	6	6-1/8	6-5/8	6-5/8	6-13/16	6-3/4	7-1/8	7-1/8	7-5/16	7-5/16	7-7/16
D - Drilling (1st Hole)	1-15/16	1-15/16	2-1/2	2-3/4	2-1/2	2-7/16	3-1/2	3-1/2	2-3/8	2-1/2	3-1/2	3-1/2	3-12	3-1/2
E - Drilling (2nd Hole)	7	7	7	5-5/8	7	7	6	6	7	6-1/2	6	6	6	6
F - Drilling (3rd Hole)	-	-	-	5-5/8	-	6	6	6	NA	6-1/2	6	6	6	6
G - Diameter of Bolt Hole	1	1	1	1-1/16	1	1-1/8	1-1/8	1-1/8	1-11/32	1-1/8	1-1/4	1-1/4	1-1/4	1-1/4
H - Base to Center of Hole	2-3/16	2-9/32	2-39/64	2-5/8	2-39/64	2-7/8	2-7/8	2-7/8	2-3/4	3-3/32	3-3/32	3-3/32	3	3-3/32
I - Diam. of Bolt	7/8	7/8	7/8	15/16	7/8	1	1	1	1-1/8	1	1-1/8	1-1/8	1-1/8	1-1/8

Note:
[1] Source: AREMA Plan Nos. 4-1-6, 4-1-7, 4-3-13

§113.3(M) Recommended Maintenance Wear Limits for Rail

§113.3.1(M) Maximum Head and Gage Face Wear for Rail (In and Out of Track)

(a) With traffic, the rail head wears vertically and horizontally. As this wear increases, the cross section of the rail decreases. This decrease in rail section may overstress the rail causing rail failure.

(b) The following table contains the maintenance wear limits for maximum vertical wear and maximum gage face wear (both gage and field) for rail sections commonly found on MassDOT rail lines.

(c) Rail that has head and gage face wear, as given in the table below, shall be immediately removed from track and scrapped as soon as practicable.

(d) Rail replacement should be programmed prior to reaching the given maintenance rail wear limits.

§113.3.2(M) Railway Limits for the Welding of Relay Rail

(a) The table below gives the maximum head wear and gage face wear values recommended by AREMA for the welding of relay rail.

(b) Relay rail that has greater amounts of either head wear and/or gage face wear should not be welded.

(c) Maximum wear values are given for both mainlines and for other tracks to include light density mainlines, sidings, and other tracks.

Recommended Maintenance Maximum Rail Wear Limits [1]							
Rail Section	New Rail Height (Inches)	Allowable Head Wear (Inches)			Allowable Gage Face Wear (Inches)		
		Mainlines	Other Tracks	New Rail Head Width [2] (Inches)	Mainlines	Other Tracks	Total Head Width Wear [3] for Mainlines and Other Tracks
80 AS	5	5/16	3/8	2-1/2	5/16	3/8	1/2
85 AS	6	3/8	7/16	2-9/16	5/16	3/8	1/2
100 NH	6	1/2	5/8	2-3/4	3/8	1/2	1/2
105 DY	6	1/2	5/8	3	3/8	5/8	1/2
107 NH	6-1/8	1/2	5/8	2-3/4	3/8	1/2	1/2
112 RE	6-5/8	1/2	5/8	2-23/32	3/8	1/2	1/2
115 RE	6-5/8	1/2	5/8	2-23/32	3/8	1/2	1/2
119 RE	6-13/16	1/2	5/8	2-21/32	3/8	5/8	1/2
130 RE	6-3/4	1/2	5/8	2-15/16	3/8	3/4	3/4
131 RE	7-1/8	5/8	1/2	3	1/2	3/4	3/4
132 RE	7-1/8	5/8	1/2	3	1/2	3/4	3/4
136 RE	7-5/16	5/8	3/4	2-15/16	1/2	3/4	3/4
140 RE	7-5/16	5/8	3/4	3	1/2	3/4	3/4
141 RE	7-7/16	5/8	3/4	3-1/16	1/2	3/4	3/4

Notes:

(1) Rail that has maximum wear as given in this table shall be removed from track immediately and scrapped as soon as practicable.
(2) Measure gage face wear at 5/8" below top of crown of railhead.
(3) Combine field and gage side wear 5/8" below top of crown of railhead. This wear column only applies to rail that has been transposed.

Rail Wear Limits for the Welding of Relay Rail[5]

Rail Section	New Rail Height (Inches)	Maximum Allowable Head Wear (Inches)			Maximum Allowable Gage Face Wear[1] (Inches)		
		Mainlines/ AREMA Class 2	Other Tracks/ AREMA Class 3	New Rail Head Width[2] (Inches)	Mainlines/ AREMA One Side Class 2	Other Tracks/ AREMA One Side Class 3	Total Head Width Wear[3]/ AREMA Both Sides Classes 2 and 3
80 AS	5	N/A	N/A	2-1/2	N/A	N/A	N/A
85 AS	6	N/A	N/A	2-9/16	N/A	N/A	N/A
100 NH	6	1/8[4]	N/A	2-3/4	3/16[4]	N/A	3/16[4]
105 DY	6	1/8[4]	N/A	3	3/16[4]	N/A	3/16[4]
107 NH	6-1/8	1/8[4]	N/A	2-3/4	3/16[4]	N/A	3/16[4]
112 RE	6-5/8	1/4[4]	3/8[4]	2-23/32	3/16[4]	5/16[4]	3/16[4]
115 RE	6-5/8	1/4[4]	3/8[4]	2-23/32	3/16[4]	5/16[4]	3/16[4]
119 RE	6-13/16	1/4[4]	3/8[4]	2-21/32	3/16[4]	5/16[4]	3/16[4]
130 RE	6-3/4	N/A	N/A	2-15/16	N/A	N/A	N/A
131 RE	7-1/8	1/4[4]	1/2[4]	3	1/4[4]	3/8[4]	3/16[4]
132 RE	7-1/8	5/16[4]	9/16[4]	3	1/4[4]	3/8[4]	3/16[4]
136 RE	7-5/16	5/16[4]	9/16[4]	2-15/16	1/4[4]	3/8[4]	3/16[4]
140 RE	7-5/16[4]	5/16[4]	9/16[4]	3[4]	1/4[4]	3/8[4]	3/16[4]
141 RE	7-7/16[4]	3/8[4]	5/8[4]	3-1/16[4]	1/4[4]	3/8[4]	3/16[4]

Notes:

(1) Measure gage face wear at 5/8" below top of crown of railhead.
(2) Combine field and gage side wear 5/8" below top of crown of railhead. This wear column only applies to rail that has been transposed.
(3) Rail classified as AREMA Class 1 or 2 may be used in any track without restriction.
(4) Rail classified as AREMA Class 3 may be used in light density mainlines, sidings, and all other tracks.
(5) AREMA values from "Rail Grading Classification by Wear Table 4-3-17."

§113.3.3(M) Classification and Identification of Rail for Reuse (In and Out of Track)

(a) By mill inspection, rails are to be classified and identified by paint marking as follows:

Type of Rail	Marking
Standard Carbon Rails	None
Head-Hardened Rails	Orange
Rails not 39 ft. or 80 ft. in length	Green
Relay Rail Pre-Tested	Green
Relay Rail Not Tested	Yellow
Industrial Quality Rail	Per Mill

(1) High-strength rails shall be marked by either a metal plate permanently attached to the neutral axis, hot stamped, or in the brand. The information will include the manufacturer and type and/or method of treatment. (Fully heat-treated rails are no longer available and are not to be used unless approved by MassDOT Rail and Transit Division.)

(2) Individual rails shall be paint-marked only one color according to the above, or as agreed to by MassDOT Rail and Transit Division and the manufacturer.

(3) Paint marking will appear on the top of the head of one end of the rail only, at least 3' from the end.

(4) All short length rails produced shall have the length identified in a manner acceptable to MassDOT Rail and Transit Division and the manufacturer on top of the head of the rail approximately 1' from each end.

(b) Failed Rails:

(1) Rails removed from track on account of any defects listed in FRA §213.113(a), except end defects described in Paragraph (2) below, must have the top of the head noticeably damaged at the defect using a cutting torch or abrasive saw, so that they will not be mistakenly returned to service in track, or be butt welded in fabricating strings of fit CWR. These rails will also be marked with red paint on the running surface near the ends of the rail. Such failed rails, damaged as above, are to be classified for scrap in its proper category.

(2) Rails removed from track on account of end defects only, such as a bolt hole crack or head-web separation where a portion of the rail end is not physically broken out, must have the top of the rail head noticeably damaged at the location of the defect using a cutting torch or abrasive saw to insure that a rail of this type is not returned to service in track without cropping the defective end.

(3) Any rail containing longitudinal or transverse defects must be removed in its entirety (all rail between joints in bolted rail, and all rail between plant welds, between plant and field welds, or between field welds in CWR). These rails will also be marked with red paint on the running surface near the ends of the rail. The entire rail is then to be considered as scrap rail. Rails removed from track on account of any defects listed in FRA §213.113(a), except end defects described in Paragraph (2) above, must have the top of the head noticeably damaged at the defect using a cutting torch or abrasive saw, so that they will not be mistakenly returned to service in track, or be butt welded in fabricating strings of fit CWR.

§113.3.4(M) Transposing and Turning Rail on Curves

(a) To obtain the maximum service life of rails on curves, the high and low sides should be transposed before horizontal wear, vertical wear or flow of metal in the head makes this impractical because of undesirable rail head stresses that may be produced leading to possible failure of the rail itself.

(b) In general, high and low sides should be transposed when the horizontal wear on the high rail is between 3/8" and 5/8" in the full body of the curve, and before the metal in the low rail flows excessively.

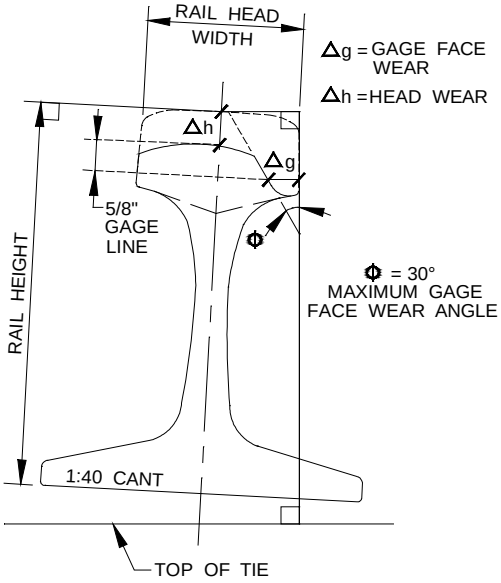
(c) In general, high side rails may be turned when horizontal wear does not exceed 1/2".

(d) 112 lb. and 131 lb. rail must not be turned or transposed without the permission of the MassDOT Rail and Transit Division.

§113.3.5(M) Gage Face Angle (Worn Rail)

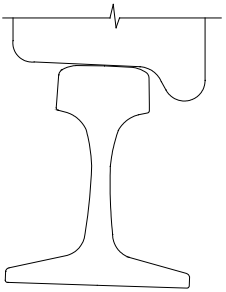
(a) When a rail is placed in track, under traffic, the gage face wears at an angle (ϕ). As this angle increases, the possibility for a wheel to climb the gage face of a rail and derail increases.

(b) As shown on the following diagram, rail replacement shall be accomplished when the gage face angle (ϕ) exceeds 30°. As the rail wear readings approach 30°, the Operating Railroad Company should make necessary plans to change out the rail.



RAIL WEAR CRITERIA

(c) For an example of new wheel and new rail interface, see the following diagram.



§113.4(M) Rail Classifications

§113.4.1(M) Defective Rails

(a) Rails removed from track on account of any defects listed in FRA §213.113(a), except end defects described in Paragraph (c) below, must be marked "NG" (no good) and a torch mark made in the head of the rail.

(b) Rails removed from track with end defects, such as bolt hole cracks or head-web separations where a portion of the rail end is not physically broken out, must have the top of the rail head noticeably damaged at the location of the defect, using a cutting torch or power saw to insure that a rail of this type is not returned to service without cropping off the defective end.

(c) "Reroller Rails/Rail Steel No. 1" are rail steel materials that are recycled as used to fabricate other steel products to include bars and shapes. Reroller rail generally has a higher value than rail scrap. Reroller rail includes:

- Standard section tee rails with a weight of 50 lbs/yard or greater which are free of all attachments;
- Rails that have no excessive pitting;
- Rails that are free of all debris (e.g., concrete, mud, asphalt, etc.);
- Rails that are not bent and twisted;
- Ferrous materials that do not contain frogs, switches and guard rails;
- Rails that do not have split heads and broken flanges;
- Pieces of CWR, provided no weld is over 9" from the end of the rail; or
- As specified by the Institute of Scrap Recycling Industries.

(d) Defective rails should be immediately removed from the right-of-way to the approved MassDOT secured scrap material storage area.

§113.4.2(M) New Rails

Class of Rail	Use
Medium-Hard Rail* Standard Rail (HB310)	In all tracks.
Head-Hardened Rail	For curves 3º and over, mainline turnouts, grade crossings, special trackwork, tunnels, and other locations as specified by the MassDOT Rail and Transit Division.

Notes:

* Standard Rail - standard rail that conforms to latest AREMA Specifications.
* Head-Hardened Rail - prime rail that is fully quenched and tempered in the head area only to increase hardness and strength. Head-hardened rail rolled by PST (Bethlehem Steel Company) will be marked "HH" to the right of the heat number. Head-hardened rail rolled by Rocky Mountain Steel Mill (CF&I Company) will be marked "DH" to the right of the heat number.
* Head-hardened markings furnished by any other manufacturers shall be approved by the MassDOT Rail and Transit Division.

§113.4.3(M) Cropped or Relay Rails

(a) Rails removed from track having only end defects, such as bolt hole cracks or head-web separations within joint bar areas, may be used without restrictions after defects have been eliminated by cropping (see §113.11(M)).

(b) Relay rail should be checked against the rail wear table given in §113.2.1(M) prior to installation.

(c) Any relay rail installed in main track that carries passenger trains, or is a hazardous material route, shall be inspected for internal rail defects if the operating speed is Class 3 or higher.

(d) If a valid search for internal defects cannot be conducted before expiration of time or tonnage limits given in FRA §213.237(a) or (c), reduce operating speed to a maximum 25 MPH until such time as the valid search can be made.

§113.5(M) Disposition and Shipment of Rails

(a) Rails released from renewals and retirements must be disposed of as authorized by MassDOT.

(b) Other track materials (OTM) must be removed from the individual rails before loading rail onto railcars or trucks (see §100.3(M)).

(c) For shipment, relay rails may be loaded head up with wood stripping between layers.

§113.6(M) Distributing Rail

(a) Rails and OTMs should be unloaded in a position as close as possible for laying to minimize further handling.

(b) Rails should be placed parallel with the track on their base to avoid excessive bending or damage. Care should be taken to avoid placing rails on manhole covers, on signal cables and conduits, or close to air lines.

(c) Rail is not to be stored between the running rails unless conditions do not allow rail placement outside the track off the ends of the ties. Rail heads should not be above the running rail.

(d) CWR ends must be offset and blocked to allow for thermal expansion.

(e) In yards and at locations where employees must walk close to the track, rail should be placed as near to the ends of ties as possible to avoid obstructing walkways.

(f) Any time rail and OTM is distributed along the right-of-way, the Transportation Department must be notified so as to include in a Division Notice.

§113.7(M) Preparation and Care

(a) As far as practicable, track should be placed in good line and surface prior to rail renewals. Programmed tie renewal shall be accomplished before laying rail. Track to be laid with CWR should be fully ballasted, and preferably, programmed tie renewals should be completed in advance of rail laying.

(b) Rails should be examined prior to laying in track to detect any sharp bends, damage, or surface conditions that will make them unserviceable.

(c) Care of rail should be taken the day on which it is laid, so that no damage to rail or fastenings will result from continued use under normal traffic. Loose ties should be tamped to a good bearing under the rail immediately behind rail laying operations.

§113.8(M) Laying Jointed Rails

(a) Jointed rails should be laid, one at a time, with space allowance for expansion being provided between rail ends in accordance with the following table:

Jointed Rail Expansion Tables	
39' Rails	
Rail Temperature (°F)	**Rail End Space (Inches)**
Below 6	5/16
6 to 25	1/4
26 to 45	3/16
46 to 65	1/8
66 to 85	1/16
Over 85	None

78' or 80' Rails	
Rail Temperature (°F)	**Rail End Space (Inches)**
Below 30	5/16
31 to 45	1/4
46 to 60	3/16
61 to 72	1/8
73 to 85	1/16
Over 85	None

(b) Rails greater than 80' and less than 400' in length, must be expanded and anchored as CWR.

(c) To insure the required space allowance, rail ends should be brought squarely together against approved expansion shims of proper thickness and the rail joints applied before spiking and anchoring.

(d) Space between rail ends for insulating joints (paper and poly types) should only be sufficient to permit insertion of standard end posts.

(e) An approved rail thermometer shall be used. The person in charge shall see that rail temperature is checked frequently and that proper rail expansion shims are used.

(f) Jointed rails should be laid, one at a time, with space allowance for expansion being provided between rail ends.

(g) To insure the space allowance required, rail ends should be brought squarely together against approved expansion shims of proper thickness and the rail joints bolted before spiking.

(h) An exception to the requirement of laying one rail at a time is to expedite rail installation no more than 180' of rail (5 @ 39' rails) may be bolted together prior to being installed in track, provided that the proper rail end spaces are maintained according to §113.9(a) above.

(i) Space between rail ends in insulated joints should only be sufficient to permit installation of standard end posts.

(j) An approved magnetic rail thermometer shall be used to determine the rail temperature. The thermometer is to be attached to the web of the rail that is shaded from the sun's rays for a minimum of 5 minutes until an accurate temperature reading can be achieved. Rail thermometer should be placed on the smooth surface of the web and not on any raised brand.

(k) Rail should be laid with joints staggered 13' to 15'. Permissible variations are as follows:

  (1) Through turnouts and at insulated joints;

  (2) Rails laid with the joints of one line of rail opposite the middle of rails in the other line in accordance with former standards need not be relocated until out-of-face rail renewals are made; and

  (3) At other locations as directed by the MassDOT Rail and Transit Division.

(l) Rails less than 18' in length should not be used in main tracks, except that rails not less than 14' may be used for:

  (1) Connections within turnouts and crossovers;

  (2) Temporary closures;

  (3) Temporary replacement of broken rails. Rails not less than 14' in length used in accordance with previous standard practice need not be removed until rails are changed or re-laid.

(m) Placing bolted joints in or closer than 30' from the edges of road crossings, within the limits of switch rails, frog guard rails, or the ends of open deck bridges, trestles, or viaducts is prohibited (unless approved by MassDOT Rail and Transit Division).

(n) Rails of the same section should be used on open deck bridges, through road crossings, through paved track areas of station platforms, through areas of direct fixation track, and to the greatest extent possible in turnouts and crossovers.

(o) Rails of unequal wear and different sections must be brought to an even surface at joints on the tread and gage side of the rail by welding. When shimming is required to run off the difference in height of rails, the requirements of §129.0(M) must be met.

(p) The use of shims or spring washers between the web and the joint bar to align the gage sides of rail heads, or the use of acetylene torches, or grinding to manufacture, or change the dimensions of compromise joints, is prohibited. Adjustments to the tread and gage side of the rail head must be accomplished by:

(1) Compromise joints of approved design.

(2) By welding the rail head.

(q) When necessary to make a temporary connection for the passage of a train at normal speed, the connection must be made with a piece of rail not less than 14' long. Use compromise or standard joints with the full number of bolts and with all rail holding spikes driven. Use of switch points to make temporary connections when laying rail is prohibited.

§113.9(M) Rail End Bolt Holes

(a) Holes must be drilled in accordance with AREMA recommended standard practice and the following:

(1) Bolt holes shall be drilled with the joint bars removed by marking the location of the center of the hole with a proper size template block or by drilling through an approved template.

(2) When bolt holes are drilled, a uniform feeding pressure should be maintained as per manufacturer's instructions.

(3) An environmentally sensitive lubricant should be used throughout the drilling process.

(4) Bolt hole sizes and drillings are found in the rail end drilling table given in §113.1(M).

(5) After drilling is completed, bolt holes should be brushed out and inspected. Any burrs or chipped edges should be removed by chamfering or filing to a smooth edge around the entire circumference of the bolt hole.

(6) If jointed rail is to be welded, rail ends should be drilled in such a manner as to provide for closure by field welding (no edge of hole closer than 6" to the joint).

(7) In those instances where the joint will not be welded, all holes in the joint bar will be drilled and fully bolted.

§113.10(M) Cutting and Electric Arc Welding of Rail

(a) For cutting of tight rails in CWR see Appendix A, "Continuous Welded Rail (CWR) Procedures."

(b) The tools which may be used for cutting rails are listed below:

(1) Power saws with approved guide attachments and proper PPE.

(2) Gas cutting torches, in emergency only in accordance with FRA §213.122.

(c) Electric arc welding is prohibited on any portion of the rail, except as listed below:

(1) Welding of engine burns. Engine burns deeper than 3/8" should not be welded. If there are more than four engine burns within a 39' rail, the rail should be changed out.

(2) Application of welded bonds.

(3) Top of rail within limits of joint bars (batter and rail ends).

(4) Gas welding of rail is prohibited.

(d) Any rail damaged by torches must be promptly removed from track.

(e) Except for the welding of engine burns in accordance with approved methods, and except for application of welded bonds, gas or electric arc welding is permitted only on the top of the rail within the limits of the joint bars.

§113.11(M) Bonding Rails for Track Circuits

(a) Except in an emergency where rails are bonded for track circuits, no rail bonds shall be broken or rails removed unless a Signal Maintainer is notified or present.

(b) Signal bonds shall not be applied to the rail web or base; only on the rail head.

(c) In an emergency, a broken rail, switch point, or frog may be renewed without waiting for the Signal Maintainer. In such cases, the joints shall be tightened to make as good contact as possible with the rails and the Signal Maintainer notified that the rail bonds have been broken.

(d) If a broken rail is replaced within the starting circuit of automatic highway crossing protection, the track shall not be restored to service until all trains approaching the crossing have been:

  (1) Instructed to be prepared to stop prior to passing over the crossing involved; or

  (2) Until a qualified person under FRA §213.7(d)(1) is provided to move train traffic at the crossing; or

  (3) The Signal Maintainer has applied all rail bonds and verified the continuity of the circuit.

§113.12(M) Maintenance of Rail by Grinding

(a) Rail grinding must be accomplished with profile grinders or production grinding units.

  (1) Hand grinding should be limited to small areas where the use of profile grinders is not practical.

  (2) Out-of-face grinding must be performed with production grinding units.

(b) Production grinding is required to remove surface anomalies such as scale, flakes, checks, shells, and corrugations on the rail head and to re-profile the rail head.

(c) In special trackwork a combination of production grinding and hand grinding may be required.

(d) Grinding of rail should be performed at regular intervals based on the condition of the rail, location (such as grades and curves), the number, and type of trains, and the accumulated tonnage at a particular location.

(e) All grinding on wooden open deck bridges shall be approved by MassDOT Rail and Transit Division before any work begins. Rail grinding on bridges (ballast deck) is permitted provided that proper precaution is taken against fire as given below:

  (1) Grinding shall only be performed when there is no highway or river traffic directly under the area to be ground.

  (2) The rail grinding crew has a supply of water and other fire suppressants to protect against fire.

  (3) After grinding, the entire structure is re-inspected for possible “hot spots” or fire.

  (4) Production grinding of rail on timber trestles is prohibited.

(f) High rail truck with water tank shall follow rail grinder to inspect for hot spots and slag.

(g) MassDOT Rail and Transit Division shall approve lubricants and/or friction modifiers to be used after grinding curves on:

  (1) Gage face on the high rail

  (2) Top of rail (TOR) on the low rail.

§113.13(M) Repair of Welds and Rail Head Depressions by Welding or Grinding

(a) Field and shop welds shall be inspected for batter. Maintenance welding and grinding shall be performed as required.

(b) The depth of low spots and depressions around welds shall be measured with a 36" straight edge and taper gauge. Maintenance welding and grinding shall be performed as required.

(c) The preferred method of removing low spots, low areas, and engine burns (but NOT engine burn fractures), in the rail head profile is by building up the rail head by welding.

(d) Any engine burn should be repaired as soon as practicable before rail and tie damage occur. Engine burns 3/8" or greater require removal and replacement of the rail.

§113.13.1(M) Cross Cutting (Slotting) of Bolted Joints

(a) Permanent bolted joints shall be inspected and rail ends slotted as required to remove metal flow and prevent end chipping.

(b) When rails are replaced at the location of a permanently bolted joint, the rail ends should be slotted.

(c) The frequency of grinding or slotting rail ends at permanently bolted joint locations may increase due to traffic and as other local conditions require.

§113.14(M) Passing Trains Over Broken Rails and/or Pull-Aparts

(a) When passing trains and/or locomotives over broken rails and/or pull-aparts, the Operating Railroad Company MOW personnel shall comply with the following information.

(b) Persons not fully qualified to supervise certain renewals and inspect track as required in Paragraph (a) of this section, but with at least one year of MOW or signal experience, may pass trains over broken rails and pull-aparts provided that:

  (1) The track owner determines the person to be qualified and, as part of doing so, trains, examines, and re-examines the person periodically within two years after each prior examination on the following topics as they relate to the safe passage of trains over broken rails or pull-aparts: rail defect identification, crosstie condition, track surface and alignment, gage restraint, rail end mismatch, joint bars, and maximum distance between rail ends over which trains may be allowed to pass. The sole purpose of the examination is to ascertain the person's ability to effectively apply these requirements and the examination may not be used to disqualify the person from other duties. A minimum of four hours training is required for initial training;

  (2) The person deems it safe and train speeds are limited to a maximum of 10 MPH over the broken rail or pull apart;

  (3) The person shall watch all movements over the broken rail or pull apart and be prepared to stop the train if necessary; and

  (4) Person(s) fully qualified under FRA §213.7 are notified and dispatched to the location promptly for the purpose of authorizing movements and effecting temporary or permanent repairs.

§115.0(M) RAIL END MISMATCH

Rail shall be maintained so that the mismatch of rails at joints may not be more than that prescribed in the following table:

Rail End Mismatch Maintenance Limits		
Class of Track	Any mismatch of rails at joints may not be more than the following:	
	On the head of the rail ends (Inches)	On the gage side of the rail ends (Inches)
1 – 5	1/8	1/8

Rail End Mismatch

§117.0(M) RAIL END BATTER/BEVELING OF RAIL ENDS

(a) Rail end batter is the depth of depression in the rail head near the end of the rail. It is measured by placing an 18" straight edge on the head of the rail at the rail end, without bridging the joint and measuring with a taper gauge the maximum distance between the bottom of the straight edge and the top of the rail head.

(b) When rail end batter is detected, it should be monitored and corrected when reaching the limits given below:

(1) See the following table:

Rail End Batter Maintenance Limits		
Class of Track	Rail End Batter May Not Be More Than (Inches):	Crop Bolt Holes and Rail Ends to Remove Batter if Batter Exceeds Values Below (Inches):
1 - 2	1/4	3/8
3 – 5	1/8	1/4

(2) Rail end batter should be repaired by a qualified welder using an electric arc welder.

(3) In Classes 3-5, rail ends that have 3/8" or more rail batter shall not be welded and shall be cut out and scrapped.

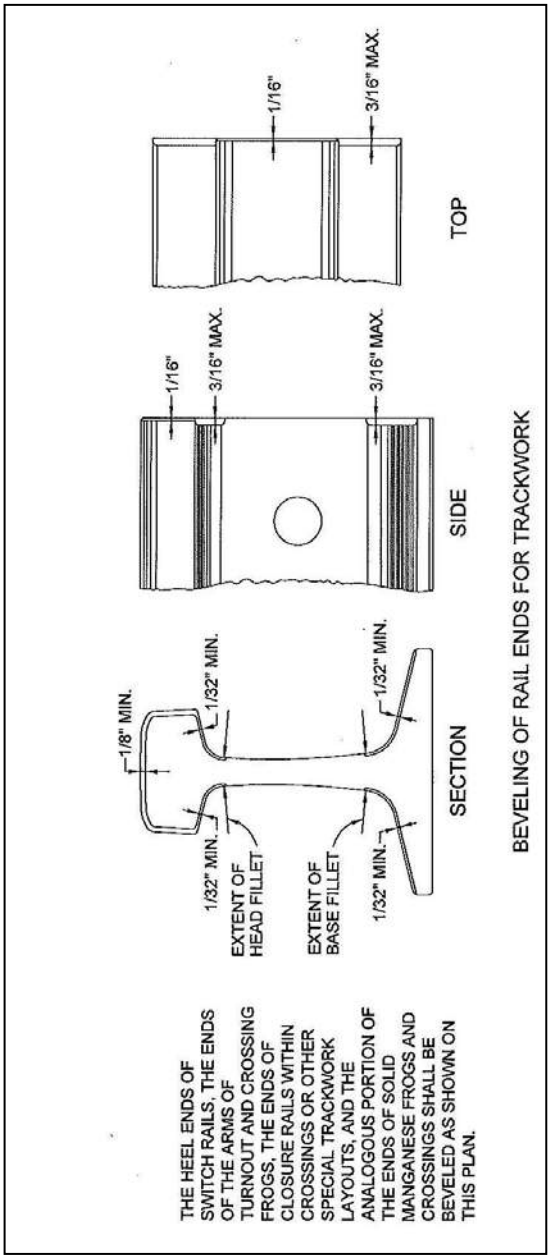
(4) After welding, rail ends shall be ground and slotted as shown in Paragraph (c).

(c) To reduce chipping or spalling due to overflow of steel under traffic, the rail end faces should be cross-cut by grinding with a 1/8" beveled slotting wheel to a depth of not less than 3/16" below the surface of the head.

(1) The maximum cut should not be wider than 1/8".

(2) If the rails are not in contact, the overflowed metal should be removed from both end faces by grinding 1/16" from the ends of both rails.

(3) See following figure as developed by AREMA.



BEVELING OF RAIL ENDS FOR TRACKWORK

§118.0(M) RAIL LUBRICATION

(a) The gage face of the running rail in track or in special trackwork must be lubricated as follows:

(1) Running rail in curve locations where there is significant gage face wear on the high rail, or significant flow on the low rail, shall be lubricated with a wayside lubricator or as specified by the MassDOT Rail and Transit Division.

(i) Lubricate high rail gage face

(ii) Lubricate low rail top of rail

(2) When changing switch points, stock rails, and frogs in heavily used routes in interlockings, regardless of turnout size or type, lubricate new components by hand.

(3) After grinding or welding repairs to switch points and/or frogs, lubricate components by hand.

(4) When production grinding, ensure that in curves both rails are lubricated on the last grinding pass.

(b) When lubricating rail, care should be taken to control the amount of lubricant being used to avoid migration to the running surface of the rail.

(c) At wayside lubricator locations, install geotech fabric to prevent fouling of ballast. Dispose of fabric in accordance with local, State, and Federal regulations.

(d) Locate lubricators no closer than 500' from grade crossings with active warning devices.

(e) When installing lubricators, care should be taken not to install steel-mesh hoses in signal territory.

(f) Both rails should be lubricated as excessive lubrication of the high rail and poor lubrication of the low rail can produce high lateral forces and low rail rollover resulting in derailment.

(g) Use only approved environmentally-friendly lubricants per manufacturer's recommendations.

§119.0(M) CONTINUOUS WELDED RAIL PROCEDURES

See Appendix A, "Continuous Welded Rail (CWR) Procedures."

§121.0(M) RAIL JOINTS

§121.1(M) Field Welding of Rail Joints

(a) When performing rail maintenance, reduce the quantity of joints in track by laying CWR and field welding joints wherever possible.

(b) Thermite and flash butt are acceptable methods for in-track field welding.

(c) Thermite and flash butt welding shall be performed in accordance with the supplier's recommended procedure.

(d) When it is necessary to install plug rails, the plug rails should be at least 13' in length.

(e) Bonded insulated joint rail assemblies shall be field welded.

(f) Whenever possible it is desirable to field weld all turnouts and special trackwork.

(g) If it becomes necessary to apply temporary joint bars in CWR, the end bolt hole in each rail must not be drilled, as this would prevent subsequent field welding. Additional rail anchors must be applied to this joint in accordance with §125.0(M).

(h) Field welding on open deck bridges is permitted provided that proper precaution against fire is taken and only allowed with the prior approval of MassDOT Rail and Transit Division.

§121.1.1(M) Thermite Field Welding

(a) When using the thermite field welding process:

(1) Ensure that rail ends are secured against movement from thermal expansion or contraction, or from other causes. Use a hydraulic expander to maintain the rail end gap and rail alignment.

(2) Saw cut rail ends to be welded. If a torch cut rail is to be welded at least 2" of rail behind the torch cut must be cut off with a saw before the weld is made.

(3) No thermite weld shall be made:

(i) If the air temperature is below 32°F.

(ii) In inclement weather (rain or snow).

(4) Required location of field welds:

(i) Within 14' of a field weld in the same rail.

(ii) Within 4' of a plant weld in the same rail.

(iii) Within 10' of the centerline of any joint (except bonded insulated joints where no weld shall be made within 7' of the centerline of the joint).

(iv) Within 6" of a bolt hole.

(v) Within 6" of a weld that has been cut out.

(vi) On or within 4-1/2" of a tie plate or concrete tie rail seat.

(vii) Within a grade crossing without the permission of MassDOT Rail and Transit Division.

(5) General welding procedures are as follows:

(i) Prior to installing the molds, make a visual inspection of the two rail ends to ensure there are no bent rails or other defects such as cracks, splits, pipes, etc., which could cause, or later be interpreted as a defective weld.

(ii) Check the gap to ensure that it meets the specification of the weld kit manufacturer.

(iii) Align the rail ends.

(iv) Remove foreign matter, luting compound, and/or moisture from the molds or crucible.

(v) If a hydraulic expander has been used, do not release it until the weld has cooled to 500°F or less. The expander shall be released gradually.

(vi) No train traffic shall be allowed to pass over the weld, nor shall there be any disturbance of the track or rail in the area of the weld, until the weld has cooled to 500°F or less.

(6) The grinding and finishing of the weldment are as follows:

(i) The top and sides of the head of the rail at the weld shall be ground flush with the parent metal.

(ii) The weld in the web and base should be ground ***only*** to remove notches created by offset conditions, sharp protrusions, and gouges. These should be blended into the contour of the weld collar to eliminate stress risers.

(iii) In the case of continuously supported rail, the bottom and sides of the base must be ground flush with the parent metal.

(iv) Overheating the rail when grinding must be avoided. If a weld has cooled to below 500°F it must be ground so as to not increase the temperature back above 500°F.

(v) Finish grinding shall be conducted when the weld temperature is less than 200°F.

(7) Welds shall be identified on the rail with a unique number and the date using a highly visible paint or paint stick to allow identification of a particular weld.

(8) Welds shall be inspected once completed and ground.

(i) A visual inspection shall be conducted immediately. This inspection shall look for voids, nicks, gouges, sharp protrusions, or other obvious surface defects.

(ii) An inspection of the alignment of the weld shall be conducted using a 36" straight edge centered on the weld. The weld will meet the following criteria:

1. There shall be no dip.
2. The crown shall not measure more than 3/50" at a point 18" from the weld.
3. The horizontal misalignment (measured by placing the straight edge on the running side of the head) shall not measure more than 3/50" at a point 18" from the weld or at the weld if the misalignment causes a gap at the weld.

(9) An ultrasonic inspection of the weld shall be conducted within 24 hours of the completion of the weld.

(b) Field welding on open deck bridges is permitted provided that all the following conditions are met:

(1) A qualified contractor and/or Operating Railroad Company individual using a 17 lb. dry chemical ABC extinguisher is available to protect against fires.

(2) A qualified contractor and/or Operating Railroad Company individual must be present for a period of at least one hour after the last field weld is finished and ground.

(3) An extra 17 lb. ABC extinguisher must also be readily accessible as a backup.

(4) While extinguishing any fires, the qualified contractor and/or Operating Railroad Company individual must stand upwind and aim the chemical at the base of the fire.

(5) A qualified contractor and/or Operating Railroad Company individual must be present during the entire welding operation from beginning of welding process to at least one hour after the last field is finished and ground.

(6) Flash butt welding, shearing and grinding shall only be performed when there is no highway or river traffic directly under the area of the welding.

(7) Bridge timber spacing may be more restrictive than that of ballasted track. Welding shall not be performed if the tie crib is less than 5-1/2" in width or as approved by MassDOT Rail and Transit Division.

(8) Welds on open deck bridges must be made as close to the center of the crib as possible. The minimum distance between center of weld and edge of tie shall be 2-3/4".

(9) After welding, the entire structure should be inspected for possible “hot spots” or fire.

§121.1.2(M) Electric Flash Butt Welding

(a) In general, thermite field requirements apply to this process along with the following additions:

(1) All electric flash butt welding consumes rail (1-1/4" – 1-1/2" at each weld location).

(2) The weld must be at least 400' from grade crossings, turnouts or other fixed objects in the track.

(3) Anchors or resilient fasteners must be removed from at least 200' of rail on both sides of the weld before the weld is made.

(4) Care must be taken to avoid skewing ties by binding the rail against the shoulder of the tie plates when the rails are pulled together.

(5) Care must be taken to avoid damaging elastomeric tie pads by sliding the rail through the tie seat area of concrete ties when the rails are pulled together.

(6) If new rail is to be welded by the electric flash butt welding method, this decision should be made before the rail is laid and distressed so that the right amount of expansion can be calculated.

(7) When CWR strings in track are laid in track and expanded to reach a preferred rail neutral temperature (PRNT), the actual required expansion shall be reduced if the CWR strings are to be electric flash butt field welded. The amount of expansion required for a particular CWR string shall be calculated using Appendix A, “Continuous Welded Rail (CWR) Procedures.” The amount of rail to be consumed when making the two electric flash butt field welds at each end of the string shall be subtracted from the amount calculated in Appendix A, “Continuous Welded Rail (CWR) Procedures.” The resulting “net” rail expansion shall be achieved in the field when distressing and/or laying the string before welding.

§121.2(M) Bolted Rail Joints

(a) Rail ends shall be fastened together by bolted standard, compromise, or insulated joints.

(b) The use of shims or spring washers between the web of the rail and the joint bar to align the gage sides of rail heads is prohibited.

(c) The use of acetylene torches or grinding to reconfigure or change the dimensions of standard and/or compromise joint bars is prohibited.

(d) Compromise joint bars of an approved design shall only be used to join rails of the respective sections.

(e) If rail end mismatch exists after applying approved joint bars, the rail head and gage face surfaces may be adjusted by electric arc welding the smaller rail and grinding to finish the weld. Do not grind the larger rail section.

(f) Each rail joint, insulated joint, and compromise joint must be of a structurally sound design and dimensions for the rail on which it is applied.

(g) If a joint bar is cracked, broken, or because of wear allows excessive vertical movement of either rail when all bolts are tight, the joint bar shall be changed.

(h) Each joint bar must be held in position by track bolts tightened sufficiently to provide firm support for abutting rail ends and to allow longitudinal movement of rails in the joint to accommodate expansion and contraction due to temperature variations.

(i) In track with conventional jointed rail, each rail shall be bolted with all joint bar bolt holes filled.

(j) If a permanent joint connection is made between CWR and bolted rail, all joint bar holes must be filled.

(k) No rail or joint bar having a torch cut or burned bolt hole may be used in track.

(l) When a bolt is changed in a joint in Track Classes 1-5, or a frog bolt is changed, then all bolts in the connections shall be checked and retightened as required.

(m) Whenever possible, new bolts, nuts, and spring washers should be used when new or relay joint bars are applied.

(n) Lubricate joint bars with environmentally-approved lubricate. Tighten all bolts, working from center of joint bars outward. During this final tightening, tap the toes of the bars inward with a sledgehammer.

(o) In locations of elastic fasteners, the appropriate clip will be used to properly fasten the ties through the joint area.

(p) Description of joint bars:

(1) Standard bolted rail joints consist of either head free or head contact standard bars or compromise joint bars held in position by track bolts having sufficient tension to firmly support abutting rail ends, but not too tight to prevent longitudinal movement in joints to accommodate expansion and contraction due to variation in rail temperature.

(2) Head free bars must have the inner surface of the head of the bar held tightly against the rail head fillet with the heel of the bar standing out the proper distance from the base fillet, where all of the “draw-in” for wear is concentrated.

(3) Head contact bars must have the top surface of the bar held tightly against the fishing surface under the rail head outside of the rail head fillet area. Bars must be secured in a vertical position without “cocking.”

(q) Application of standard bolted joint bars will be as follows:

(1) Joint bars shall be applied with their full number of bolts, nuts, and spring washers according to the standard plans and specifications.

(2) New bolts, nuts, and spring washers should be used when new or reformed joint bars are applied or renewed out-of-face.

(3) Grease shall be applied to the fishing area of the rails, for the full length of the joint bars.

(4) When initially applying joint bars, the bolt tension should be brought in the range of 20,000 to 25,000 lbs. and for subsequent retightening from 15,000 to 20,000 lbs. This may be approximated by an average individual with a 36" track wrench.

(r) Application of head free joint bars will be as follows:

(1) Set bars in position, insert all bolts, and apply spring washers and nuts by hand.

(2) Tighten up the two center nuts with a power track wrench in high gear without fully tightening to avoid locking bars in an improper position.

(3) Strike the bead of the heads of both inside and outside bars at both ends with a hammer to force the inside faces of the bars tightly against rail head fillets. Do not strike the toe of the bar, as this tends to force the toe of the bar outward.

(4) Tighten remainder of bolts from center of joint bars outward in high gear.

(5) Tighten all bolts in low gear, working from center of joint bars outward. During this final tightening drive the toes of the bars inward by tapping with a spike maul or sledge.

(6) By following the above procedure, proper contact will be obtained between the inner face of the bar and the rail head fillet. Also, the heel of the bar will stand out the proper distance from the rail base fillet.

(s) Application of head contact joint bars will be as follows:

(1) Set bars in position on rail; insert all the bolts, nuts, and spring washers by hand.

(2) See that the bars are in a vertical (uncocked) position as one of the center bolts is tightened by:

(i) Inserting a bar or drift pin in a bolt hole (necessary only when applying a 131 lb. bar).

(ii) Tapping toes of joint bars as bolt is tightened.

(3) Tighten all bolts, working from center of joint bars outward. During this final tightening drive the toes of the bars inward by tapping with a spike maul or sledge so that their vertical position is maintained.

(t) Maintenance of joints:

(1) Drilled ends of new rails are to be ground to remove burrs at the mills.

(2) To avoid chipping or spalling under service due to overflow of steel, the rail end faces should be cross-cut by grinding with 1/8" wheel to a depth of not less than 3/16" below the surface of the head. If the rails are not in contact, the overflowed metal should be removed from the end face of each rail. If the rails are in contact, only one pass should be made removing approximately 1/16" from each rail.

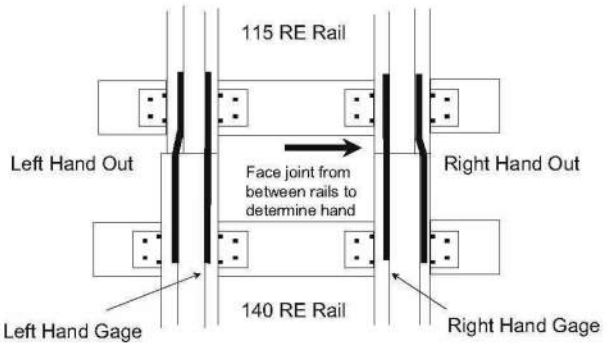
(3) When bolted joints are applied, other than insulated joints, the bolts should be tightened at the time they are applied, retightened within a week and again within a month after application.

(4) Bolts should be retightened periodically at intervals of not more than 1 year and in all cases following program track raising or surfacing.

(5) To prevent undue rail stress on account of expansion or contraction at the changes of seasons and wide temperature changes, sufficient joint bars should be loosened to permit the rail to adjust itself, immediately after which bolts should be retightened. Where necessary, a piece of rail should be cut out to avoid heat kinks or buckling of track.

(6) Wear in fishing spaces of rail should be compensated for by the application of oversized joint bars.

(u) Compromise joints are specified as left or right hand as shown in the following diagram. To determine where a left hand (“LH”) or right hand (“RH”) lays, stand in the center of the track and face the joint to be compromised.



Compromise Joint Example

§121.3(M) Insulated Rail Joints

(a) For new work or rail renewals in track circuit territory, insulated joints shall be located as follows:

(1) Insulated joints shall be staggered not more than 60" nor less than 24".

(2) Insulated rail joints at highway grade crossings shall be located in accordance with the material supplier's standard plans.

(b) For the application of Bonded Insulated Joints (Glued Insulated Joints), see the following:

(1) Glued plug insulated joints are required on all concrete tie tracks.

(2) When utilizing insulated plug rails, install the shortest plug rail available so as to minimize the number of joints and/or wells added.

(3) Conventional rail joints adjacent to bonded insulated joint rails should be field welded.

(4) All bonded insulated joints are to be installed as suspended joints. If it is absolutely necessary to install the insulated joint as a supported joint on a wood crosstie, an approved type rubber tie plate must be used under the joint. The end posts should not project above or beyond rail heads and should be trimmed with a hack saw.

(5) Double shoulder tie plates or elastic fastener tie plates should be used on the two wood crossties supporting suspended bonded insulating joints.

(6) Rail holding spike heads must be in reverse position and must be carefully driven to ensure that spike head is not in contact with the bar, which could result in the joint's being short circuited. All bonded insulating joints will have plate holding spikes installed.

(7) Joints installed with elastic fasteners shall have the correct clips (modified "e" clip) applied to prevent possible damage to the joint.

(8) No attempt should be made to tighten bolts in bonded insulated joints. In the event the bolts in the joint become loose, the joint should be replaced.

(9) Any rail head overflow at a bonded insulated joint is to be removed by grinding. Extreme care must be exercised to ensure that the end post is not damaged. The overflow should be ground only to the rail end, so that the joint gap will not be greater than the original gap. A cross grinder/slotter should not be used to remove the overflow.

(10) Bonded insulated joints will be considered as welded rail for purposes of compliance with the anchoring requirements of §125.1(M).

(11) Glued plug insulated joints shall be used in CWR (unless approved by MassDOT Rail and Transit Division).

(c) For the application of Polyurethane Coated Steel Insulated Joints (Poly Joints) see the following:

(1) Polyurethane coated (poly) steel insulated joints may be used permanently in track where the use of a bonded insulated jointed rail is not practical.

(2) Whenever possible, poly insulated joints are to be installed as suspended joints.

(3) The top of the poly joint must be set first into the fillet area of the rail. Bolts should be applied and tightened from the center out to the end of the bar.

(4) Rail holding spikes shall be reversed and not driven up against the poly joint.

§123.0(M) TIE PLATES

(a) Tie plates shall be installed and centered under running rails on all wood crossties, switch timber, and bridge timber.

(b) The preferred tie plate is a 14" double shoulder canted (1:40) plate (DSC).

(c) Tie plates with different cants and flat plates shall not be mixed.

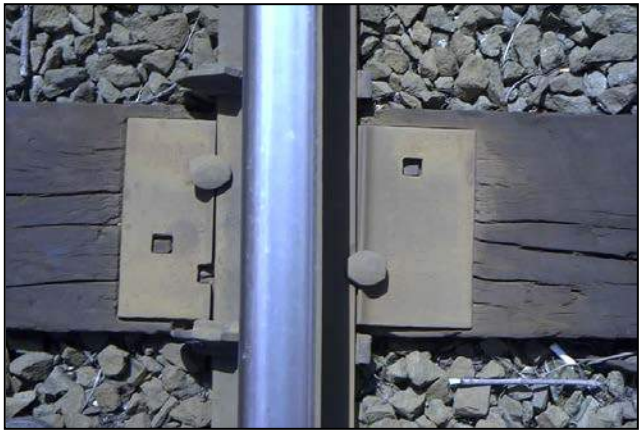
(d) Canted tie plates shall be installed so that the rail cants towards the centerline of track.

(e) Tie plates must be placed square and tight to the base of the rail and no portion or part of the shoulder can be under the base of the rail.

(f) No metal object that causes a concentrated load by solely supporting a rail shall be allowed between the base of the rail and the bearing surface of the tie plate (e.g., tie plate shoulders, spikes, ballast, etc.).

Tie Plate with Anchors Applied Correctly

Tie Plate with Anchors Overdriven



Box Anchored Ties with Anchors Applied Correctly

§124.0(M) TIE PADS

The use of tie pads, under the tie plates on open deck bridges, may be used only with the approval of the MassDOT Rail and Transit Division.

§125.0(M) RAIL ANCHORS/ELASTIC FASTENERS

§125.1(M) Anchor Placement

(a) Rail anchors shall be applied as follows:

(1) Anchors shall be applied on both rails and on the same side of the tie. Where special applications may be necessary, other arrangements may be used with permission of the MassDOT Rail and Transit Division.

(2) Wherever practicable, rail anchors shall be applied from the gage side of the rail.

(i) In turnouts, drive on type anchors shall be applied to switch stock rails from the field side of the track. Care must be taken in application of anchors so as not to foul switch rods.

(3) When adjusting or laying rail, the necessary anchor pattern shall be applied immediately as the rail is adjusted.

(4) Anchors should be fit tightly against sound ties.

(5) When ties at a joint cannot be anchored because of interference with a joint bar, there shall be no anchors applied to the affected joint.

§125.2(M) Fasteners Required

(a) Rail anchors should be driven just far enough so that the locking lip or groove of the anchor snaps into place on the base of the rail.

(b) A sufficient number of anchors must be applied in a pattern to effectively control longitudinal rail movement. See next pictures for typical fastening and anchoring systems.

Elastic Fastener: Pandrol Fast Clip

Elastic Fastener: Pandrol E-Clip

(c) Insufficient anchors may result in longitudinal rail movement and allow changes in rail neutral temperature (RNT) in CWR.

(d) The movement of rail can result in changes in line and surface, which may create a hazardous condition.

(e) Additional anchors must be applied if there is a standard anchor pattern and there is evidence that rails are still moving longitudinally under traffic.

(f) It should be recognized that when track is raised out-of-face, the resistance to longitudinal movement is reduced and additional anchors may be required to avoid undue rail and tie movement.

(g) Basic anchor requirements in CWR track:

(1) Every other tie shall be box anchored in all CWR tracks.

(2) Box anchor every tie in curves 3° and over.

(3) Additional anchors may be added at designated locations in anchored track or elastic fastener territory as required if longitudinal movement of the rail is detected.

(h) On main tracks the number of anchors to be applied when CWR is laid and maintained is as follows:

(1) When using rail anchors, box anchor every wood tie 200' in each direction from:

(i) Ends of CWR strings.

(ii) All joints to include glued plug insulated joints.

(iii) Turnouts, crossovers, and other special trackwork.

(iv) Rail track crossings.

(v) Public and private highway grade crossings.

(vi) Transitions to locations with elastic fasteners.

(vii) Transitions to locations of tie type change (e.g., wood to concrete or wood to steel).

(viii) Open decks on bridges, where the timbers are hooked and blocked in accordance with §119.1(M).

(2) To the extent practical, fully box anchor all ties in CWR within switch, turnout, and crossover areas.

(i) Rail anchoring systems shall be used on open deck bridges, trestles, and viaducts as determined by the MassDOT Rail and Transit Division.

(j) All jointed rail tracks require:

(1) A minimum of 40 anchors for a 78' rail and be boxed on 20 ties.

(2) A minimum of 16 anchors per 39' rail and be boxed on 8 ties.

(3) A minimum of 10 anchors per 33' rail and be boxed on 5 ties.

(4) No anchors will be placed in grade crossing panels (unless approved by MassDOT Rail and Transit Division).

(k) A fully clipped wood tie, bridge timber, or fully clipped and insulated concrete tie with an elastic fastener, is considered equivalent to a box anchored wood tie.

§125.3(M) Anchor Maintenance

(a) Ineffective anchors shall be removed and replaced when installing railing.

(b) Rail anchors must have full bearing against the tie, or tie plate, when applied.

(c) In order to avoid damage, only proper tools or machines should be used in applying and removing rail anchors.

(d) Anchors should never be applied with a spiking hammer.

(e) Anchors should not be driven along the base of the rail with a hammer.

(f) Care should be taken not to strike the rail.

(g) When the bearing of rail anchors against the tie is disturbed by renewing or re-spacing ties or replacing rail, or the anchor was not properly applied, the anchors must be taken off and then re-applied in proper position. All anchors removed must be re-applied, and defective or broken anchors must be replaced as necessary.

(h) Proper opening between rail ends in jointed rail is maintained by the use of rail anchors.

§125.4(M) Anchor Use

New or relay rail anchors may be used at any location on the MassDOT system as long as they are designed for the rail section to which they are applied and perform as intended.

§127.0(M) RAIL FASTENING SYSTEMS

§127.1(M) Number Required

(a) Track shall be fastened by a combination of components which effectively maintains gage to the prescribed limits.

(b) Additional fasteners may be used where they are needed to hold gage and/or restrain the movement of rail (both longitudinal and lateral).

§127.2(M) Installation of Fasteners

§127.2.1(M) Elastic Fasteners/Clips

(a) All elastic fasteners shall be inserted or removed from the specially designed tie plate with an approved device such as an 8 lb. sledgehammer. ***The use of a spike maul is prohibited.***

(b) Elastic fasteners shall not be overdriven as overdriving will cause premature relaxation of the fastener.

Overdriven Pandrol E-Clip

Correctly Driven Pandrol E-Clip as End of Clip Lines Up with Edge of Tie Plate

(c) If a fastener has been overdriven or is not performing its intended function of limiting the vertical and longitudinal movement of the rail, it shall be replaced.

(d) In the case of an “e” clip, a distance of 3/8" (approximate width of a wooden pencil) between the shoulder and the face of the clip should be maintained. This clearance will prevent overdriving.

(e) When applying clips with a sledgehammer, the clip must be gently tapped to ensure proper insertion before the clip is fully seated. When removing clips with a sledgehammer, secure clip with foot and gently tap clip to remove the toe load to ensure safe removal of the clip.

(f) When installing clips, the tie must be tamped up flush with the base of the rail before driving the clip so as not to damage the clip. The clip is not to be used to pull the tie up to the base of the rail.

§127.2.2(M) Screw Spikes

(a) A 15/16" diameter lag screw shall be used to secure elastic fastener plates with 1" diameter holes to wood ties and timber. Lag screws must be screwed into a 11/16" diameter pre-drilled hole that is 6" deep. Driving of lag screws with a sledgehammer or spike maul is prohibited.

(b) As shown in the MBTA Standard Plan Book 1225, in turnouts, gage, slide, heel, frog and standard tie plates, all round holes will be filled with a screw spike except:

(1) Self-aligning frog tie plates shall have one screw spike installed on each end of each plate.

(c) Holes for screw spikes shall be pre-drilled 11/16" in diameter and 6" deep.

§127.2.3(M) Cut Track Spikes

(a) All spikes (cut spikes) shall be driven with the head pointed toward the rail, except that spikes driven against the sides of insulated joints shall be driven with the head pointing away from the rail and not be in contact with the joint bars.

(b) Spikes should not be driven at ends of insulated joints as rail movement may cause the insulated joint bar to become electrically connected to the rail.

(c) Spikes must be started vertically and squarely and driven straight. The shank of rail holding spikes must have full bearing against the base of rail. Spikes should be driven

in accordance with the AREMA Manual, Chapter 5, leaving 1/8" clearance between the spike head and the base of the rail. Do not overdrive spikes.

(d) The use of lock spikes (hair pins) are prohibited. When existing lock spikes are removed they shall be replaced with cut spikes.

(e) Care must be taken not to strike the rail, its fastenings, or signal appliances when driving spikes.

(f) Spikes in main tracks, that have a cut throat, or are deteriorated due to rust, should be replaced.

(g) All old spikes, when pulled, shall be picked up and scrapped.

(h) Track spikes shall not be driven into round plate holes.

(i) When the head of the track spike is broken off, the replacement spike should be inserted in a new location, leaving the spike stub in the tie.

(j) All spike holes shall be plugged with cedar wood plugs, or with an approved plugging material, prior to re-spiking.

§127.3(M) Rail Fasteners Required

(a) Track shall be fastened by a system of components that effectively maintains gage within the limits prescribed.

(b) When spikes or elastic fasteners are used (unless otherwise ordered by the MassDOT Rail and Transit Division), each rail shall be fastened to every tie in the following manner:

Track	**Rail Holding Spikes**	**Plate Holding Spikes or Lag Screws**
Conventional Tie Plates		
Tangent and curves up to 1°	3 (1 field side rail holding; 2 gage side rail holding)	0
Curves between 1° and up to 4°	3 (1 field side rail holding; 2 gage side rail holding)	1 (1 field side)
Curves 4° and over and curved leads on all turnouts and crossovers	3 (1 field side rail holding; 2 gage side rail holding)	2 (1 field side; 1 gage side)[(1)]
Elastic Fastener Tie Plates	**Elastic Fasteners (Clips)**	**Lag Screws**
Tangent	2 clips	2 (1 field side; 1 gage side)[(1)] (2 cut spikes – 1 in each square hole field and gage)
All Curves	2 clips	4 (2 field side; 2 gage side) (2 cut spikes – 1 in each square hole field and gage)
All track with pre-plated ties	2 clips	4 (2 field side; 2 gage side)
Note: [(1)] Apply diagonally on opposite side of clip.		

§129.0(M) TRACK SHIMS

(a) If track does not meet the geometric limits (e.g., crosslevel or profile), track shims may be installed to temporarily correct the track surface.

(b) Shimmed track must be watched carefully to ensure that shims are in place and tight, and that proper gage and crosslevel is being maintained.

(c) If shims are used, they must be removed as soon as the weather, or other conditions, permit the track to be surfaced.

(d) Tie plates must not be removed from the ties as a means of adjusting the surface or crosslevel of track.

(e) Track shims must be at least the size of the tie plate and be spiked directly to the tie with spikes which penetrate the tie at least 4-1/2".

(f) Track shims must be bored where spikes are to be driven, and made of a material approved by MassDOT Rail and Transit Division.

(g) Track shims shall be braced if the shim is over 1" in thickness.

(h) Design and materials used in braces shall be approved by MassDOT Rail and Transit Division.

§145.0(M) BRIDGE GUARD RAILS

§145.1(M) Location

(a) A bridge guard rail is a continuous line of rails, connected by bolted joints or welds. The guard rail is fastened to the crossties or bridge ties adjacent to the gage side of the running rail.

  (1) One such rail is designated in these instructions as a “Single” bridge guard rail.

  (2) Two such continuous lines of rail, one adjacent to the gage side of each running rail is designated as a “Full” bridge guard rail.

(b) Guard rails are applied between the running rails of tracks at undergrade bridges which meet the below listed criteria. Full bridge guard rails shall be installed at the following locations:

  (1) Open deck bridges.

  (2) Ballast deck bridges.

  (3) Truss bridges (all).

  (4) Moveable bridges (all).

  (5) Other locations as directed by MassDOT Rail and Transit Division.

(c) Existing bridge guard rails applied in accordance to previous standards or practices need not be changed (unless instructed by MassDOT Rail and Transit Division).

(d) When it is necessary to remove bridge guard rail to perform work, bridge guard rail will be reinstalled only where required by the above instruction.

§145.2(M) Materials

(a) Suitable scrap or relay running rail may be used. The installed rail section will be approximately:

  (1) Level, but not more than 3/4" below the top of the adjacent running rails as per MBTA Standard Plan Nos. 3060 and 3062.

  (2) But in no case higher than the running rail.

(b) Install tie plates under guard rails on every other tie or timber. Tie plates should be installed with reverse cant.

(c) Joints shall be either four or six hole bars with a minimum of four bolts per joint. Joint bars shall not be used within the curved end section of the guard rail.

§145.3(M) Application

(a) Bridge guard rails shall extend a minimum distance of 39' (for speeds up to 60 MPH) and 78' (for speeds over 60 MPH), beyond each end of the bridge abutment, unless increased distances have been prescribed for specific territories or locations.

(b) The end of the bridge guard rails should be curved and brought to the center of the track.

(c) Guard rail ends shall have the rail ends beveled, bent down, or be fitted with a bridge guard rail nose. Each end shall be fastened to the center of the track so as to divert a derailed wheel and not catch dragging equipment.

(d) The guarding face of bridge guard rails on open deck bridges shall be parallel to and 12-5/8" from the gage of the running rail. If plates and clips are used on open deck bridges, see Paragraph (e) below.

(e) The distance of the guarding face will be changed in the following locations:

(1) On ballasted deck bridges the guarding face shall be at 18".

(2) On ballasted approaches to bridges the guarding face shall be at 18".

(f) Guard rail ends shall rest on a sound tie and be securely fastened.

§145.4(M) Inspection and Maintenance

Guard rails shall be inspected periodically to make certain that bolts and joints are tight, spikes are firmly against base of the rail, and castings fastened securely to rail ends, or ends properly beveled or bent down.

Subpart E - Tools

§150.0(M) TOOL REQUIREMENTS

(a) The person who is responsible for performing the track/switch inspection shall plan ahead and coordinate with the Operating Railroad Company to ensure that inspection tools are available when the inspection is made.

(b) The person who is responsible to perform track inspections shall notify the Operating Railroad Company when tools become in disrepair so that a tool can be fixed or replaced.

(c) Specified numerical limits given in this Part are to be confirmed during the track/switch inspection with the appropriate tool.

(1) Values are not to be estimated or approximated.

(2) Only values measured with approved tools are to be recorded on the Track Inspection Form.

(d) The person who is responsible for performing track inspections is encouraged to make periodic recommendations for improvements in existing tools or gauges and changes in tools that are needed to make the required inspection measurements.

§150.1(M) *Inspection Tools*

(a) Marking materials, as noted below, may be used to mark stations, tie lengths, dimensional data, and other information that will be made part of the inspection.

(1) Crayon (keel);

(2) Permanent metal marker.

(b) A mirror to be used to view difficult areas, especially the base or fillet of the rail, or connections to the moveable point frog and switch point area.

(c) A cloth measuring tape or folding wooden ruler may be used to measure track components and ties in the turnouts. The tape or ruler shall be non-conducting. The tape or folding wood ruler can also be used to measure switch point throw, frog guard face, and guard check, stations for alignment measurements, rail flow, tie spacings, offsets, and other key dimensional data.

(d) A standard combination track gauge with level shall be used so that gage, flangeway width, crosslevel, and superelevation measurements can be made.

(1) Level Board:

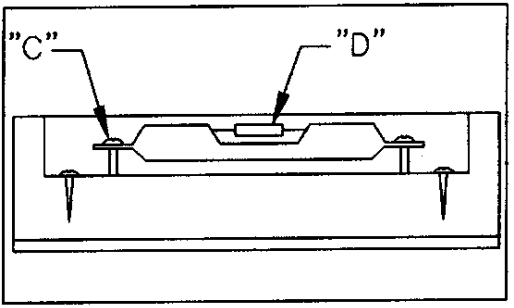
(i) The person who is responsible for performing the track inspection shall ensure that the level board is checked and maintained to measure correct crosslevel readings.

(2) Adjusting a Level Board:

(i) Set the level board on the tangent track where accuracy was checked and the difference in elevation between the two rails is known.

(ii) If required, turn the adjusting screw “C” to return the bubble “D” halfway between the readings for the known elevation. Center the bubble if possible.

- Turning the adjusting screw to the right moves the bubble away from the screw (Memory Aid: “Turn screw right away”).
- Turning the screw to the left moves the bubble toward the screw.



(iii) Turn the level board end for end and place it at the same point on the track.

(iv) See if the bubble is centered or the same. If the bubble rests at the same place, the board is adjusted.

(v) If the bubble readings are not the same, or not centered, continue steps (ii) through (iv). When the bubble is always at the same location (and centered), the level board is adjusted.

(3) Adjusting a level board by bubble positions:

(i) Place level board on the rails.

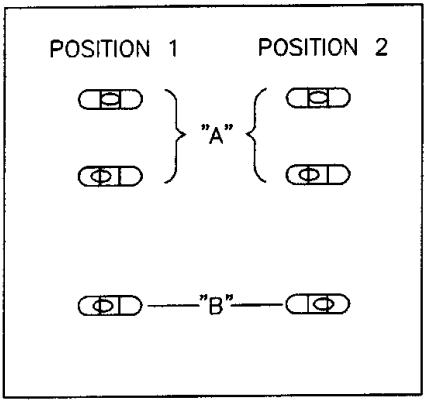
(ii) Note position of the bubble.

(iii) Turn level board end for end and place it at the same point on the track.

(iv) Note position of the bubble again.

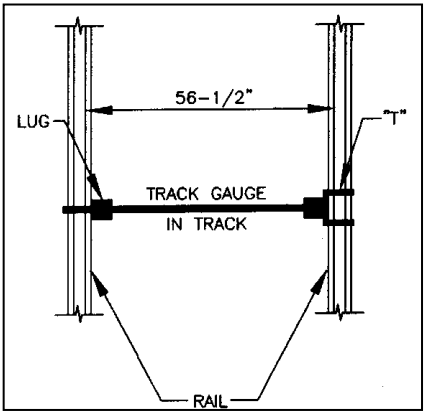
(v) If the bubble comes to rest in the same position both times “A”, the board is in adjustment.

(vi) If the bubble comes to rest in different positions “B”, adjustment of the board is necessary (see “Adjusting a Level Board” (d)(2)).



(4) The Track Inspector shall check and verify daily prior to use that standard track gauges are correctly measuring track gage.

(e) Checking a non-adjustable fixed track gauge.



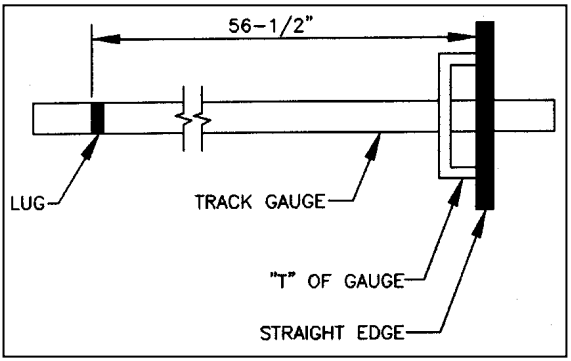
(1) Turn the gauge upside down.

(2) Place a straight edge along the “T” of gage.

(3) Measure the distance between the nearest face of straight edge and the lug.

(i) If the measurement is 56-1/2", the track gage is accurate.

(ii) If the measurement is not 56-1/2", the track gage is inaccurate. DESTROY AND DO NOT USE IT!



Track Gage Check

(f) A machined straight edge (minimum of 18" in length) shall be used to measure batter and chipping of rail ends, wear, flattened rails, mismatches (gage and tread) and engine burns on frogs and rail heads.

(g) A 36" machined straight edge with taper gauge shall be used to measure the straightness of field and plant welds.

(h) A taper gauge shall be used in conjunction with the straight edge to measure the depth of engine burns, flattened rails, and other anomalies in the rail head. In addition, the taper gauge shall be used to measure switch point/stock rail gap, and the gap at the moveable point frog.

(i) Stringline equipment capable of measuring 31' and 62' chords shall be used to check "alignment" spots. A discussion of stringlining curves is given in §55.2(M).

(j) Approved magnetic rail thermometer shall be:

(1) Calibrated in Fahrenheit, with a temperature range of 0°F - 150°F or as approved.

(2) Encased in housing with strong magnet(s) for attaching to web of rail.

(3) Meet AREMA Standard Rail Thermometer Plan 34-71, or approved equal.

(k) The following gauges may be used to check critical dimensions in and around frogs:

(1) Flangeway gauge: the gauge is designed to measure the flangeway in worn frogs so that grinding and welding repairs can be programmed. The gauge to be used by the Track Inspector shall conform to AREMA Plan No. 790-94.

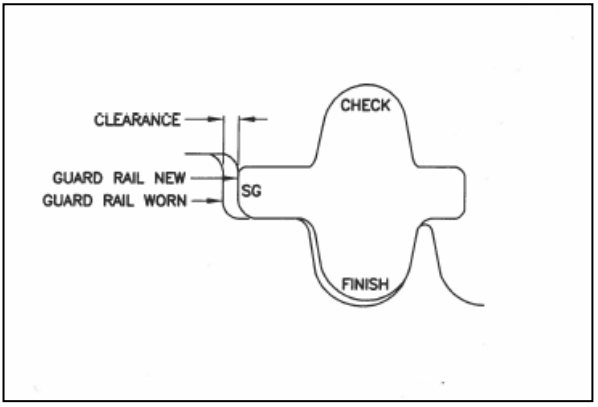
(2) Guard wear gauge: the gauge is designed to measure the wear on the guarding faces on a self-guarded frog.

(i) See AREMA plan for permissible variations in dimensions due to wear of frogs.

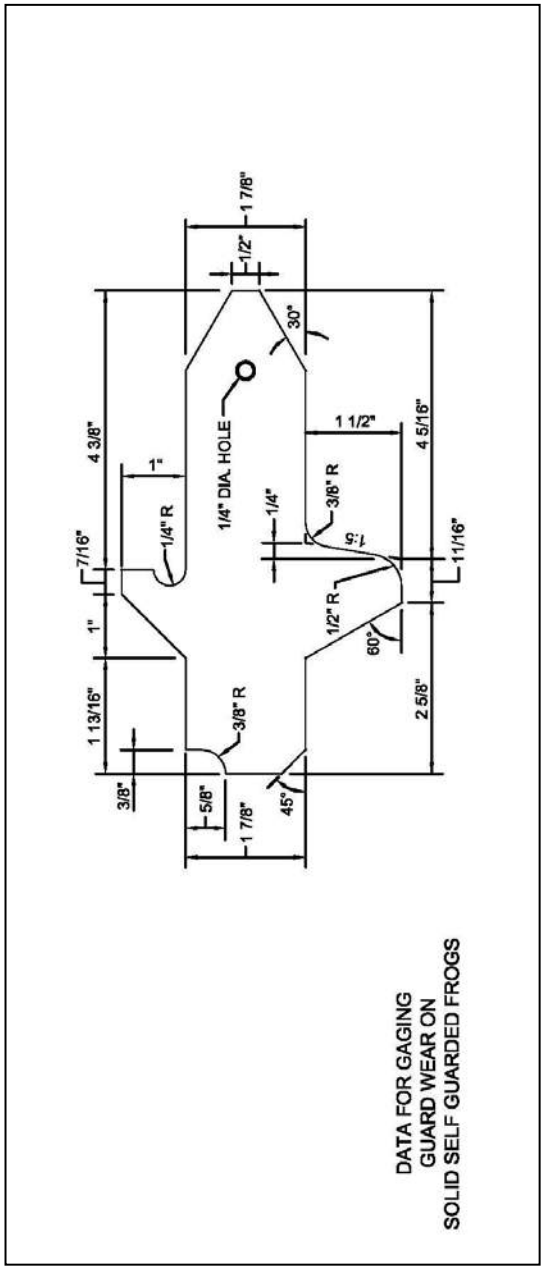
(3) The check gauge is used to test the flangeways in worn frogs and crossings for grinding or for welding repairs when necessary. It is designed for normal 1-7/8" flangeways and proper allowance should be made when used with wider flangeways. Standard contour gauge for self-guarded frogs is shown on the next page.

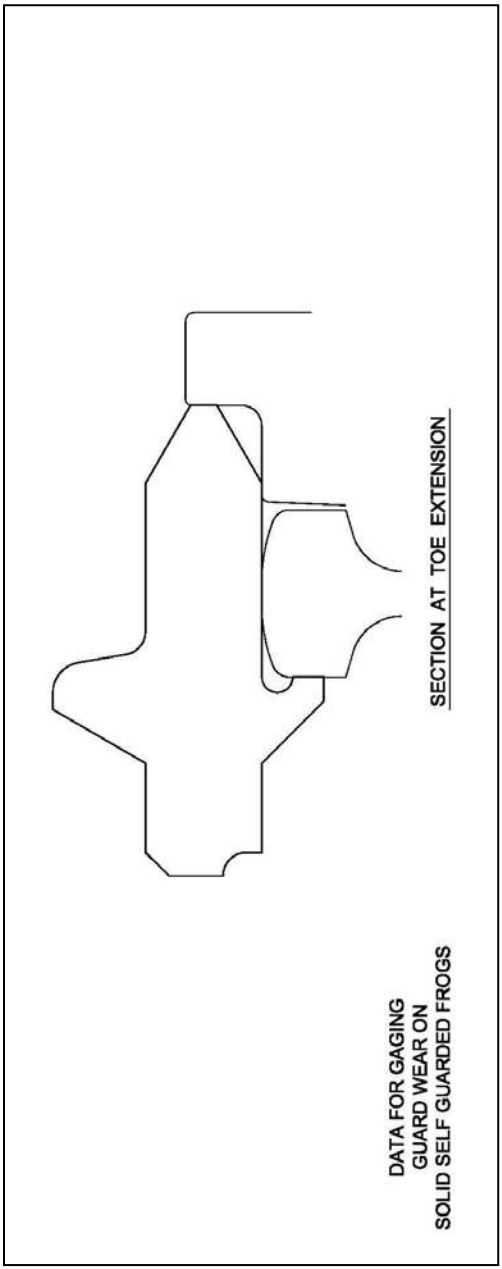
(4) The following check gauge graphic is used to measure flangeway widths in worn frogs and crossings to determine necessary welding and/or grinding repairs:

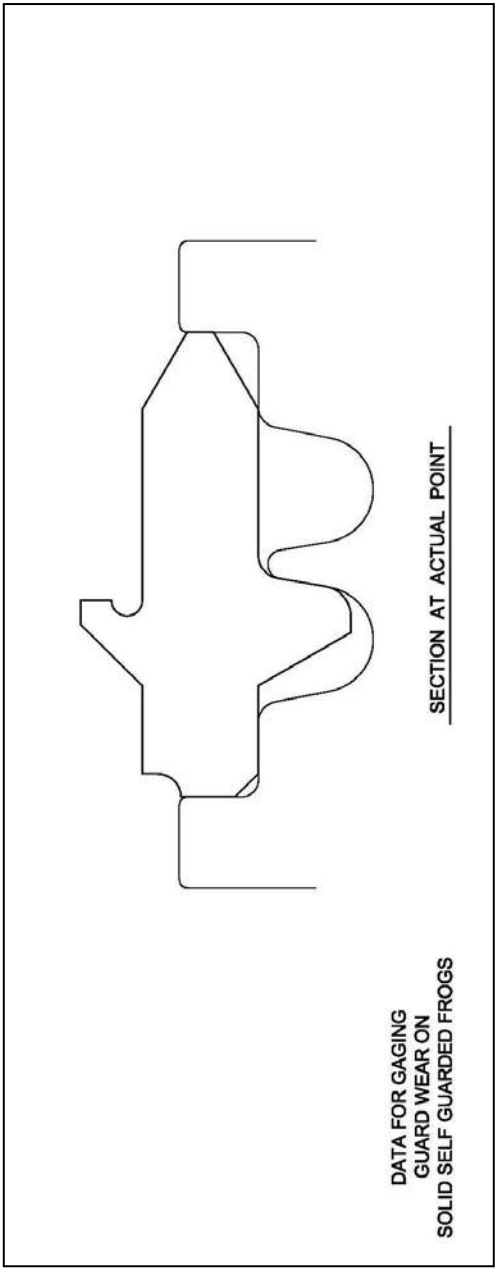
(i) The gage is designed for normal 1-7/8" flangeways.



(5) The gauge to be used by the Track Inspector shall conform to AREMA Plan No. 790-02 as shown on the following pages.


1 7/8"
1/2"
30°
1 1/2"
4 5/16"
11/16"
2 5/8"
60°
1/2" R
1:6
1/4"
3/8" R
1/4" DIA. HOLE
4 3/8"
1"
1/4" R
7/16"
1"
1 13/16"
3/8"
3/8" R
5/8"
1 7/8"
45°
DATA FOR GAGING
GUARD WEAR ON
SOLID SELF GUARDED FROGS


DATA FOR GAGING
GUARD WEAR ON
SOLID SELF GUARDED FROGS
SECTION AT TOE EXTENSION


DATA FOR GAGING
GUARD WEAR ON
SOLID SELF GUARDED FROGS
SECTION AT ACTUAL POINT

This page intentionally left blank

SUBPARTS A-H

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF SPECIAL TRACKWORK

This page intentionally left blank

RECOMMENDED PRACTICE FOR THE MAINTENANCE OF SPECIAL TRACKWORK

TABLE OF CONTENTS

Page

SUBPART A GENERAL 81
1.0(STM) SCOPE 81
2.0(STM) MAINTENANCE RESPONSIBILITIES 81
3.0(STM) SCHEDULED MAINTENANCE ACTIVITIES 81
4.0(STM) UNSCHEDULED MAINTENANCE ACTIVITIES 83

SUBPART B MAINTENANCE PROGRAM 84
5.0(STM) MAINTENANCE 84
6.0(STM) PLANNING AND COORDINATION 84
7.0(STM) QUALITY CONTROL 84

SUBPART C SCHEDULED SITE MAINTENANCE ACTIVITIES 85
33.0(STM) DRAINAGE AND WATERWAYS 85
37.0(STM) VEGETATION MANAGEMENT 85

SUBPART D MAINTENANCE LIMITS 86
50.0(STM) SCOPE 86
53.0(STM) GAGE 86
55.0(STM) ALIGNMENT 86
63.0(STM) TRACK SURFACE 86

SUBPART E GENERAL MAINTENANCE REQUIREMENTS 87
133.0(STM) TURNOUTS AND CROSSOVERS 87
133.1(STM) Use of Turnouts and Crossovers 87
133.2(STM) Speeds Through Turnouts 87
135.0(STM) SWITCHES 88
137.0(STM) FROGS 89
139.0(STM) SPRING RAIL FROGS 90
141.0(STM) SELF-GUARDED FROGS 91
142.0(STM) GUARD RAILS 92
142.1(STM) Guard Rails – General 92
142.2(STM) Guard Rails – Use 92
143.0(STM) FROG GUARD RAIL AND GUARD FACES; GAGE 92
144.0(STM) INSTALLATION OF SPECIAL TRACKWORK GUIDELINES 93

SUBPART F SCHEDULED MAINTENANCE ACTIVITIES 95
150.0(STM) DESCRIPTION OF SCHEDULED MAINTENANCE ACTIVITIES TO BE PERFORMED 95
151.0(STM) RECORD OF TRACKWORK DISTURBANCE IN CWR TERRITORY 95
152.0(STM) LUBRICATION OF SWITCHES AND FROGS 95
152.1(STM) Lubrication of New Switch Points 95
156.0(STM) SURFACING (SPOT TAMPING) - GENERAL 95
157.0(STM) OUT-OF-FACE SURFACING AND ALIGNMENT 96
158.0(STM) SPOT REPLACEMENT OF MAJOR COMPONENTS 96
159.0(STM) SPOT RAIL REPLACEMENT 97
160.0(STM) BOLTS AND LOCK WASHERS 97

161.0(STM) FASTENING SYSTEMS 98

SUBPART G TURNOUTS IN SIGNALIZED TRACK 99
170.0(STM) GENERAL PROCEDURES FOR WORK ON TURNOUTS IN SIGNALED TERRITORY 99

SUBPART H MECHANISMS, APPLIANCES, AND DEVICES 100
200.0(STM) SWITCH OPERATING MECHANISMS 100
200.1(STM) Use of Mechanisms 100
200.2(STM) Installation of Switch Stands 100
205.0(STM) SWITCH POINT POSITION INDICATORS (TARGETS) 100
205.1(STM) General 100
205.2(STM) Installation of Position Indicators 100
205.3(STM) Maintenance 100
205.4(STM) Position Indication 100
205.5(STM) Distance From Rail For Switch Stands and Switch Point Targets 101
210.0(STM) SWITCH STAND MAINTENANCE 101
220.0(STM) SWITCH LOCKS 101
300.0(STM) DERAILS 102
300.1(STM) Position of Derails 102
300.2(STM) Use of Derails 102
300.3(STM) Types of Derails 102
300.4(STM) Installation of Derails 103
300.5(STM) Operation of Derails 103
300.6(STM) Maintenance of Derails 103

SUBPART I SCHEMATICS / PHOTOGRAPHS 104

Subpart A – General

§1.0(STM) SCOPE

(a) This subpart will provide guidance as to the types of maintenance and maintenance limits required for special trackwork**.**

(b) This subpart shall be used by the MassDOT' s Operating Railroad Companies to maintain a safe, reliable track structure in the most economical and efficient manner possible.

(c) Forces engaged in the repair of special trackwork and appliances shall be aware that their maintenance goal is to provide a safe and reliable track structure with a superior ride quality.

(d) Ensuring adequate spare material inventory for all trackwork is the responsibility of the Operating Railroad Companies.

§2.0(STM) MAINTENANCE RESPONSIBILITIES

(a) MOW personnel in charge of making repairs and performing maintenance of turnouts and other trackwork shall attend and successfully complete courses prescribed by the Operating Railroad Companies.

(b) For Track Classes 1-5, individuals designated to supervise the maintenance, restoration, and renewal of trackwork shall be designated in accordance with FRA §213.7.

§3.0(STM) SCHEDULED MAINTENANCE ACTIVITIES

(a) Turnouts and other special trackwork must be maintained on a regular basis to:

(1) Provide a safe and reliable track structure;

(2) Provide acceptable ride quality;

(3) Maximize the useful life of the special trackwork.

(b) The maintenance schedule for special trackwork is driven by:

(1) Location of the special trackwork;

(2) Frequency and accumulated tonnage over the special trackwork;

(3) Type and maintenance history of the special trackwork;

(4) Inspection reports of the Operating Railroad Companies.

(c) A summary of scheduled maintenance activities for special trackwork is given in the following table. This table is not intended to be all-inclusive and only identifies the major activities that are usually associated with special trackwork maintenance.

Scheduled Maintenance Activities for Special Trackwork

- Lubrication of switch and spring frog plates
- Maintenance grinding of frog, switch point, and stock rails
- Maintenance grinding of welds, forged areas, and slotting of mechanical joints
- Maintenance welding of worn frogs
- Maintenance welding of engine burns (≤3/8")
- Production grinding of special trackwork and approaches:*
  - 8-12 stone production switch grinder
- Inspection of gage, with attention to the spread of the rail due to defective fasteners, timber, and/or rail wear
  - Inspection of guard face gage, guard check gage and track gage
- Inspection of head block area (switch stand, timbers, and latches)*
  - Check the crank eye bolt under the switch stand to include cotter pin
  - Check the upright bolt and cotter pin at the connection between number 1 rod and the throw rod
  - Inspect all switch locks, circuit controller (CC) box, and unlock box for proper number and placement
  - Throw turnout to observe for loss of motion
  - Observe switch point and stock rail fit
- Maintenance, cleaning, and adjustment of switch targets
- Maintenance and replacement of gage plate and rod insulation*
- Spot tamping of trackwork*
- Out-of-face surfacing and alignment of trackwork*
- Spot replacement of major trackwork components (stock rails, switch points, frogs, etc.)*
- Spot rail replacement to include the replacement of insulated joints and curve worn rail*
- Bolt maintenance: tighten or replace loose and defective bolts and torque to specifications; inspect and install cotter pins as required
- Replacement or adjustment of defective fastener systems
- Maintenance of drainage and waterways
- Vegetation management
- Ballast maintenance
- Out-of-face ballast replacement (undercutting and shoulder ballast cleaning)*

***The Signal Department shall be notified prior to maintenance and inspection as noted above. In addition, the Signal Department must be notified when work is required on the following items:**

- Insulation on bridal plates
- Insulation on switch rods
- Repair/replacement of insulation joints
- Protection of track wires and bond wires

§4.0(STM) UNSCHEDULED MAINTENANCE ACTIVITIES

(a) Unscheduled maintenance activities are maintenance activities that cannot be planned or programmed.

(b) Unscheduled maintenance of special trackwork and components can be due to:

(1) Any signal failure.

(2) Natural events, such as fire, flood, severe storms, and extreme temperatures or extreme variations in temperature, and earthquakes.

(3) A sudden change in the type of traffic, speed of traffic, or frequency of traffic over special trackwork.

(4) A “run through” or derailment within the area of special trackwork or a component of special trackwork.

(5) Failure of a component or components.

Subpart B – Maintenance Program

§5.0(STM) MAINTENANCE

Refer to §5.0(M)

§6.0(STM) PLANNING AND COORDINATION

(a) Refer to §3.0(STM) for the list of maintenance activities that shall be planned and performed by track forces.

(b) Programmed maintenance shall provide for the safety of train operations and shall be carried out in a cost-effective manner to provide maximum life to the trackwork and maximum benefit to the Operating Railroad Company.

(c) The information contained in inspection reports shall be used to plan trackwork maintenance.

(d) Program maintenance and/or capital maintenance and production should be internally coordinated with the Operating, Signal, and Bridge & Building (B&B) Department of the Operating Railroad Company.

(e) Planned maintenance that involves work within private rights-of-way (i.e., grade crossings and utilities), shall be coordinated with fire, police, public safety, and appropriate utilities (call 811 for Dig Safe). Also coordinate with local Department of Public Utilities (DPU) and/or State District.

§7.0(STM) QUALITY CONTROL

(a) The person in charge of performing the maintenance activity or repair shall be responsible for the overall quality of the work performed.

(b) All maintenance work shall be performed in accordance with these practices.

(c) An Operating Railroad Company Official shall periodically review the work performed for quality, consistency, and adherence to (b).

(d) Trackwork repairs that are deficient:

  (1) May be cause for remedial action.

  (2) Shall be brought to the attention of an Operating Railroad Company Official.

(e) An Operating Railroad Company Official shall see that any additional work necessary is performed to bring the repair into compliance with MassDOT recommended practice and shall re-inspect for substandard or deficient work.

(f) Operating Railroad Company personnel are encouraged to make recommendations as to the required modifications to methods, procedures, and practice to improve the overall quality of work.

Subpart C – Scheduled Site Maintenance Activities

§33.0(STM) DRAINAGE AND WATERWAYS

Drainage in and around special trackwork shall be maintained in accordance with §33.0(M).

§37.0(STM) VEGETATION MANAGEMENT

Vegetation in and around special trackwork shall be maintained in accordance with §37.0(M).

Subpart D – Maintenance Limits

§50.0(STM) SCOPE

(a) Maintenance is the repair or replacement of a component of special trackwork which may include switch points, frogs, and fastenings.

(b) Maintenance limits are to be used as a triggering mechanism that prompts maintenance or reconstruction.

  (1) It is MassDOT's goal to have special trackwork that is maintained above FRA minimum standards.

  (2) As special trackwork components wear, maintenance should be programmed before the track reaches the maintenance limits.

  (3) Maintenance must be executed whenever the maintenance limits are exceeded and completed prior to reaching the FRA minimum standards.

  (4) Whenever possible, special trackwork should be repaired or reconstructed to as-new condition.

(c) The maintenance limits and recommended practice for special trackwork and other trackwork are found in this subpart or the applicable maintenance sections.

§53.0(STM) GAGE

Refer to §53.0(M), "Gage."

§55.0(STM) ALIGNMENT

(a) Maintenance shall be performed when alignment values reach the limits given in §55.0(M) Alignment.

(b) The straight stock rail (open point) in a turnout is the line rail. If stations fall within undercut portions of the stock rail, alignment measurements may be taken on the field side of the stock rail.

(c) In special trackwork, alignment deviation in curves is the difference in the mid-ordinate value between adjacent stations and not the average of multiple stations (uniformity) as given in FRA §213.55.

§63.0(STM) TRACK SURFACE

(a) The following criteria:

  (1) Will serve as a practical guide for the maintenance of smooth riding conditions in special trackwork; and

  (2) Will minimize the wear on special trackwork, special trackwork components, and rail vehicles.

(b) For Track Classes 1-5, surface may not deviate more than the amount prescribed in the table in §63.2(M).

Subpart E – General Maintenance Requirements

§133.0(STM) TURNOUTS AND CROSSOVERS

§133.1(STM) Use of Turnouts and Crossovers

(a) Turnouts and crossovers are designated by their frog numbers and should be used as follows:

(1) No. 20: At interlocking plants for crossing over of high speed trains from one main track to another main track (normally used in the same or reverse direction in locations where the normal speed is 50 MPH or more).

(2) No. 15: At interlocking plants for movements to another main track (normally used in the same or reverse direction, where conditions do not justify or afford the distance required for No. 20 frogs). For diverting trains to sidings or other tracks and returning trains to main tracks through power operated or spring switches.

(3) No. 10: For all other turnouts from main tracks and sidings, where practicable, and in yards and terminals.

(4) The use of other turnouts must have the approval of MassDOT Rail and Transit Division.

§133.2(STM) Speeds Through Turnouts

(a) The maximum permissible speeds through turnouts when located in tangent track will be as follows:

Frog No.	Switch Point/ Switch Rail Length (Ft.)	Maximum Authorized Speeds (MAS) (MPH)
20	59'-6"	60*
20	39'	45
20	39'	60*
15	38'	30
15	26'	30
10	27'	15
10	16'-6"	15
8	16'-6"	10
Note: * With equilateral turnouts only.		

(b) When turnouts or crossovers are located in curved tracks, speed must be adjusted in accordance with FRA §213.57.

(c) The maximum authorized speed (MAS) through turnouts shall be designated by the MassDOT Rail and Transit Division.

§135.0(STM) SWITCHES

(a) Switch points and moveable points should be kept in line and surface with all bolts tight and cotter pins in place.

(b) Switch points must fit the stock rails closely and accurately, with a full bearing against the head of the stock rail. If a wear pattern indicates bearing only along the top edge of point, the cause of wear shall be investigated and corrected.

(c) When an open switch point is found of more than 3/16", it must be immediately corrected and/or removed from service.

(d) Each switch stand in connecting rod must be securely fastened and operable without excessive loss of motion.

  (1) Connecting rod bolts must be of the proper size and installed with the bolt facing upwards and the nut on top.

  (2) The upright bolt and nut shall be drilled to accept and installed with a cotter pin.

(e) Switch points and stock rails should have the overflow ground off. Attention should be given to the overflow and fit of the back side of the switch point to the stock rail.

(f) When necessary to replace individual switch points or stock rails, use replacement material of similar kind (i.e., Samson points to Samson stock rails; plain points to plain stock rails).

(g) When replacing or changing a switch point, replace switch points and stock rails as a set:

  (1) Fastenings must be intact and maintained so as to keep the components securely in place.

  (2) Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

  (3) Classes 3-5 track must be fully box anchored through and on each side of track crossings and turnouts to restrain rail movement affecting the position of switch points and frogs. Elastic fasteners designed to restrict longitudinal rail movement are considered the same as rail anchors.

(h) Adequately fasten switch points and stock rails to prevent lateral and longitudinal rail movement.

(i) Upright bolts used with horizontal switch rods must be placed with nut ends up and nuts secured with cotter pins so they can be visually inspected.

(j) Switch points shall be replaced when worn or chipped so that the top of the switch point, at any place, is more than 7/8" below the plane across the top of the stock rails.

(k) Unusually chipped or worn switch points that are found to have an unprotected flat, vertical service, 5/16" or more in width, at a depth of 3/4" below the top of the stock rail and switch point, must be removed from service and replaced immediately. This type of point wear may contribute to a wheel climb derailment.

(l) Switch points shall be replaced when the raised portion of the switch point (rise) is worn down to the level of the top of the stock rail. The purpose of the rise is to prevent the outer edge of the wheel tread from striking the stock rail and rolling the stock rail out of the switch plates and causing a derailment.

(m) Chipping or wear on any switch point should be investigated, its cause determined and corrective action taken. Wear or chipping produces a sloping surface on the face of the switch point which may tend to lift a wheel having an imperfect flange. The switch rail should be further examined to locate any point of hard contact by the wheel, which might contribute to wheel climb.

(n) Spot grinding of points is allowed to remove chips, minor burns, small imperfections, small cracks, etc., with care being taken to insure that proper profile is restored to the switch point to prevent wheel climb. Grinding is not to exceed 7/8" below top of stock rail.

(o) When changing switch points and curved closure rails, or when grinding switch points, lubricate as follows:

(1) The gage face of the curved point and the curved closure rail.

(2) Spot lubricate top of straight closure rail in vicinity of switch point.

(3) Lubricate gage face of all ground switch points.

(p) Switch points, components, and connections must be examined frequently.

(1) It is important that the stock rails are securely seated and have no movement in the switch plates.

(2) Care should be taken to avoid canting the rail by over-tightening the rail braces.

(3) Switch plates shall have no movement on the ties.

(q) Switch plates and moveable parts should be kept clean and lubricated with an approved graphite dry lubricant.

(r) The heel of each switch point must be secured and the bolts of each heel must be kept tight (e.g., fixed blocks).

(s) In yards when using No. 10 turnouts or smaller, and the maximum authorized speed does not exceed 15 MPH, a switch point guard may be applied to the outside of the stock rail.

(t) Switch point guards shall be used only in yards and installed so that the distance of the guarding face of the guard to the gage face of the switch point is set at 3-15/16". The gage face of the switch point guard shall be restored by welding once the wear exceeds 1/4" (4-3/16").

§137.0(STM) FROGS

(a) See AREMA Standard Track Plan No. 300 for guidance on the use of frogs.

(b) All metal flow from frogs must be ground promptly and the gage and guard edges of castings rounded. The radius shall be ground to match the original radius and contour of the frog. See AREMA Standard Track Plans or manufacturer's shop drawing.

(c) New frogs should be ground 30 days following installation. Subsequent grinding will be required monthly for the first several months depending on frog type and service.

(d) Frog points, frog castings, and wheel relief areas (false flange), should be built up by welding to maintain as-new cross section. Spring rail frogs also have false flange relief areas by design. See AREMA Standard Track Plans or manufacturer's shop drawing.

(e) Worn frogs should be repaired in track by an approved electric welding method and then ground to the correct contour.

(f) Each flangeway in special trackwork must be at least 1-1/2" wide with a 1/8" head radius.

(g) The flangeway depth, measured from a plane across the wheel-bearing area of the frog, may not be less than 1-3/8" in Track Class 1 or less than 1-1/2" in Track Classes 2-5.

(h) If a frog point is chipped, broken, or worn more than 1/2" down and 3" back, the frog should be repaired.

(i) If a frog point is chipped, broken, or worn more than 5/8" down and 6" back, operating speed over that frog may not be more than 10 MPH.

(j) If a riser or insert of a frog is broken out or worn down more than 3/8" below the original contour, operating speed over that frog may not be more than 10 MPH.

(k) Welding repairs on manganese (Mn) steel frogs shall be performed by a welder certified to weld manganese steel.

(l) All frog repairs should be ground to contour. Square corners lead to breakouts into the flangeway.

(m) Frog welding may be prolonged indefinitely by proper grinding practices.

(n) Missing or loose frog bolts shall be retightened or replaced with bolts of correct length and diameter.

(o) All frogs requiring repairs that cannot be made in track shall be removed from track and shipped to the designated repair point.

(p) Frogs shall be supported on effective timber that is fully tamped to minimize wear and damage from train traffic.

§139.0(STM) SPRING RAIL FROGS

(a) Spring frogs have a moveable wing rail that is normally held closed against the body of the frog except when pushed open by a diverging movement. This results in a smoother ride for main line moves.

(b) Spring frogs must be inspected to comply with FRA §213.139.

(c) Recommended practice for the proper installation, inspection, and maintenance:

  (1) Spring frogs must be inspected on foot at least once per week.

  (2) Good surface, line, drainage, and timber condition must be maintained.

  (3) The outer edge of a wheel tread must not be permitted to contact the gage side of the spring wing rail.

  (4) All bolts should be tight:

    (i) Some body bolts are special thin head bolts.

    (ii) Maintenance body bolts (studs) are available for locations where frog must be disassembled to install new bolt.

  (5) Ensure spring wing can move freely.

(d) Spring rail frogs are to be used on industrial tracks that are used infrequently (unless approved by the MassDOT Rail and Transit Division).

(e) The clearance between the hold-down housing and the horn may not be more than 1/8" at the top and 1/8" at the bottom. Other issues to be addressed:

  (1) Wing and point must fit properly. Grind overflow to prevent chipping. Grind gage corner radius to 5/8".

  (2) The spring wing to frog point is designed to have a 3/8" gap at the point. A gap of no more than 3/4" must be maintained.

  (3) Ensure there is sufficient tension on spring:

    (i) The spring nuts should be adjusted to compress the spring 1" (1/4" between spring follower and housing).

    (ii) This results in approximately 600 pounds of force from the spring.

(f) Typically, by design, there is a gap of up to 3/8" between the spring wing rail and frog point within the first 5" of the frog point. It is desirable to maintain contact between the spring wing rail and the remainder of the frog.

  (1) A gap less than 3/4" is to be maintained.

(2) If a gap of 3/4" exists, check the compression of the springs on the wing rail to see if the springs must be adjusted and/or replaced.

(g) Particular attention should be paid to the guard face gage in the point area on the straight side of the turnout. A guard rail protects the straight move through the length of the moveable wing.

(h) The outer edge of a wheel tread must not contact the gage side of a spring wing rail.

(i) When surfacing a spring frog:

(1) Do not jack the frog with production equipment between the toe and heel. This could bend the base plate.

(2) Use hydraulic hand jacks.

(j) Base plate and horns should be lubricated with switch plate lubricant.

(k) The toe of each wing rail must be solidly tamped and fully bolted, or preferably, field welded.

(l) Spring frogs should be ground 30 days after installation. Subsequent grinding may be required monthly for the first several months depending on frog type and service.

(m) Welding of a spring rail frog may only be performed with the permission of the MassDOT Rail and Transit Division.

(1) If a spring rail frog is welded in the field, the first train will operate at Class 1 speeds, freight trains at 10 MPH, and passenger trains at 15 MPH.

(2) The spring rail frog will be re-inspected after the first train before the track will be returned to MAS.

(n) Each spring must have sufficient compression force to hold the spring wing rail against the point rail.

(o) Lubricate spring frog plates with approved lubricant in the Spring, Summer and Fall and “Ice Free Switch” anti-icing agent in the winter (or approved equal).

(p) The opening between the spring wing rail and frog point of spring frog shall be kept free of any debris and snow and ice that may impede the operation of the spring wing rail.

§141.0(STM) SELF-GUARDED FROGS

(a) Self-guarded frogs shall be used in non-main tracks where the speed does not exceed 15 MPH.

(b) If, because of wear, repairs need to be made to the guarding face of a self-guarded frog:

(1) The raised guard face of a self-guarded frog may not be worn horizontally more than 3/8".

(2) Repairs require the use of a contour gauge (see §150.1(M), “Inspection Tools”).

(3) The track should be taken out of service.

(4) When repairing the guard face of a self-guarded frog, the build-up of weld material must be made from the top down to prevent wheel climb

(5) When repairs are made to a self-guarded frog, the guard face must be restored before rebuilding the point. This practice will ensure that the wheel does not strike the rebuilt frog point.

§142.0(STM) GUARD RAILS

§142.1(STM) Guard Rails - General

Guard rails shall be furnished in accordance with MBTA Standard Plan Book, AREMA Standard Plan Book, or as approved by the MassDOT Rail and Transit Division.

§142.2(STM) Guard Rails - Use

(a) Guard rails used with No. 15 spring frogs shall be a minimum of 16'-0" in length. Guard rails used with frogs of lesser number shall be a minimum of 13'-0" in length.

(b) Guard rails used with No. 10 spring frogs shall be a minimum of 16'-0" in length, or as approved by the MassDOT Rail and Transit Division.

(c) Guard rails installed in accordance with previous standard practice may be continued in general use until their replacement becomes necessary.

(d) Relay quality hook flange guard rails must only be reinstalled in other than main tracks.

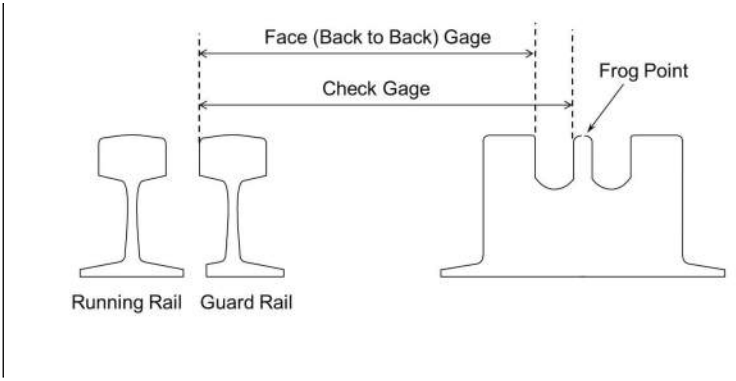
§143.0(STM) FROG GUARD RAIL AND GUARD FACES; GAGE

(a) If possible, when performing trackwork maintenance, repairs shall be made to restore the installation dimensions of guard rails:

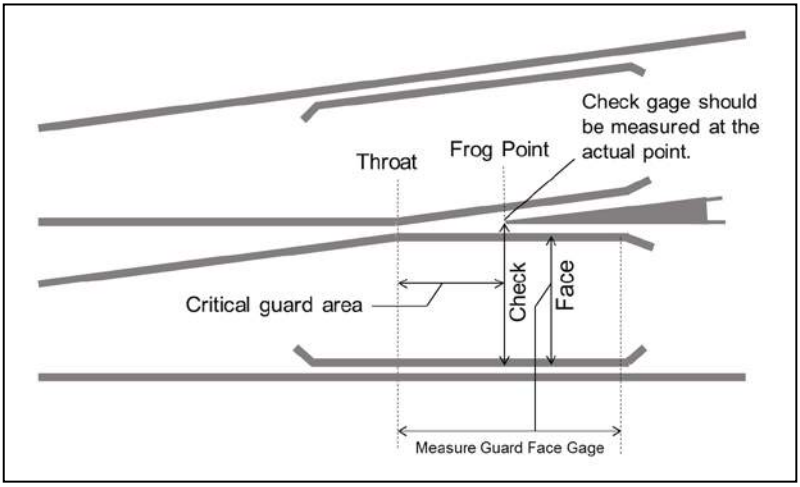
Track gage	56-1/2"
Guard check gage (may not be less than)	54-5/8"
Guard face gage (back to back) (may not be more than)	52-3/4"

(b) Maintenance limits contained in Paragraph (a) are more restrictive than those found in FRA §213.143.

(c) See the following diagrams showing guard check gage and guard face measurement locations.



Guard Check and Guard Face Gage



Guard Check and Guard Face Gage Measurement Locations

§144.0(STM) INSTALLATION OF SPECIAL TRACKWORK GUIDELINES

(a) Trackwork constructed in track, or at the site, shall be built to, and perform to the MBTA Standard Track Plans, AREMA Standard Track Plans, or as approved by the MassDOT Railroad Transit Division.

(b) Turnouts and crossovers shall not be placed in curves or spirals without the approval of the MassDOT Rail and Transit Division.

(c) Pre-plated, pre-assembled switch timber and pre-fabricated switch nose panels (if truckable), are preferred.

(d) Care must be used in unloading and handling all trackwork, timber, and turnouts. This includes handling and unloading from flatbed cars and trucks and assembling and loading onto transport cars.

(e) A minimum 12" bed of clean-bottom compacted ballast shall be provided with good drainage. See MBTA Standard Plan Nos. 1000 and 1002.

  (1) If roadbed materials (sub-ballast and sub-grade) are inadequate, an 8" layer of compacted sub-ballast shall be installed; or

  (2) A 5" layer of compacted hot-mix asphalt under-layment as per MBTA Standard Plan No. 1030; or

  (3) A Geo-Web (or approved equal) sized appropriately for the field conditions (4", 6", or 8") may be used as determined by the MassDOT Rail and Transit Division.

(f) When practicable, special trackwork should be completely installed with switches connected to their operating mechanisms and properly adjusted before trains are permitted to move over the trackwork.

(g) Care must be used when installing trackwork panels to prevent rail bending, tie splitting, or tie cracking, as well as bending and/or breaking fasteners and OTM.

(h) When installing special trackwork panels, bottom ballast should be furnished and installed and compacted level to within 2" to 4" of final bottom of tie grade. The final lift shall be nominal 1-1/2". (Ballast bagging or blocking can be used when undercutting or in emergencies.)

(i) Initial surfacing lifts for special trackwork shall be limited to 2" increments. This size lift helps prevent tie breakage, and the bending of rail and plates in spring and moveable point frogs. The final lift shall be a nominal 1-1/2".

(j) Where only one switch rail (closed point) has been installed in a main track turnout in existing main track, and it is necessary to move trains over the turnout, the following precautions must be taken:

  (1) All switch plates on the turnout side must be in the correct position and clipped and/or fully fastened.

  (2) The switch rail must be securely held against its stock rail by driving a spike in each of the first two ties back of the point and, where possible, spikes must pass through holes in the switch plates.

  (3) The switch point must be secured to the stock rail by standard clamping devices.

  (4) Unconnected ends of lead rails, or the toe of the frog, must be protected by a tapered wedge fastened to the tie to protect against dragging equipment.

  (5) The free end of stock rail must be fastened down to prevent movement and a tapered wedge fastened to prevent against dragging equipment.

  (6) Facing point train movements shall only be made under a 10 MPH temporary speed restriction unless point detection is provided.

(k) If both switch rails have been installed, but not properly connected to the switch operating mechanism, the following must be done before trains are permitted to move over the main track turnout:

  (1) Switch rods must be installed.

  (2) The main track switch rail must be secured against its stock rail, as required above.

  (3) The diverting switch rail (open point) must be blocked by driving a wooden wedge, not less than 18" long, between the switch rail and the stock rail.

  (4) On wood ties, a wedge must be secured in place by means of a lag screw or heavy nail through one clip bolt hole and a piece of wood placed against the end of the wedge and spiked to the first and second ties ahead of the point.

  (5) Unless the curved lead has been installed and spiked or clipped to prevent movement, a connecting rail shall be fastened to the heel of the open switch rail and moved away from the running rail so as to provide at least 5" clearance between rail heads.

  (6) Facing point train movements shall only be made under a 10 MPH temporary speed restriction unless point detection is provided.

(l) The main track guard rail must be correctly placed and clipped or spiked if the frog has been installed.

(m) Unconnected ends of lead rails or the toe of the frog must be protected by a riser wedge fastened to the tie to protect against dragging equipment.

(n) Where track is signaled, a switch circuit controller shall be installed, tested and functioning, by a signal employee of the Operating Railroad Company.

Subpart F – Scheduled Maintenance Activities

§150.0(STM) DESCRIPTION OF SCHEDULED MAINTENANCE ACTIVITIES TO BE PERFORMED

Refer to the table in §3.0(STM) for the list of major trackwork activities to be performed by the Operating Railroad Company.

§151.0(STM) RECORD OF TRACKWORK DISTURBANCE IN CWR TERRITORY

(a) Maintenance activities performed in trackwork installed in CWR track can cause a change in the rail neutral temperature (RNT) of the CWR and cause track instability in and around the special trackwork.

(b) MOW employees in charge of, or responsible for maintenance work performed in and around special trackwork in CWR track, shall be thoroughly familiar with and understand and comply with Appendix A, "Continuous Welded Rail (CWR) Procedures."

§152.0(STM) LUBRICATION OF SWITCHES AND FROGS

(a) Switch and spring frog plates shall be cleaned and lubricated as necessary.

(b) The Signal Maintainer has the overall responsibility to lubricate powered switches and derails in signaled track.

(c) The Track Department has the responsibility to lubricate all other switches, derails, and spring frogs with approved seasonal lubricants.

§152.1(STM) Lubrication of New Switch Points

(a) New switch points shall be greased after installation.

  (1) Special attention should be paid to lubricate the gage face of the diverging point from point of switch to point of frog.

(b) Existing switch points that show indication of wear should be carefully lubricated frequently on the gage face so as to prevent migration to the top of rail, as well as excessive ground and ballast contamination.

§156.0(STM) SURFACING (SPOT TAMPING) - GENERAL

(a) Spot tamping (less than 200') is required to restore the surface and line when deviations approach the alignment and surface maintenance limits given in §§55.0(M) and 63.0(M).

(b) Spot tamping is required to eliminate the excessive deflection and pumping of ties which:

  (1) Overstresses clips causing premature failure or backing out of clips.

  (2) Increases abrasion of the wood ties.

  (3) Fouls the ballast.

  (4) Increases ballast abrasion and wear.

  (5) Changes the load distribution over the length of the tie which, in some cases, may overstress the tie.

(c) Tamping should be performed in such a manner as to prevent the centerbinding of timber and ties.

(d) In wood tie turnouts, head block and movement ties may require tamping by hand to provide full support of the long timber.

(e) When spot surfacing in welded rail territory, see Appendix A, "Continuous Welded Rail (CWR) Procedures."

§157.0(STM) OUT-OF-FACE SURFACING AND ALIGNMENT

(a) Out-of-face surfacing (greater than 200') shall be accomplished by multiple tool switch tampers, ballast stabilizers, and ballast regulators.

(b) Out-of-face surfacing is usually required when there are multiple spots to be surfaced that are greater than 200' in length.

(c) Out-of-face surfacing is required to restore the overall surface and line when deviations approach the alignment and surface maintenance limits given in §§55.0(M) and 63.0(M).

(d) The Operating Railroad Company shall plan any out-of-face surfacing program for trackwork. The Operating Railroad Company MOW personnel shall make use of information on the Track Inspection Report, Special Track Inspection Report, Monthly Switch Inspection Report, track geometry car readings (if available) and train rides when planning the out-of-face surfacing program.

(e) Out-of-face surfacing and aligning of CWR track should be avoided:

(1) When the ambient air temperature is 80°F, or rail temperature is 100°F, or above;

(2) Anytime there is an ambient air temperature of 40°F, or below, for a 24-hour period. To surface and align track below the above temperature requires the approval of MassDOT Rail and Transit Division.

(3) Any other time when questionable track conditions exist that will not safely support surface and alignment of track.

(f) When out-of-face surfacing in welded rail territory, see Appendix A, "Continuous Welded Rail (CWR) Procedures."

§158.0(STM) SPOT REPLACEMENT OF MAJOR COMPONENTS

(a) During the useful life of special trackwork, it may be required to replace major components and systems as part of a programmed maintenance activity. The major components include, but are not limited to:

(1) Switch points, stock rails, and/or point protectors.

(2) Switch plates or tie plates and clips and fasteners.

(3) Frogs and guard rails.

(4) Bolt assemblies.

(5) Closure rails (associated joint and insulated joints).

(6) Switch timber and headblock ties.

(7) Switch stands, switch machines, and/or derails.

(8) Switch targets, handles, rods, and cotter pins.

(b) The replacement of major components is based on:

(1) The physical condition of the component.

(2) The amount of measured wear on the component compared to an established maximum "wear limit" as given in this Part.

(3) The ability of the component to sustain MAS and meet the operational requirements of the railroad.

(4) Lost motion of any moving switch parts.

(c) When changing major components, all work performed shall be reported on the daily Track Inspection Report and be available to the MassDOT Rail and Transit for review.

§159.0(STM) SPOT RAIL REPLACEMENT

(a) Rail replacement shall be performed on an as-needed basis as traffic and local conditions warrant.

(b) The replacement of rail is based on:
   (1) The age and physical condition of the rail.
   (2) The existence of a rail defect as defined in FRA §213.113.
   (3) The amount of measured wear on the rail compared to an established "wear limit" for that rail as given in §113.2(M).
   (4) Switch point to stock rail wear limits as given in this Part take precedence over the maintenance limits given in §113.2(M).

(c) A "Rail Failure in Main Track Report" must be filled out and available for MassDOT Rail and Transit Division to review every time a rail is changed.

§160.0(STM) BOLTS AND LOCK WASHERS

(a) During the useful life of trackwork there may be a requirement to replace broken or defective bolts and/or washers in frogs, heel blocks, and at permanently bolted joints.

(b) When evaluating the performance of bolts:
   (1) Verify that the bolt is of the correct diameter, length, and type.
   (2) Visually inspect the performance of the bolt and washer under load.
   (3) Visually inspect the joint or appliance and look for signs of vertical movement, batter, crushing, excessive flow, or excessive wear in the component affixed with the bolt and washer.
   (4) Visually inspect the condition of crib ballast and general line and surface at that location.
   (5) Visually inspect the condition of ties, plates, and clips at bolted locations.

(c) When changing a bolt in a joint, frog, or in a switch point, tighten all other bolts in the immediate vicinity.

(d) The preferred method of tightening new bolts is with a torque wrench and multiplier that applies the recommended level of torque (foot-pounds) to the bolt. See the following tables.

Recommended Torque Values in ft.-lb. to Produce the Minimum Specified Tension in Society for Automotive Engineers (SAE) Grade 5 Bolts

Bolt Diameter	Min Tension (lb.)	Lubricated Condition(1)	Non-Lubricated Condition(1)
1/2"	12,000	80	105
5/8"	18,000	155	210
3/4"	28,000	275	370
7/8"	39,000	450	600
1"	51,000	670	800
1-1/8"	56,000	825	1,100
1-1/4"	71,000	1,165	1,550
1-3/8"	85,000	1,535	2,040

Note:
(1) Lubricated torque valves shall be achieved by applying a metal-based lubricant to the bolt threads.

Recommended Torque Values in ft.-lb. to Produce the Minimum Specified Tension in SAE Grade 8 Bolts			
Bolt Diameter	**Min Tension (lb.)**	**Lubricated Condition(1)**	**Non-Lubricated Condition(1)**
1/2"	15,000	100	130
5/8"	24,000	195	265
3/4"	35,000	345	460
7/8"	49,000	565	750
1"	64,000	840	1,120
1-1/8"	80,000	1,180	1,575
1-1/4"	102,000	1,675	2,230
1-3/8"	121,000	2,185	2,910
Note: (1) Lubricated torque valves shall be achieved by applying a metal-based lubricant to the bolt threads.			

§161.0(STM) FASTENING SYSTEMS

(a) During the useful life of trackwork, it may be required to change rail fasteners (e.g., clips or spikes or screw spikes) as a normal maintenance activity.

(b) The replacement of fasteners is based on:

(1) The physical condition of the fastener (worn or corroded and/or broken or missing).

(2) The ability of the fastener and the fastening system to minimize the horizontal and vertical movement, as well as the longitudinal movement of the rail or components (e.g., switch points, frogs and guard rail), and to sustain maximum authorized speed.

(c) When evaluating the performance of fasteners, the Foreman shall:

(1) Verify that the correct type of fastener is being used.

(2) Visually inspect the fastener for cracks and breaks.

(3) Visually inspect the fastener to see if they are overdriven.

(4) Visually inspect the components being fastened and look for signs of vertical or horizontal movement or excessive wear.

(d) Clips that have repeatedly backed-out or fallen-out should be replaced with new clips and not reused.

Subpart G – Turnouts in Signalized Track

§170.0(STM) GENERAL PROCEDURES FOR WORK ON TURNOUTS IN SIGNALED TERRITORY

(a) When adjusting or working on a main track turnout in signaled territory:

(1) Notify the Signal Maintainer.

(2) Obtain foul time, track time or other form of Roadway Worker Protection (RWP) from the dispatcher.

(3) Hold a job briefing.

(4) Block the switch point.

(5) Perform the work.

(6) Remove blocking.

(7) Perform obstruction test (by Signal Maintainer).

(8) Make sure hand-thrown turnout is aligned and locked with an approved lock in the normal position before returning to service.

(9) Return track to service.

Subpart H – Mechanisms, Appliances, and Devices

§200.0(STM) SWITCH OPERATING MECHANISMS

§200.1(STM) Use of Mechanisms

(a) Switches shall be operated by approved types of mechanisms as follows:

(1) Power mechanisms as approved by the MassDOT Rail and Transit Division after recommendation by the Signal Department.

(2) Spring switches: Manually operated switch mechanisms, which are supplemented by slow-acting spring devices that permit wheels to trail through switches set for the opposite route, may be used with the approval of the MassDOT Rail and Transit Division.

(3) Approved type of new installation switch stands (unless approved by MassDOT Rail and Transit Division), are: Racor Model 36EH (High Mast) for mainlines and Racor Model 36E for yards.

(4) Manual operated mechanisms shall use the “back saver” and/or “triangular hand level” handles for new installations.

§200.2(STM) Installation of Switch Stands

(a) Manually operated switch stands shall be placed so that the operating rod is in tension when the switch is set in normal position.

(b) Whenever possible, the switch stand handle shall be positioned facing the frog when the switch is in the normal position.

(c) Where crossover switches are protected by signals, a switch locking arrangement shall be provided.

(d) Switch stands for all tracks shall be located to serve the safety and efficiency of employees.

§205.0(STM) SWITCH POINT POSITION INDICATORS (TARGETS)

§205.1(STM) General

(a) Where required, indicators shall be provided on all non-interlocked switches to give a clear and distinct indication of the position of the switch points

(b) Switch point targets shall be reflectorized. The height of the centerline of the target shall not exceed 20" above the track ties. Targets higher than this are called “high targets.”

(c) Generally, high targets with the EH36 high stand are used on all main track.

(d) Generally, low targets are used in yards and at locations on main tracks where clearance precludes the use of a high stand.

§205.2(STM) Installation of Position Indicators

Targets shall be set at right angles to the track and perpendicular to the headblock ties.

§205.3(STM) Maintenance

Switch targets should be kept clean to provide uniform brightness and visibility.

§205.4(STM) Position Indication

(a) In order to give a clear and distinct indication of the position of non-interlocked switch points, colored targets shall be provided, in addition to the switch stands.

(b) Target colors are given in the Northeast Operating Rule Advisory Committee (NORAC) Rule Book (Rule 104H).

(1) Where switch targets are used, a green or white banner indicates normal position of the switch, and a red or yellow banner indicates reverse position.

(2) Green and white banners are used on main tracks, and red and yellow banners are used on other than main tracks and yards.

§205.5(STM) Distance from Rail for Switch Stands and Switch Point Targets

(a) Switch stands, not between tracks, must be placed so that the distance from the gage of the nearest rail to the center of the spindle with a low mast is 4'-1" and with a high mast is 7'-0".

(b) Low target masts placed between tracks must be installed as follows:

Track Center Distance (at least)	**Minimum Distance From Gage of Nearest Rail to Center of Spindle**
12'-2" but less than 13'	3'-8-3/4"
13' or greater	4'-1

(c) All powered switch machines shall be installed as per Signal Department Instructions.

§210.0(STM) SWITCH STAND MAINTENANCE

(a) Switches, switch stands, and operating rods must be examined frequently. Broken, damaged, or missing parts shall be replaced immediately.

(b) Regular inspection shall be in accordance with FRA §213.233, and if necessary, corrective action must be taken immediately.

(c) Worn switch latches must be replaced before the wear is sufficient to permit the switch lever to be thrown without manually releasing the latch (keeper).

(d) Special attention should be taken to ensure that the cotter pin is maintained at the clevis location at the base of the switch stand and at the connection to the No. 1 rod (FRA §213.135).

§220.0(STM) SWITCH LOCKS

(a) At all main track switches, throw levers of switch stands, shall be secured by two latches (for normal and reverse positions), and locked by a standard switch lock. The lock is to be fastened by a chain to the switch stand, or tie, so that the switch can only be locked in the normal position.

(b) The throw levers of switch stands in other than main or secondary track, shall be provided with latches, but shall be provided with padlocks only when required.

(c) The standard switch lock used by the Operating Railroad Company is to be approved by MassDOT Rail and Transit Division.

(d) Recommended operating and cleaning procedures for switch locks are:

(1) Unlock the padlock and open the shackle to soak and wash the lock thoroughly in the recommended cleaner (LPS Instant Super Cleaner/Degreaser) or equivalent. This will remove any oil, grease, and their foreign matter from the

area of the locking balls. If feasible, use of an ultrasonic cleaning tank is advised. This type of device produces superior results.

(2) If cleaning by hand, use a squirt bottle to force the cleaning solution into the locking ball cavities. This will complete the cleaning and flushing of the locking ball area.

(3) Do not oil, grease, or graphite the lock. Lubricate only with a light, non-grease substance, such as LPS #1 Greaseless Lubricant.

§300.0(STM) DERAILS

§300.1(STM) Position of Derails

The "normal" position of a derail shall be to derail wheels of rolling equipment away from the main track or structure. The "reverse" position shall permit the unobstructed movement of equipment.

§300.2(STM) Use of Derails

(a) Derails shall be used on all tracks.

(b) Selection of derail type:

(1) A **double switch point derail** will be used at the following locations:

(i) Where the track on which the derail is to be placed descends towards the main track requiring protection.

(ii) On all tracks, even if descending away from the main track, if any portion of that track is higher in elevation than the track at the derail location.

(iii) Where the industry moves rail cars using on or off track equipment or by gravity or with a car puller.

(iv) On tracks used for loading, unloading, or storage of cars containing hazardous (hazmat) materials as defined in the U.S. Hazardous Material Instructions for Rail.

(v) Where operating conditions demand positive derailing protection.

(2) A **sliding rail** may be used where track on which the derail is to be placed is level or descends away from the main track requiring protection.

(3) A **hinge derail** may be used in yard areas where a derail operating stand would adversely impact the normal walking path.

(4) A **portable derail** is used to provide protection to personnel working on or about a track to make work limits inaccessible (see RWP Rules for Operating Railroad Company), or to protect equipment stored temporarily on a track not normally used for storage.

§300.3(STM) Types of Derails

(a) Derails are generally of three kinds: the "split switch," the "sliding block," and the "hinged block" type.

(b) Where derails are prescribed, the split switch type shall be used on side tracks or industrial tracks as follows:

(1) At all locations where the side track or industrial track is on a descending grade to the main track.

(2) Within interlocking limits, in main tracks, in secondary tracks, and as designated by the MassDOT Rail and Transit Division.

(3) In tracks where it is possible for the speed of rolling equipment to exceed 15 MPH.

(c) Approved sliding block type derails shall be used in other than main tracks with speeds less than 15 MPH at other locations than those given in Paragraph (b) above.

(d) Hinged block derails are usually used in yard limits or in conjunction with Roadway Worker Protection (RWP) practices.

§300.4(STM) Installation of Derails

(a) A derail shall be placed a sufficient distance back of the clearance point, not less than 12', to ensure that derailed rolling equipment will not foul the main or other protected track.

(b) When using single point split switch derails, a deflecting rail must be used.

(c) Where deflecting rails are used:

(1) The minimum length shall be 18'.

(2) The nearest end shall be 10' from the derail.

(3) The flangeway opening at the end nearest to the derail shall be 4".

(4) The end farthest from the derail shall be set to provide a 12" clear opening between running rail opposite the derail and the deflecting rail.

(5) The deflecting rail shall be of a section and weight that is not greater than that of the running rails, and, preferably less.

(6) The deflecting rail should be spiked to every tie with two rail holding spikes, one on each side of the rail base.

(7) Deflecting rails shall be fully anchored or otherwise secured to ensure that they do not move longitudinally.

(8) Derails are to be installed in accordance with manufacturer's recommendations.

(9) Existing installations of derails need not be changed to meet these provisions until renewals are necessary, or unless so ordered by the MassDOT Rail and Transit Division.

§300.5(STM) Operation of Derails

(a) Lever stands of approved types may be used for operating derails. Where practicable, the distance from the center line of the lever stand spindle to the gage of the nearest rail shall be at least 50".

(b) Derails shall be provided with standard switch padlocks fastened to the tie by a chain and staple, so that the lever or derail can be locked only in the normal position.

§300.6(STM) Maintenance of Derails

(a) Sliding block or hinged block derails shall be painted yellow.

(b) Dirt and weeds must be kept away from derails.

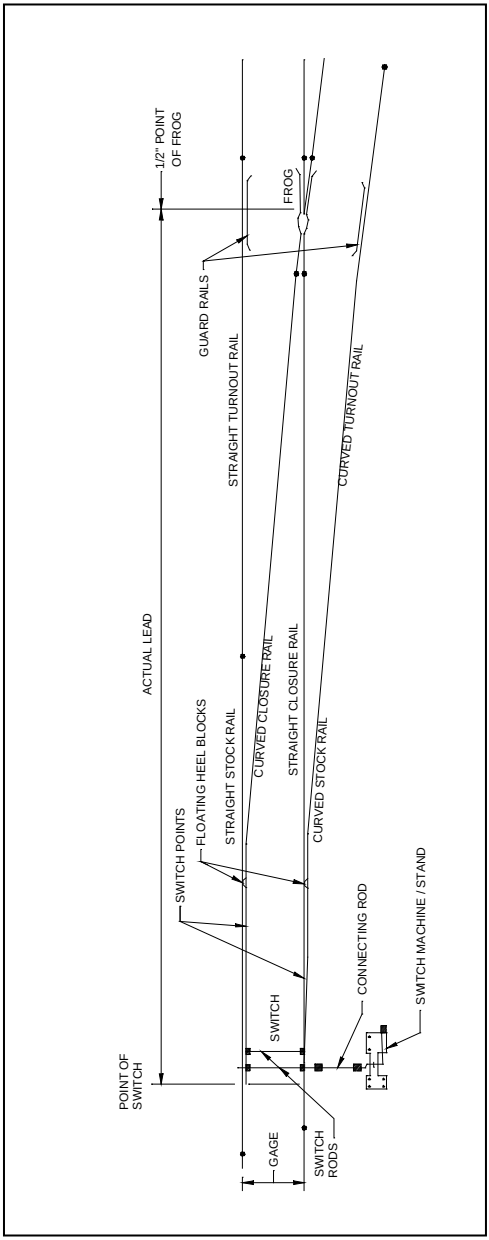
(c) Ballast, snow, and ice must be kept away from derails.

Subpart I – Schematics / Photographs

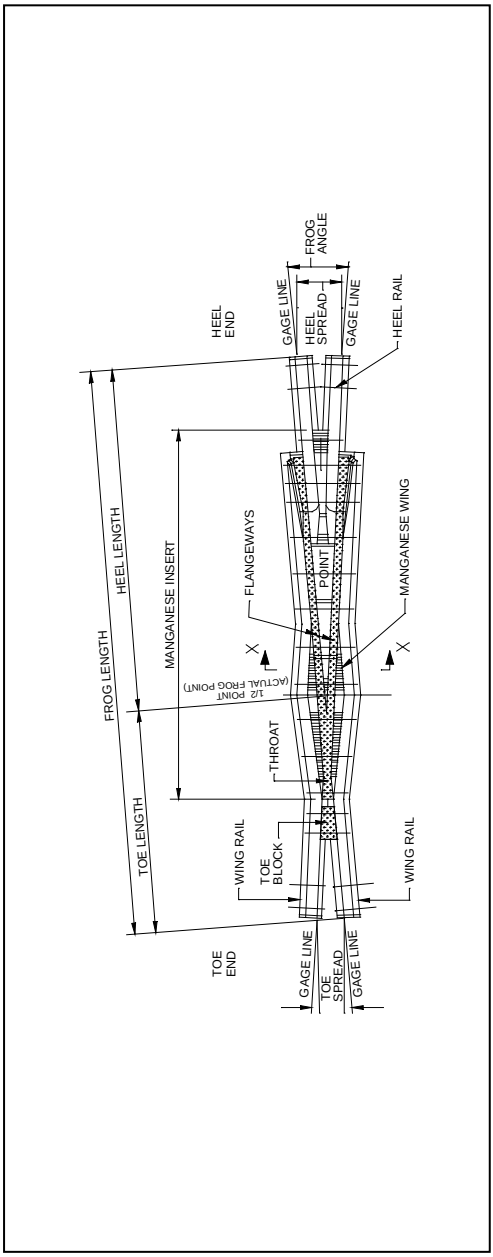
(a) Schematics and photos of trackwork are provided in the MW-1 to illustrate the name, location, and general arrangement of trackwork types and major components.

(b) Trackwork types and components are shown below in photos and drawings and include:

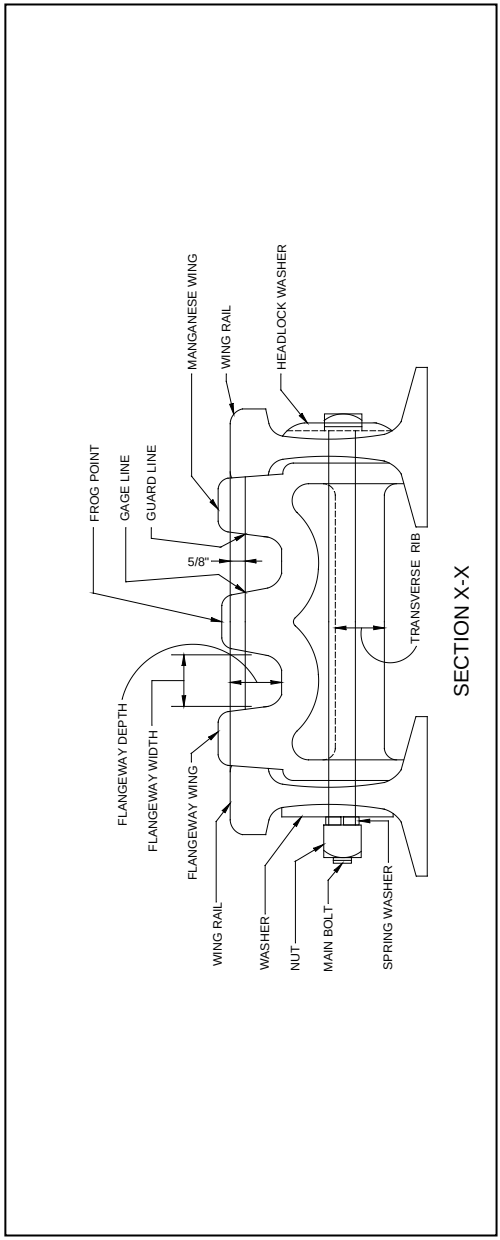
1. Conventional Turnouts
2a. Railbound Manganese Frog (RBM)
2b. Railbound Manganese Frog – Section X-X
3a. Self-Guarded Manganese Frog
3b Self-Guarded Frog – Section Y-Y
4a. Spring Frog Arrangement
4b. Spring Frog Details
5a. Guard Rail - Hook Flange Type
5b. Guard Rail - Hook Flange Type – Section A-A
6a. Hinged Derail
6b. Sliding Block Derail
6c. Double Switch Point Derail
7a. Switch Stand Type 36
7b. Switch Stand Type 36
8a. Western-Cullen Type Bumping Post
8b. High Energy Hydraulic Bumping Post



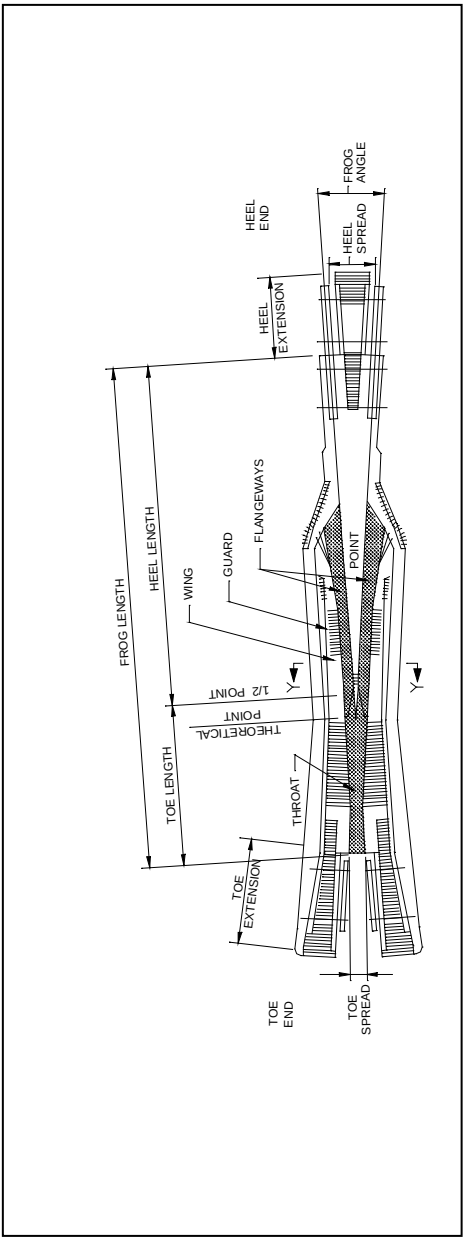
1. Conventional Turnout



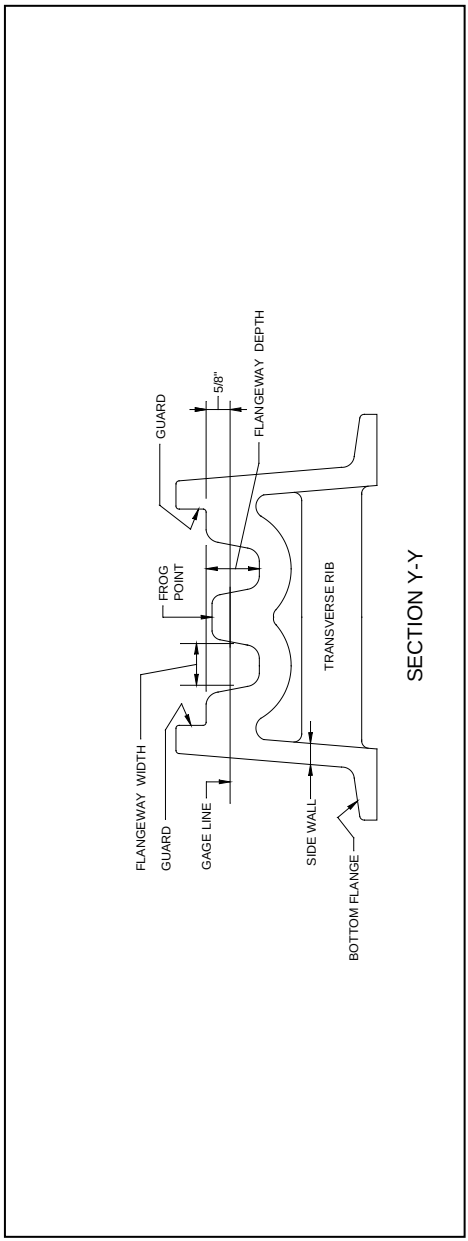
2a. Railbound Manganese Frog (RBM)



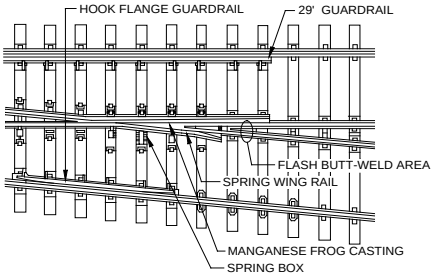
2b. Railbound Manganese Frog – Section X-X



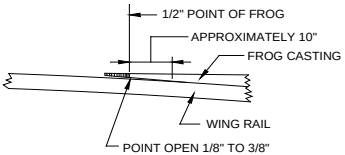
3a. Self-Guarded Manganese Frog



3b. Self-Guarded Frog – Section Y-Y



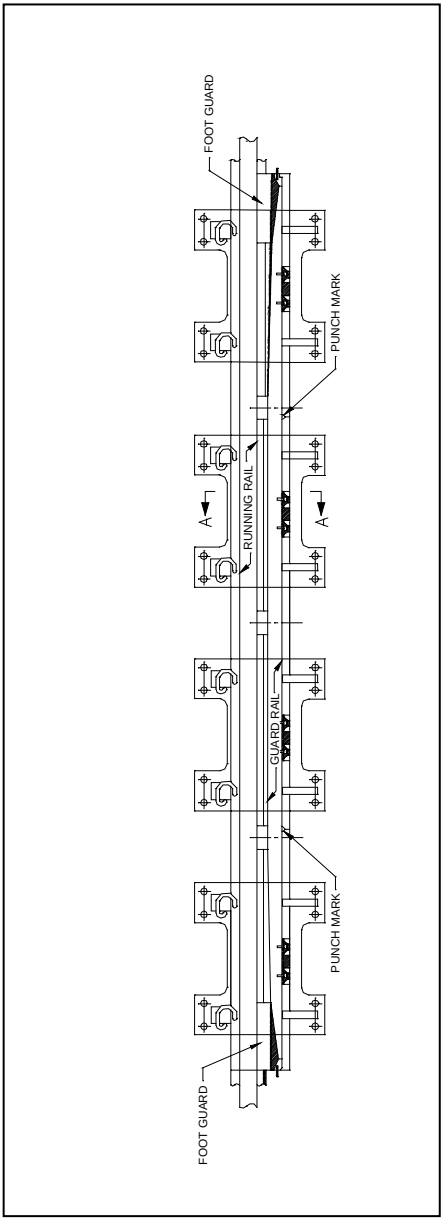
MANGANESE SPRING FR0G LAYOUT



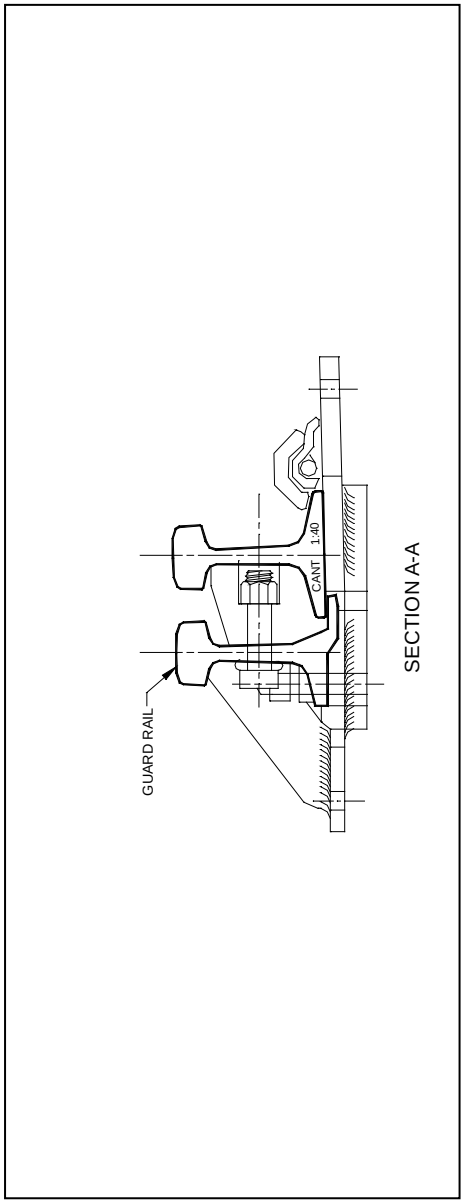
DETAIL OF SPRING FROG POINT AREA

4a. Spring Frog Arrangement

4b. Spring Frog Details



5a. Guard Rail – Hook Flange Type



5b. Guard Rail – Hook Flange Type – Section A-A

6a. Hinged Derail

6b. Sliding Block Derail

6c. Double Switch Point Derail

7a. Switch Stand Type 36

7b. Switch Stand Type 36

8a. Western-Cullen Type Bumping Post

8b. High Energy Hydraulic Bumping Post

APPENDIX A

CONTINUOUS WELDED RAIL (CWR) PROCEDURES

This page intentionally left blank

Table of Contents

1.0 Applicability A-1
1.1 Introduction A-1
2.0 Fabrication and Distribution A-2
(a) Unloading A-2
(b) Use of CWR On MassDOT Rail and Transit Owned Lines A-2
3.0 Installation and Adjustment of CWR A-2
(a) Definitions A-2
(b) Installation of CWR A-3
(c) Adjustment/Distressing A-4
4.0 Anchoring of CWR A-7
5.0 Maintenance of the Desired Rail Neutral Temperature (RNT) in Previously Installed CWR A-9
(a) Maintaining Desired Neutral Temperature Range: Broken or Defective Rail, Pull-Apart (Service Failures) and/or Tight Rail or Track Buckle A-9
(b) Adjusting or Distressing Previously Installed CWR A-10
(c) Procedures for Making Repairs to Buckled Track A-11
(d) Installing Rail Plugs in Existing CWR Track A-12
(e) Field Welding of CWR A-12
6.0 Trackwork that Disturbs CWR Track and the Protection of Disturbed Track . A-13
6.1 General A-13
6.1.1. Trackwork that Disturbs CWR A-13
6.1.2 Trackwork that Does Not Disturb CWR A-13
6.2 Train Definition A-13
6.3 Work Activities that Disturbs CWR Track A-13
(a) Installation of Plugs in CWR that Disturbs CWR Track A-13
(b) Tie Renewal in Tangent Track that Disturbs CWR Track A-14
(c) Tie Renewal in Curves that Disturbs CWR Track A-15
(d) Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <3°) A-16
(e) Surfacing, Smoothing and/or Lining that Disturbs CWR Curved Track: Curves $\geq$3° A-18
(f) Cut and Throw of Track that Disturbs CWR Track A-19
(g) Switch or Track Panel Installation that Disturbs CWR Track A-20
(h) Undercutting that Disturbs CWR Track A-21
(i) Out-of-Face Shoulder Ballast Cleaning that Disturbs CWR Track A-21
(j) CWR Installation that is Unacceptable A-22
(k) Anchor or Clip Removal that Disturbs CWR Track A-22
(l) Cribbing that Disturbs CWR Track A-22

6.4 Suspension of Work Due to Heat Where Ambient Temperature >80°F or Rail Temperature >110°F A-23
6.5 Protection of Work Areas for Latent Heat Effects A-24
7.0 Special Inspections of CWR Track A-24
(a) Special Inspection in Hot Weather A-24
(b) Special Inspection in Cold Weather A-25
(c) Semi-Annual Inspection A-25
(d) Protection of CWR Track with Deficiencies A-26
8.0 Joints in CWR Track A-26
8.1 New Installations of CWR A-26
(a) Joints in CWR Track When Installing CWR A-26
8.2 Service Failures in Existing Previously Installed CWR A-26
(a) Bolted Joints in Exiting CWR that Experience a Service Failure A-26
8.3 Service Failure of Joint Bars and/or Track Bolts in a CWR Joint A-27
(a) Minimum Remedial Action Required A-27
(b) Number of Bolts in Rail Ends Required A-27
(c) Cracked or Broken Joint Bars A-27
(d) Opening (Gap) of Joints in CWR A-27
8.4 Inspection of Joints in CWR Track A-28
8.4.1 Embedded Joints A-28
8.4.2 Joint Inspection in CWR A-29
8.4.3 Record of Inspections A-29
9.0 Training A-29
10.0 Reporting Requirements for CWR Track A-30
(a) Report of Disturbance of CWR Track (Form “TD”) (Attachment E) A-30
(b) Report of Track Movement (Form “TM”) (Attachment E) A-30
(c) Report of Joint Elimination by Field Welding (Form “JE”) (Attachment E) A-31
(d) Report of Rail Clipping/Anchoring (Form “RC”) (Attachment E) A-31
(e) Report of Semi-Annual (Spring/Fall) Inspection of CWR Track (Form “CWR”) (Attachment E) A-31
(f) Special Instructions – Earthquakes A-31
11.0 Record Keeping A-33
(a) Report of CWR Installation A-33
(b) Report of Maintenance Work in CWR A-33

Attachments

Attachment A: Determination of Estimate of Pre-Break / Pre-Cut Neutral Temperature for a Service Failure in CWR A-35

Attachment B: Recommended Procedures for Distressing Continuous Welded Rail (CWR) Previously Laid in Track A-41

Attachment C: Recommended Procedures for Readjusting Continuous Welded Rail (CWR) After a Break, Pull-Apart (Service Failure) or Cut Below the Target Rail Laying Temperature (105°F) A-51

Attachment D: Joint Defect Guidelines / Maximum Allowable Temporary Speed Restrictions (TSRs) A-63

Attachment E: Preparation of Forms A-65

- Instructions for the Preparation of the Report of Disturbed Track (Form "TD") A-68
- Instructions for the Preparation of the Report of Track Movement Due to Surfacing or Out-of-Face Tie Renewal (Form "TM") A-70
- Instructions for the Preparation of the Report of Joint Elimination by Field Welding (Form "JE") A-72
- Instructions for the Preparation of the Report of Rail Clipping / Anchoring (Form "RC") A-74
- Instructions for the Preparation of the Report of Semi-Annual (Spring/Fall) Inspection of CWR Track (Form "CWR") A-76

Attachment F: Torch Cutting Rail (Figure/Remarks) A-77

This page intentionally left blank

APPENDIX A

MINIMUM RECOMMENDED REQUIREMENTS TO BE INCLUDED IN THE OPERATING RAILROAD'S CWR PLAN CONTENTS AS PER FRA 213.118 & 213.119

1.0 APPLICABILITY

The installation, adjustment, maintenance and inspection of continuous welded rail (CWR) shall be performed in accordance with FRA Part 213, Track Safety Standard's §213.118 and §213.119. As such, the requirements herein are based on the FRA/Rail Safety Advisory Committee (RSAC) Generic Policy document provided to the U.S. railroads as a part of the October 2009 enacted FRA safety rule and are based on current best practice guidelines on CWR in providing minimum requirements on CWR.

These MassDOT procedures are aimed to aid and assist the Railroad Operating Companies to maintain MassDOT-owned tracks in a safe and efficient manner. Performing CWR installation, maintenance, adjustment and inspection in accordance with the provisions and requirements stipulated herein will meet the expectations of the Commonwealth and provide uniform practice between the different properties of the Railroad Operating Companies.

This document details MassDOT's policy on installing, adjusting, maintaining, and inspecting CWR track. Each section details how the individual MassDOT rail operator applies its standards and procedures to comply with FRA standards.

1.1 INTRODUCTION

(a) Continuous Welded Rail (CWR) is defined as any rail that contains no joints in 400' or greater in length. This document will serve as the recommended practice for the installation, adjustment, maintenance, and inspection of CWR. Rail that is installed as CWR and subsequently has additional joints installed within the limits of the rail will still be considered as CWR, and subject to the requirements of this document. Track laid with CWR is referred to as "CWR Track." Any employee who installs, adjusts, maintains and inspects CWR must have a copy of their approved FRA Plan (§213.118 and 213.119).

(b) If the Operating Railroad cannot comply with the minimum recommended requirements found in Appendix A, they shall immediately notify MassDOT Rail and Transit Division.

(c) Preparation and care:

(1) **Programmed tie renewals shall be completed in advance of rail laying.**

(2) **Track shall be surfaced and aligned prior to CWR installation.**

(3) Track to be laid with CWR must have standard ballast section (shoulders and cribs) for welded rail before CWR is installed.

(4) Rails should be examined for defects and damage prior to laying in track.

(5) At the time of installation, care should be taken so that no damage to rail or fastenings will result.

(6) All ties, to include loose ties, should be tamped to full bearing under the rail, with a small tamper, during rail laying operations ahead of the spiker.

2.0 FABRICATION AND DISTRIBUTION

(a) Unloading:

(1) CWR should be unloaded as close as possible to the position where it is to be installed with a minimum of further handling, giving special attention to accurately locating the ends of CWR.

(2) CWR should be placed parallel with the track and base down, avoiding excessive bending or damage, making use of suitable mechanical equipment when available. Care should be taken to avoid placing rails on drainage facilities and other civil structures.

(3) CWR ends must be bypassed.

(b) Use of CWR on MassDOT Rail and Transit Division owned lines:

(1) CWR fabricated by an approved process may be laid without restriction in fully ballasted main and secondary tracks. When welded rail is laid on curves, particularly those sharper than 6 degrees, it must be closely monitored for any indication of movement up out of the plates.

(2) CWR may be laid across open deck bridges where bridge ties are spaced with timber blocks between ties provided that the following conditions are satisfied:

(i) The anchoring of open deck bridges shall be approved by the Operating Railroad's Bridge Engineer.

(ii) Per MBTA Standard Plan, all ties and blocks in a panel are tightly jacked and fastened together with guard timbers or spacing bars secured by lag screws in every tie. See latest MBTA Standard Plan.

(iii) Per MBTA Standard Plan, bridge ties are securely fastened to steel structure by means of a hook bolts, tie anchors, or other approved holding device. See latest MBTA Standard Plan.

(iv) The bridge structure is properly anchored to abutments and piers to prevent any movement other than normal expansion.

(v) CWR is anchored to the bridge ties in both directions in accordance with Section 4.0 of this document.

(3) After application of hook bolts, tie anchors or other approved holding devices, these devices must be checked and retightened weekly until ties have been fully seated on top flanges of built up members.

3.0 INSTALLATION AND ADJUSTMENT OF CWR

(a) Definitions:

(1) Neutral Temperature: The rail neutral temperature (RNT) is the temperature at which a rail is neither in tension or compression (i.e., when it has zero longitudinal force).

(2) The Rail Laying Temperature (RLT): The temperature at which the rail is installed that is sufficiently high so as to provide a high RNT to prevent possible track buckling.

(i) CWR on MassDOT Rail and Transit Division owned lines shall be installed at an RLT of 105°F with an allowable construction tolerance of -10°F to +10°F or 95°F to 115°F. **The target RLT shall be at least 105°F**.

(ii) When laying and/or distressing rail, the required minimum expansion shall be determined by using a target RLT of at least 105°F (see Section 3.0 and Attachment "B").

(iii) When repairing a service failure to include broken joint bars, pulled apart joints, a broken rail, a broken weld (shop or field), the replacement of a plug

rail or a rail cut in the field, the repair shall be made to ensure that the RNT after the repair is made is at or above RLT-10°F (95°F) (see Attachments A and C).

(3) Temperature Differential: The difference between the target rail laying temperature and the actual rail temperature taken at the time of installation is called the temperature differential (TD).

(i) CWR laying and adjusting procedures have been established to take into account these temperature differences.

(ii) If the rail temperature is below desired RNT of 105°F, the rail must be expanded to the target RLT of at least 105°F.

(iii) The rail expansion required is marked at the quarter points in the field on the string to be expanded.

(iv) RNT is achieved when the correct expansion amounts have been realized at the quarter points.

(v) RNT is not achieved when the required rail temperature of 105°F has been reached unless the required expansion has been realized.

(b) Installation of CWR:

(1) Programmed tie renewals shall be completed in advance of rail laying.

(2) Track shall be placed in good line and surface prior to rail renewals.

(3) Track to be laid with CWR must have standard ballast section for welded rail before installation of CWR.

(4) Rails should be examined for defects and damage prior to laying in track.

(5) At the time of installation, care should be taken so that no damage to rail or fastenings will result.

(6) All ties, to include loose ties, should be tamped with a small tamper to full bearing under the rail, during rail laying operations ahead of the spiker.

(7) Any alignment deviation reduces the temperature at which a track will buckle. As an example, an alinement deviation of about 1" may reduce the buckling temperature from 10 – 15 °F°**.** In addition, an alignment deviation from a Class 5 line defect to a Class 3 line defect (1" to 1 1/8") may reduce the buckling potential by 15 - 20°F, depending on track parameters and conditions."

(8) **The target RLT and RNT is at least 105°F unless approved by the MassDOT Rail and Transit Division.**

(9) CWR shall be anchored or have resilient fasteners applied ("clipped") at a rail temperature of between 95°F and 115°F, unless otherwise directed by MassDOT Rail and Transit Division. This is known as the "Desired Rail Installation Temperature Range."

(10) An approved rail thermometer (magnetic) shall be used to measure the rail temperature of all CWR before it is anchored or clipped. The thermometer should be placed on the web of rail just above the bottom fillet, on the side of the rail that is shielded from the direct rays of the sun and left there long enough (5 minutes) to determine the temperature accurately.

(11) When the rail temperature is lower than the target RNT of 105°F an approved rail heating device or a hydraulic rail stretcher must be used for expanding the CWR to make proper adjustment.

(12) A rail puller can be used to hold the required expansion, and/or to help get the required expansion. At least 20 ties on the next string to be distressed shall be

box anchored and/or clipped to provide sufficient holding power for the rail puller to hold or pull the string being expanded.

(13) Where CWR has been anchored and/or clipped at a rail temperature below 105°F- 10°F (RLT -10°F) and not expanded to the target RNT of 105°F during the rail laying operation, the rail shall be inspected by a person qualified on §213.7(a)(b)(c)(d). A TSR shall be placed, if necessary, and then removed when the rail is expanded to a target RNT of 105°F.

(14) If the CWR is anchored and/or clipped at a rail temperature greater than 115°F (RLT +10°F), up to and including 125°F, the rail may remain in track without restriction.

(15) The following information shall be recorded on the field side web of the individual string (with permanent metal marker) as the strings are being laid:

(i) String number

(ii) Date installed or adjusted or distressed

(iii) Length of string in feet

(iv) Existing rail temperature/preferred rail neutral temperature

(v) Total expansion required at end of string (if appropriate)

(16) The person in charge of installing the CWR shall be responsible for recording on the appropriate Form ("CWR Rail Expansion/Heat Record Report") the amount of required expansion and the rail temperature at each CWR string is anchored. Copies of these forms should be forwarded to MassDOT Rail and Transit Division. See Appendix "E", Form "RC".

(17) The "CWR Rail Expansion/Heat Record Report(s)" for any CWR laid in track and or distressed shall be retained by the Railroad Operating Companies until the CWR is readjusted and/or removed from service.

(c) Adjustment/Distressing:

(1) The target RNT is always 105° or greater. When the rail temperature is lower than the target RNT of 105°F an approved rail heating device, a hydraulic rail stretcher or heating by natural means or the ambient temperature shall be used to expand the CWR at its quarter points to achieve proper adjustment.

(2) Adjusting CWR strings to increase RNT by natural means or by using the ambient temperature is allowed only if the unadjusted rail temperature falls in the Desired Rail Installation Temperature Range of RLT -10°F to +10°F or 95°F to 115°F.

(3) All rail anchors and/or resilient fasteners must be removed from strings of CWR requiring adjustment to permit the desired expansion or contraction at the quarter points of the CWR string.

(4) The anchor and/or clip removal should start at the end of the string at the last quarter point to be expanded and move back towards the ¼ point or beginning of the string to be expanded. This is especially important if the rail to be expanded is in compression.

(5) .With conventional cut spikes and plates, an approved mechanical vibratory device may be used to free the rail. Additionally, rail holding spikes shall be pulled if restraining rail movement.

(6) With elastic fasteners and rolled plates, it may be necessary to pick the rail up out of the plates and set on spikes and/or rollers about every 20th tie so as to permit the unrestrained movement of the CWR when being expanded. Again, this process should start from the last quarter point to be expanded and proceed

back towards the ¼ point or beginning of the string to be expanded. This is especially important if the rail to be expanded is in compression.

(7) The rail head must not be struck with a hammer at any time; to include expanding the rail.

(8) CWR should be heated and vibrated so that expansion is introduced from one end of each string to the other end in the direction of rail laying.

(9) All rail anchors or resilient fasteners must be re-applied immediately after the CWR string has achieved proper expansion at the quarter points based upon the target RNT of at least 105°.

(10) The number of inches each CWR string should be expanded during the rail laying operation may be determined by calculation according to the following formula:

$$A = 0.000078 \times (T_D - T_E) \times L$$

where:

A = the amount (inches) of length a CWR string must be increased or decreased to reach the target rail laying or rail neutral temperature

T_E = the existing rail temperature of the CWR before the heating process has begun

T_D = the target neutral temperature or rail laying temperature (105°F) of the CWR at the end of the heating process

L = the length of the CWR in feet

Example: How much expansion is required to adjust the length of a 1,450 ft. CWR string, anchored at a rail temperature of 50°F to the target rail laying/rail neutral temperature of 105°F? Subtract 50°F from 105°F to obtain a difference of 55°F and then multiply as follows:

$$0.000078 \times 1{,}450 \times (105 - 50) = 0.000078 \times 1{,}450 \times 55 = 6.22 \text{ inches.}$$

Say 6.25 inches

Or use "Change In Rail Length Due To Change In Rail Temperature" Table on the back of Form "RC", "Report of Rail Clipping/Anchoring" found in Attachment E.

(11) A space equal to the amount of expansion required for each string of CWR should be provided between the far end of the string being expanded and the near end of the next adjacent string.

(12) The clipping or anchoring operation shall consist of sufficient personnel so that the work will progress closely enough behind the heating and/or pulling process so that the string is held in place, and no loss of expansion occurs.

(13) Quarter points should be marked on the rail and the tie plate, so that the amount of expansion can be accurately determined. The tie plate used for marking as a reference point must be one that is either doweled or has been spiked, or screw lagged; so that it will not move as the rail expands. Particular attention must be

paid to insure that the rail does not bind on tie plates, spikes or other obstructions.

(14) Heating should commence at the beginning of the first CWR string and steadily applied while moving forward until the required expansion has been obtained at the end of the string. Uniformity of expansion is to be controlled by marking each quarter of the string and introducing expansion as follows:

¼ point - ¼ of total expansion
½ point - ½ of total expansion
¾ point - ¾ of total expansion
End of the string – 100% of total expansion

(15) If when heating, the heated CWR string does not have the required expansion at each quarter point, the heater will back over the heated portion, without applying heat, and then reheat the rail until the necessary expansion is obtained.

(16) During and subsequent to heating, resilient fasteners or anchors shall be applied to the patterns specified in Section 4.0 to prevent the rail from losing expansion. If resilient fasteners fail to hold expansion, rail anchors in the pattern of the following paragraph shall be applied.

(17) Rail anchors and/or clips may be used to control and maintain the expansion realized in a string of CWR while the rail string is being anchored and/or clipped in its entirety. A minimum of 20 consecutive ties shall be solid box anchored and/or clipped at the fully expanded end of the string , to hold the expansion while applying all other anchors and or clips as required.

(18) A rail puller can be used to hold the required expansion and/or to help get the required expansion. At least 20 ties on the next string ahead of the string being distressed shall be box anchored and/or clipped to provide sufficient holding power for the rail puller to hold or pull the string being expanded.

(19) The entire CWR string is to be anchored and/or clipped in accordance with Section 4.0 “Anchoring of CWR” before the track is returned to service and trains are permitted to operate.

(20) An approved rail thermometer (magnetic) shall be used to measure the rail temperature of all CWR before it is anchored or clipped. The thermometer should be placed on the web of rail just above the bottom fillet, on the side of the rail that is shielded from the direct rays of the sun and left there long enough (5 minutes) to determine the temperature accurately.

(21) Where CWR has been anchored and/or clipped at a rail temperature below 95°F (RLT -10°F) and not expanded to the target RNT of 105°F during the rail laying operation, the rail shall be inspected by a person qualified on §213.7(a)(b)(c)(d). A TSR shall be placed, if necessary, and the removed when the rail is expanded to at least 95°F (RLT -10°F).

(22) If the CWR is anchored and/or clipped at a temperature greater than 115°F (RLT +10°F), up to and including 125°F, the rail may remain in track without restriction.

(23) If the CWR is anchored and/or clipped at a temperature greater than 125°F, the rail may remain in track without restriction with the permission of the MassDOT Rail and Transit Division.

(24) The following information shall be recorded on the field side web of the individual string (with permanent metal marker) as the strings are being laid:

(i) String number

(ii) Date installed or adjusted or distressed

(iii) Length of string in feet

(iv) Existing rail temperature/preferred RNT

(v) Total expansion required at end of string (if appropriate)

(25) The person in charge of installing the CWR shall be responsible for recording on the appropriate Form ("CWR Rail Expansion/Heat Record Report") the rail temperature for which each CWR string is anchored. Copies of these forms should be forwarded to MassDOT Rail and Transit Division. See Appendix "E", Form "RC".

(26) The "CWR Rail Expansion/Heat Record Report(s)" for any CWR laid in track and or distressed shall be retained by the Railroad Operating Companies until the CWR is readjusted and/or **removed from service.**

4.0 ANCHORING OF CWR

(a) CWR Rail Anchoring Requirements: The following anchoring requirements apply to all CWR tracks.

(1) Existing anchor patterns may remain in place until CWR is installed.

(2) Where the anchoring function is otherwise provided, such as with a resilient fastener, rail anchors may be omitted.

(3) Anchors may not be applied where they will interfere with signal or other track appliances or where they are inaccessible for adjustment or inspection.

(4) Anchoring must effectively restrain the longitudinal rail movement.

(5) Rail must be adjusted and/or anchors must be added to rail that is moving, or where the existing anchors do not have effective holding power to restrain longitudinal movement.

(6) Anchor pattern may be varied, if possible, to avoid placing anchors against deteriorated ties.

(7) When a crosstie has four properly installed resilient fasteners, or four properly installed rail anchors, it will be considered to be fully box anchored tie.

(b) When laying or distressing welded rail, rail anchors are used to maintain the desired expansion and length of CWR strings. Crossties shall be fully box anchored in accordance with the following:

(1) Every Tie:

(i) Curves 3° and over

(ii) Through all rails of turnouts and crossovers, where practicable

(iii) For 195' in each direction from:

a. Main track turnouts and crossovers
b. Track crossings (diamonds)
c. Highway grade crossings
d. On the fixed side of expansion joints
e. On the approaches to open deck bridges
f. On both sides of all insulated joints (bonded and/or non-bonded)
g. On both sides of hot box, dragging equipment and wheel impact load detectors
h. Before bumping posts

(2) Every Other Tie:

(i) Through the remainder of CWR strings where full boxing is not specified above.

(3) Bridge Anchor Patterns:

(i) Ballast deck bridges should be anchored with the same pattern as the rail on each approach to the bridge.

(ii) Open deck bridges should be anchored according to the following table or as approved by the MassDOT Rail and Transit Division:

Length of Continuous Open Deck Portion (ft.)**	**Individual Span Length (ft.)**	**Rail Anchor Requirements**	**Sliding Joint Requirements**
100 ft. or less	All spans	Every 3rd or 4th tie. See §111.0(M) Bridge Timbers*	None required
Greater than 100 ft.	100 ft. or less	Every 3rd or 4th tie. See §111.0(M) Bridge Timbers*	None required
	Greater than 100 ft.	Every 3rd or 4th tie. See §111.0(M) Bridge Timbers*	As per requirements of MassDOT Rail and Transit Division
* Box anchors are to be applied only to ties that are hook bolted to the span. **See MBTA Book of Standard Plans Drawing Nos. 1232 and 1236.			

(4) Other Anchor Patterns:

(a) Under pavement off the ends of grade crossing panels.

(b) Under grade crossing surfaces as per crossing surface manufacturer.

(c) In areas adjacent to the expansion side of expansion joints as authorized and approved by MassDOT Rail and Transit Division.

(c) Anchor Requirements After Making Rail Repairs in CWR and Adding Joints:

(1) When repairs are made to stripped joint or failed bar on CWR that already exists in track, the adjustment or addition of anchors will be as prescribed below:

Condition	Action
Bolted joint in CWR experiencing a service failure (pull-apart) or failed bar(s) with gap* present (FRA §213.119(c)(3)	Weld Joint, **OR** Remediate Joint conditions **and** replace four (4) bolts (new, in-kind or stronger) **and** weld joint within 30 days, **OR** Replace broken bar(s), install 2 additional bolts (6 total) and adjust anchors (ballast permitting), **OR** Replace bars, bolts (if broken or missing) and anchor every tie for 195' in both directions (ballast permitting) **OR** Add rail and make out Form "TD" and make future repairs
* Gap exists if it cannot be closed with a drift pin.	

5.0 MAINTENANCE OF THE DESIRED RAIL NEUTRAL TEMPERATURE IN PREVIOUSLY INSTALLED CWR

(a) **Maintaining Desired Neutral Temperature Range: Broken or Defective Rail, Pull-Apart (Service Failures) And/or Tight Rail or Track Buckle**

(1) This section addresses repairs for broken or defective rail, and corrections made for tight rail, track buckle or pull-apart.

(2) Also see Attachments A, B, and C.

(3) When performing this work, care shall be taken not to add rail to the track.

(4) In general, if a length of rail is installed in CWR, it should have a length less than the rail removed and/or not exceed the length of rail removed (DO NOT ADD RAIL).

(5) Before joint bars are removed and/or a rail is cut, reference marks shall be added at tie plates and on the base of the rail. Reference marks can be used to determine how much the joint opens, or how much rail is cut out (if rail is in compression) or how much rail is added.

(6) The use of reference marks includes:

- Marking the locations where the joint is to be removed or the rail is to be cut
- Marking the rail outside the limits of the joint bars
- Measuring the distance between the reference marks and mark it on the rail
- Installing the rail and re-measure the distance between reference marks
- Recording the difference and documenting the location

(7) If rail is added for any reason, such as repairing a pull-apart, making emergency repairs, fixing a service failure or any other interim repair, measure and record the amount of rail added on Form "TD" so that adjustments can be made before reaching the rail return temperature.

(8) Existing RNT shall be estimated where the rail has pulled apart, broken, or been cut for defect removal by using the appropriate charts in Attachment A.

(9) To determine the pre-break/cut RNT, record the length of the rail end gap, rail temperature, rail base size and existing rail anchorage and use tables in Attachment "A".

(10) The estimated pre-break/cut RNT shall be recorded on Form "TD" so that additional required repairs, if any, can be tracked and done before rail return temperatures are exceeded (see Attachment C).

(11) Work performed by Railroad Operating Companies, such as rail that has pulled apart, broken, or been cut for service failures to make repairs to CWR, shall be readjusted to a preferred RLT or RNT of 105°F +/- 10°F**. The minimum RNT is 95°F** (see Section 3.0).

(12) If rail has not been adjusted before rail return temperatures exceed the values in Attachment C, then a temporary speed restriction (TSR) of 25 MPH shall be placed. A TSR of 40 MPH may be placed if a required daily inspection is made during the heat of the day, every day, **until the adjustment and permanent repair is made.**

(13) For detailed procedures on adjusting pulled apart, broken, or cut rail, refer to Attachment C.

(b) **Adjusting or Distressing Previously Installed CWR**

(1) Rail can be distressed by heating rail and/or pulling rail that has a RNT below the target RLT of 105°F. In a curve, the CWR can be distressed or the curve can be lined out. When distressing or adjusting CWR with an RNT below the target RLT of 105°F, the following is a *general* procedure:

(2) Procedure:

(i) Determine amount of rail to be distressed on either side of a cut and/or joint (up to 800' on either side of the joint and/or cut for a total of 1,600' maximum).

(ii) Cut rail at the end or in center of rail to be distressed (see Attachment B).

(iii) Remove anchors or clips in both directions from either side of the cut back to the distressing limit or to a fixed object or an appliance in the track (turnout or grade crossing) or structure that prevents rail movement.

(iv) Wait until rails stop moving. The rail ends may need to be misaligned to allow for expansion and then trimmed one time (if possible) to fit.

(v) Take the rail temperature.

(vi) Compare the rail temperature to the target RLT=105°F to determine the temperature differential (TD).

(vii) If the actual rail temperature is lower than the RLT of 105°F, use the Rail Expansion Table in Attachment E (Form "RC") to determine the rail length to be removed based on the total distance the anchors or clips that have been removed.

(viii) Expand rail required amount by using ambient temperature, rail heater and/or rail puller.

(ix) Replace the rail anchors or clips.

(x) Weld the joint or apply joint bars:

- When making an orgothermite field weld, cut out required amount of rail plus the weld width allowance as specified by the weld manufacturer. **(**Typically **1"+/-)).**
- When making an electric flash butt field weld, the amount of rail to be cut is the amount determined from the rail expansion table minus the

amount of rail consumed when making the electric flash butt weld. (Typically 3/4" to 1-1/2")**.**

(3) All other provisions of Section 3.0 apply to this process.

(c) **Procedures for Making Repairs to Buckled Track**

(1) In the event of buckled track, the following conditions exist and procedures are to be used as a guideline:

(i) Since both rails are assumed to be in compression, cut both rails with a torch.

(ii) Make these torch cuts out of the displaced track zone where there may be significant compressive stress in the rails.

(iii) Torch cuts shall be at least one rail length (39'+) beyond the end of lateral track displacement.

(iv) If possible, before cutting the rail, line the track at the point of displacement in the direction of the displacement to further reduce the compressive stresses in the rail. If the displaced area is near a joint then the joint bars should be removed after lining the track.

(v) Misalign the cut and/or uncoupled rail ends, allowing the ends to bypass.

(vi) Bring the track back into correct alignment.

(vii) Both rails for some distance on either side of the point of maximum displacement and/or the point where rails were cut or the joint bars were removed are now considered to have lost their adjustment.

(viii) These rails must be readjusted and/or distressed according to this Section.

(ix) Also, see Attachment B: "Recommended Procedures for Distressing Continuous Welded Rail (CWR) Previously Laid In Track": "Reactive or Emergency Distressing".

(x) Track buckle at a fixed object:

- In those cases where the buckle occurs at a fixed object (grade crossing, turnout, etc.) the readjustment/distressing need only take place in the direction away from the fixed object,
- However, a close inspection of the track on the other side of the fixed object is required to determine if there is any evidence of rail or track movement, rail bunching, etc. which may indicate inadequate adjustment in that area and the need for additional distressing.

(xi) If the area cannot be readjusted or repaired before running a train, appropriate remedial action shall be taken:

- A Form "TD" shall be filled out so that necessary distressing work can be accomplished before return rail temperatures are exceeded (see Attachment C).
- Alignment measurements should be taken to ensure that the track meets minimum alignment requirements for the Class of Track at which the track is to be returned to service as is shown in the FRA Track Safety Standards §213.55**.**
- Rails that have been torch cut during the corrective procedure will be either cut back and/or removed from track promptly (see Attachment B).
- On MassDOT Rail and Transit Division owned rail lines, torch cut rails shall be protected by a maximum 10 MPH (F&P) temporary slow order (TSO) until the rail is cut back and/or removed from track.

(xii) New rail adjustment and rail clipping records shall be prepared on the Rail Clipping/Anchoring Form "RC" with the new adjusted temperatures when the rail in the affected area is distressed (see Attachment E).

(xiii) The original Form "TD" that was made out at the time of the incident shall be updated to indicate that all necessary repairs, to include distressing, have been made, when the permanent repairs are made.

(xiv) The Operating Railroad shall retain Form "RC" for the record for the duration of their Operating Contract and/or until the rail is removed from service. A copy of Form "RC" shall be sent to the MassDOT Rail and Transit Division.

(d) **Installing Rail Plugs in Existing CWR Track**

(1) When it is necessary to install rail plugs in existing CWR due to replacement of defective rails, defective field or plant welds, defective joints or insulated joint failures, etc., an approved heating device or hydraulic expander must be used to **assure the amount of rail installed is equal to or less than the length of rail removed. DO NOT ADD RAIL**

(2) If the work cannot be completed and a permanent repair cannot be made before running a train, appropriate remedial action shall be taken:

(i) A Form "TD" shall be filled out to document work done so that the necessary permanent repair can be accomplished before return rail temperatures are exceeded (see Attachment C).

(3) **Where necessary to install a plug rail in CWR, use at least a 14' long plug in tangent and at least a 21' plug in curves wherever possible.**

(4) See FRA §213.119(c)(3): If it becomes necessary to apply joint bars in CWR already laid in track, because of a service failure or a failed bar with a rail gap present:

(i) Weld the joint (The end bolt hole in each rail end must not be drilled to permit field welding);

(ii) Replace broken bar(s), replace broken bolts, adjust anchors and within 30 days, weld the joint;

(iii) Replace the broken bar(s), replace the broken bolts, install one additional bolt per rail end (six hole bar needs six bolts), and adjust anchors;

(iv) Replace the broken bar(s), replace the broken bolts, and anchor every tie 195 feet in both directions from the CWR joint.

(e) **Field Welding of CWR**

(1) When field welding joints with orgothermite welds between CWR strings that have been temperature adjusted, or field welding plugs previously installed in properly adjusted CWR track:

(i) **The necessary gap for welding will not be developed by allowing the rail gap to open up to the correct welding gap.**

(ii) The following welding practices shall be used:

- Remove the joint bar. Remove with an approved rail saw 1"+/- of rail, or as specified by weld manufacturer, to provide the required welding gap. If a "Wide Gap" field weld is to be used, the gap shall be as required by the weld manufacturer. Torch cutting of rail is prohibited. **DO NOT ADD RAIL**
- To maintain the proper weld gap apply a hydraulic expander to return the rail ends to the required gap and while holding this position,

proceed to make the weld in accordance with existing procedures. Let field weld cool to 500°F before removing expander.

- Upon completion of weld reapply anchors and/or clips before removal of the hydraulic expander.

(2) All other provisions contained in §121.1(M), "Field Welding of Rail Joints," of the MW-1 will be followed when field welding is conducted.

6.0 TRACKWORK THAT DISTURBS CWR TRACK AND THE PROTECTION OF DISTURBED TRACK

6.1 General

The following trackwork repairs are considered to disturb CWR track.

6.1.1 Trackwork that Disturbs CWR

(a) Trackwork activities discussed below are repairs and/or production work that are considered to have disturbed CWR track.

(b) **Trackwork activities that disturb CWR track** shall be inspected by a qualified person as designated in FRA §213.7(a)(b)(c).

(c) Before returning the track to service, the above designated person in (b) shall take appropriate remedial action and place a TSR as given in this Section 6.0.

(d) The designated qualified person as given in (b) shall place more restrictive TSRs and additional remedial action as conditions warrant.

6.1.2 Trackwork that Does Not Disturb CWR

(a) **Trackwork activities that do not disturb CWR track** shall be inspected by a qualified person as designated in FRA §213.7(a)(b)(c).

(b) Before returning the track to service, the above designated qualified person in (a) shall take any appropriate remedial action that that person sees fit to protect the safety of train operations.

6.2 Train Definition

(a) For the purposes of this part, a train is defined as:

(1) A locomotive and at least eight loaded ballast cars (80 ton cars each) (1,000 ton +/- consist), or

(2) A commuter train with at least five cars and a locomotive (750 ton +/- consist), or

(3) Some combination of railroad equipment that is 1,000 ton consist (including locomotive), or

(4) A ballast stabilizer that is equivalent to 50 tonnage trains (1,000 tons each) or 50,000 tons, or

(5) As approved by MassDOT Rail and Transit Division.

6.3 Work Activities that Disturbs CWR Track

(a) **Installation of Plugs in CWR that Disturbs CWR Track:**

(1) If, during the installation of a plug rail in CWR, rail has been added or RNT as determined by measurement of rail gap is less than 95°F or (RNT-10°F) see Attachments A and C and the following:

(i) Install the rail anchors reversed on field side of plug rail only until necessary permanent repairs are made; or

(ii) Spray the elastic fasteners on the gage side in orange paint until necessary permanent repairs are made.

(iii) Fill out Track Disturbance Report (Form "TD"). The amount of rail added, as well as the temperature and rail gaps of the rail at the time of the break or

saw cut, **shall** be reported on Form "TD", "Record of Disturbance of Main CWR Track."

(iv) Make temporary and/or permanent repairs as given in Attachment C using tables in Attachment A as required.

(v) The track shall be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(2) **Protective Slow Order**: See Table in Attachment C for maximum rail temperatures (°F) at which permanent repairs or readjustments shall be made and/or slow orders applied. **When these rail temperatures exceeded a TSR of no more than 25F and 25P MPH shall be placed on the track in question until repairs are made, unless inspected daily in the heat of the day, in which case the TSR can be no more than 40F and 40P MPH**

(3) Repairs shall be accomplished in accordance with Section 5.0 and Attachments C and A.

(4) Following steps (1) and (2), when permanent repairs have been made, the track will be returned to maximum authorized speed (MAS) unless additional deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(5) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work such as installing plug rails shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(b) **Tie Renewal In Tangent Track and in Curves <3° that Disturbs CWR Track:**

(1) Installing more than four ties in 39' of track with four undisturbed ties between renewed ties; or

(2) Installing four or less than four ties per 39' of track with fewer than four undisturbed ties between renewed ties.

(3) In any case no more than four ties per 39' of track (540 ties per mile) can be replaced in one pass.

(4) **When old ties are removed, and new ties and plates installed, do not lift the rail.**

(5) **When tamping ties installed, tamper should be set so that no lifting of the track occurs.**

(6) **MassDOT shall review means, methods, and equipment before ties are removed and installed.**

(7) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(8) Ties shall not be installed at ambient temperature of less than 40°F unless approved by the MassDOT Field Representative.

(9) Fill out Track Disturbance Report (Form "TD").

(10) The track shall be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(11) **Protective Slow Order (without stabilizer) (Ambient ≤80°F):** Not to exceed 25F and 30P MPH shall be applied for a period of 24 hours and a minimum of 12 trains over the affected track.

(12) **Protective Slow Order (with stabilizer) (Ambient ≤80°F):** Not to exceed 25F and 30P MPH shall be applied for the first train over the affected track.

(13) **Protective Slow Order (with or without stabilizer) (Ambient >80°F):** If ambient temperature >80°F and rail temperature is >110°F, a slow order of 10F and 15P shall be applied until the ambient temperature drops to 80°F. When the ambient temperature is ≤80°F, the Protective Slow Order applied is described as above in (11) or (12).

(14) Following steps (11) and/or (12), (13), track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(c) **Tie Renewal in Curves ≥3° that Disturbs CWR Track:**

(1) In addition to the protective action required when installing ties in tangent track in Paragraph (b) above, if 540 ties per mile or more are installed in curves ≥3° the following shall be done:

(i) The curve or curves ≥3° in question shall be staked as described in Attachment E, using Form "TM," Report of Track Movement.

(ii) Movement of the curve(s) when ties are installed shall be recorded on Form "TM"; and,

(iii) If a curve greater or equal to 3° moves inward and/or outward when installing ties, the curve shall be inspected by a person qualified under FRA §213.7(a)(b)(c), and appropriate remedial action taken as conditions warrant.

(iv) If movement limits to the inside of the curve are exceeded then the RNT shall be adjusted by distressing the rail in the curve and/or lining the curve out (see Attachment B).

(2) **When old ties are removed, and new ties and plates installed, do not lift the rail.**

(3) **When tamping ties installed, tamper should be set so that no lifting of the track occurs.**

(4) **MassDOT shall review means, methods, and equipment before ties are removed and installed.**

(5) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(6) Ties shall not be installed at ambient temperature of less than 40°F unless approved by the MassDOT Field Representative.

(7) Fill out Track Disturbance Report (Form "TD") and Report of Track Movement (Form "TM") as appropriate.

(8) **Protective Slow Order (with or without stabilizer) (Ambient ≤80°F)**: Same as for Tie Renewal in Tangent Track if curve movement for curves ≥3° is less than 3"as given on the table for Form "TM" (see Attachment E for table).

(9) **Protective Slow Order (without or with stabilizer) (Ambient >80°F):** If ambient temperature is >80°F and rail temperature is >110°F, a slow order of 10F and 15P MPH shall be applied until the ambient temperature drops below 80°F. When the temperature drops below 80°F, the Protective Slow Order is applied as described above in (8).

(10) **Protective Slow Order for Curve Movement (with or without stabilizer) (Ambient ≤80°F)**: If a curve ≥3° has movement ≥3" to the inside (see Form "TM," Attachment E), a protective slow order not to exceed 25F and 30P shall be applied. In addition:

(i) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(ii) The restriction shall remain in effect until the curve is lined out back to its original position and/or both rails are readjusted to the target neutral temperature of 105°F in accordance with Section 3.0 and Attachment B

(11) **Protective Slow Order for Curve Movement (with or without stabilizer) (Ambient >80°F)**: If a curve ≥3° has movement ≥3" to the inside (see Form "TM," Attachment E), a protective slow order not to exceed 10F and 15P shall be applied. In addition:

(i) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(ii) The slow order of 10F and 15P MPH shall be applied until the ambient temperature drops below 80°F. When the temperature drops below 80°F, the protective slow order is applied as described above in (10); and

(iii) The restriction of 25F and 30P shall remain in effect until the curve is lined out back to its original position and/or both rails are readjusted to the target neutral temperature of 105°F in accordance with Section 3.0 and Attachment B.

(12) Following steps (7) through (11), track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(d) **Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <3°):**

(1) **The normal balancing of throws done during high speed surfacing operations does not constitute out-of-face curve realignment.**

(2) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(3) If the ambient temperature and/or rail temperature is less than 40°F, all work will be suspended unless it is an emergency or directed by the MassDOT Field Representative.

(4) **Protective Slow Order: T**he protection of CWR Track which has been surfaced is shown in the following table, "Protection Required for CWR Track Surfaced Based on Air and Rail Temperatures."

(5) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(6) When operating speeds change during the time a restriction (TSR) is in effect, the worked track must be re-inspected by a qualified Operating Railroad Employee each time the speed is to be raised.

(7) Whenever a dynamic stabilizer is to be used as part of a surfacing operation, it will be:

(i) Operated after each pass of the tamper; and

(ii) Both vibration units must be fully operable and the frequency of oscillation shall be in the range of 30-35 Hz, with a minimum vertical loading pressure of 870-1,000 psi and working speed shall be in the range of 1-2 MPH.

(iii) A ballast compactor may be used if approved by MassDOT Rail and Transit Division.

Protective Slow Order Required for CWR Track Surfaced Based on Air and Rail Temperatures

Air Temperature	Distance	Wood Tie Track Protection	Concrete Tie Track Protection
Applies to ALL Surfacing: STOP Work			
Ambient Does Exceed 80° or the and Rail Temperature Exceeds 110°F***	All Distances	STOP Work	STOP Work
Protections to be applied for Surfacing with NO Dynamic Stabilizer			
Ambient Does Not Exceed 80° (Rail Temp ≤110°F)	0 ft. to 19'-6"	None*	None*
	Over 19'-6"	25F-30P MPH for 24 hours **and** the passage of 12 trains	25F-30P MPH for 24 hours **and** the passage of 12 trains**
In an Emergency, Ambient Does Exceed 80° (Rail Temp >110°F)	All Distances Ambient >80°F	10F-15P MPH until ambient temperature ≤80°F	10F-15P MPH until ambient temperature ≤80°
	All Distances Ambient ≤80°F	25F-30P MPH for 24 hours **and** the passage of 12 trains	25F-30P MPH for 24 hours **and** the passage of 12 trains**
Protections to be applied for Surfacing USING a Dynamic Stabilizer			
Ambient Does Not Exceed 80° (Rail Temp ≤110°F)	All Distances	10F-15P MPH for the first train 25F-30P MPH for the second train,	10F-15P MPH for the first train 25F-30P MPH for the second train,
	WITH the use of a Dynamic Stabilizer	Then Normal Speed	Then Normal Speed
In an Emergency, Ambient Does Exceed 80° (Rail Temp >110°F)	All Distances	10F-15P MPH first train 25F-30P MPH for the second train,	10F-15P MPH first train 25F-30P MPH for the second train,
	WITH the use of a Dynamic Stabilizer	Then not more than 40F-60P MPH for the passage for 24 hours and 12 additional trains	Then not more than 40F-60P MPH for the passage for 24 hours and 12 additional trains

* If the air temperature does exceed 80°F (rail temperature exceeds 110°F) during the 24 hours following the work then a 25F-30P MPH restriction must be placed on the worked area for 24 hours and the passage of 12 trains.

** A restriction with a speed no greater than 40F-60P MPH may be applied only if a Shoulder and Crib Compactor is used immediately after surfacing. If a restriction greater than 25F and 30P MPH is applied, the first train over the affected area must be limited to 25F and 30P MPH.

***If the air temperature exceeds 80°F and the rail temperature exceeds 110°F, there is no work permitted except in an emergency or as directed by MassDOT Rail and Transit Division.

(e) **Surfacing, Smoothing and/or Lining that Disturbs CWR Curved Track: Curves ≥3°**:

(1) **The normal balancing of throws done during high speed surfacing operations does not constitute out-of-face curve realignment.**

(2) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(3) If the ambient temperature and/or rail temperature is less than 40°F, all work will be suspended unless it is an emergency or directed by the MassDOT Field Representative.

(4) Curves 3° or over being surfaced and aligned shall be staked to monitor movement.

(i) To stake a curve, place reference points uniformly around the curve in the track along the gage side of the high rail, starting at the tangent to spiral point (TS). As a minimum, tag and stake the following points:

- Tangent to Spiral Point (TS)
- Spiral to Curve Point (CS)
- Full Body of Curve: at least every 200'
- Curve to Spiral Point (CS)
- Spiral to Tangent Point (TS)

(ii) The reference points shall be 200' or less apart. Each reference point around the curve shall be staked on the field side of the high rail (where possible). Stakes should be set a minimum of 15' from the gage corner side of the high rail out of the way of ballast unloading and the ballast regulator wings.

(iii) The reference points are to be recorded on Form "TM," "Report of Track Movement" (see Attachment E).

(iv) Measure from the reference points to the stakes on the field side of the high rail to obtain initial values of distance between reference points and stakes before any work is conducted and record on Form "TM".

(v) The reference point to stake distances shall be re-measured immediately after the final surfacing pass by the surfacing gang. These measurements are made to determine track movement, if any, at the reference points. The measurements shall be measured and recorded on Form "TM" before track is returned to normal speed.

(vi) In addition, the track movement at the reference points should also be re-measured seven days after the work is completed.

(vii) Track movements shall be calculated and compared to the values given on Form "TM" (see Attachment E).

(5) **Protective Slow Order (any temperature):** If in surfacing and aligning a curve ≥3°, the limits of out-of-face curve realignment given in Attachment E, Form "TM", are NOT EXCEEDED:

(i) If the curve is moving outward and/or inward, inspect the curve with a person qualified under FRA §213.7(a)(b)(c), and provide protection and/or TSRs as given in Section 6(d), "Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <3°)"; or

(ii) If the curve is moving outward and/or inward, inspect the curve with a person qualified under FRA §213.7(a)(b)(c), and, if conditions warrant, take

remedial action ad provide more restrictive protection than required in Section (6)(d), "Surfacing, Smoothing and/or Lining that Disturbs CWR Track (Tangent and Curves <°3)."

(6) **Protective Slow Order (when curve movements in Attachment E, Form "TM", are exceeded):** If in surfacing and aligning a curve ≥3°, the limits of out-of-face curve realignment (≥3") given in Attachment E, Form "TM" are exceeded (≥3"), proceed as follows.

(i) Fill out Form "TD" Track Disturbance Report and Form "TM" Report of Track Movement.

(ii) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(iii) The curve will have been considered to have lost its neutral temperature and will have to be adjusted in accordance with Section 3.0, "Installation and Adjustment of CWR" and/or realigned out to original position as determined by staking.

(iv) **Protective Slow Order (Ambient ≤80°F):** Not to exceed 25F and 30P MPH until rail has been cut and RNT adjusted to 105°F and/or curve has been lined out to original position.

(v) **Protective Slow Order (Ambient >80°F):** Not to exceed 10F and 15P until:

- The ambient temperature drops below 80°F. When the temperature drops below 80°F, the protective slow order is applied as described above in (iv) above; and.
- The restriction of 25F and 30P shall remain in effect until the curve is lined out back to its original position and/or both rails are readjusted to the target neutral temperature of 105°F in accordance with Section 3.0 and Attachment B

(7) Following steps (4) through (6), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(f) **Cut and Throw of Track that Disturbs CWR Track:**

(1) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(2) When existing CWR track is cut and thrown, it will be considered to have lost its neutral temperature and will have to be adjusted in accordance with Section 3(b). **DO NOT ADD RAIL.**

(3) Fill out Track Disturbance Report (Form "TD").

(4) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(5) **Protective Slow Order (Ambient ≤80°F):** Not to exceed 25F and 30P MPH shall be applied until RNT is readjusted to 105°F.

(6) **Protective Slow order (Ambient >80°F):** Not to exceed 10F and 15P MPH until RNT is readjusted to 105°F.

(7) The area of cut and throw will have been considered to have lost its neutral temperature and the RNT shall be adjusted in accordance with Section 3.0, "Installation and Adjustment of CWR."

(8) RNT adjustments shall be made before the ambient and rail temperatures reach those given in (1).

(9) Following steps (3) through (8), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(g) **Switch or Track Panel Installation that Disturbs CWR Track:** When performing panel installation, the following requirements apply:

(1) Fill out Track Disturbance Report (Form "TD").

(2) Switch and track panel installation shall only be performed at ambient temperatures greater than 30°F unless it is an emergency or as directed by MassDOT Rail and Transit Division; and,

(3) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(4) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(5) The area of switch or track panel installation will have been considered to have lost its RNT if:

(i) Rail has been added when the switch and track panel has been installed.

(ii) This can be determined by placing match mark on the rail before the track is cut to install the switch and/or track panel and by measuring the rail gap.

(6) If RNT has been lost, the rail shall be adjusted to a target RNT of 105°F in accordance with Section 3.0, "Installation and Adjustment of CWR."

(7) If rail has been added, a protective slow order shall be placed until the adjacent CWR and RNT is adjusted. These RNT adjustments shall be made before the ambient and rail return temperatures are exceeded as given in Attachment C. These temperatures are related to the rail temperature at which the rail was cut to install the track or switch panel.

(8) **Protective Slow Order (Ambient ≤80°F) (until rail neutral temperature adjustment):** Not to exceed 25F and 30P shall be applied until the RNT adjustment work is accomplished.

(9) Protective Slow Order (Ambient >80°F) (until rail neutral adjustment): Not to exceed 10F and 15P MPH shall be applied until the RNT adjustment work is accomplished.

(10) In addition, the track panel has lost all its lateral stability and the CWR is considered disturbed until the ballast section is restored and recompacted/stabilized by machine action and/or by train traffic.

(11) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast without stabilizer):** Place a protective slow order not to exceed 25F and 30P MPH will be applied after surfacing, for a period of 24 hours ***and*** a minimum of 12 trains over the affected track.

(12) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast with stabilizer):** Not to exceed 25F and 30P MPH shall be placed for a period of 24 hours and a minimum of three trains over the affected track if a stabilizer has been used.

(13) Following steps (4) through (12), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(h) **Undercutting that disturbs CWR track:** When performing this work, the following requirements apply:

(1) Fill out Track Disturbance Report (Form "TD").

(2) Undercutting shall not be done at an ambient temperature below 30°F and above 80°F (rail temperature greater than a temperature of 110°F) except in an emergency and as approved by MassDOT Rail and Transit Division.

(3) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(4) When undercutting track, the neutral temperature shall be considered lost and the rail will have to be adjusted to a target RNT of 105°F in accordance with Section 3.0, "Installation and Adjustment of CWR."

(5) These RNT adjustments shall be made before the ambient and rail return temperatures are reached as given in Attachment C. These temperatures are related to the rail temperature at which the rail was undercut and the existing RNT was substantially altered.

(6) **Protective Slow Order (Ambient ≤80°F) (until rail neutral temperature adjustment):** Not to exceed 25F and 30P shall be applied until the RNT adjustment work is accomplished.

(7) **Protective Slow Order (Ambient >80°F) (until rail neutral adjustment):** Not to exceed 10F and 15P MPH shall be applied until the RNT adjustment work is accomplished.

(8) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast without stabilizer):** Place a protective slow order not to exceed 25F and 30P MPH will be applied after surfacing, for a period of 24 hours ***and*** a minimum of 12 trains over the affected track.

(9) **Protective Slow Order (at any ambient Temperature) (with correct RNT) (to consolidate ballast with stabilizer):** Not to exceed 25F and 30P MPH shall be placed for a period of 24 hours and a minimum of three trains over the affected track if a stabilizer has been used.

(10) Following steps (3) through (9), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(i) **Out-of-Face Shoulder Ballast Cleaning that Disturbs CWR Track:**

(1) Fill out Track Disturbance Report (Form "TD").

(2) Out-of-Face shoulder ballast cleaning shall not be done at an ambient temperature below 30°F and above 80°F (rail temperature greater than a temperature of 110°F) except in an emergency and as approved by MassDOT Rail and Transit Division.

(3) After shoulder ballast cleaning is performed, there shall be a full restoration of the standard ballast section to include cribs and shoulders.

(4) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(5) **Protective Slow Order (with compactor and/or stabilizer) (Ambient Temperature ≤80°F):** The track may be put back at MAS provided that:

(i) The first train shall operate after out-of-face shoulder ballast cleaning at no more than 25F and 30P MPH.

(ii) The Operating Railroad person qualified under FRA §213.7 shall re-inspect the track and if no deficiencies are found; and

(iii) The track has a fully restored standard ballast section that has been treated with:

- A standard ballast compactor and/or;

- A dynamic stabilizer.

(iv) The track shall be returned to MAS.

(6) **Protective Slow Order (without compactor and/or stabilizer) (Ambient Temperature ≤80°F):** If ballast compaction is not performed with a standard ballast compactor and/or a dynamic stabilizer:

(i) The track shall have a protective slow order of no more than 25F and 30P MPH for 24 hours. for a period of 24 hours ***and*** a minimum of 12 trains over the affected track.

(ii) The Operating Railroad person qualified under FRA §213.7 shall re-inspect the track and if no deficiencies are found;

(iii) The track speed shall be returned to MAS.

(7) **Protective Slow Order (with compactor and/or stabilizer) (Ambient >80°F):** In an emergency, if the ambient temperature exceeds 80°F (rail temperature >110°F), out-of-face shoulder ballast cleaning shall continue only if a shoulder compactor and/or dynamic stabilizer is used. A protective slow order shall be placed as follows:

(i) Wood or concrete tie track: not to exceed 25F and 30P MPH during the period the air temperature exceeds 80°F and/or until 24 hours elapses then re-inspect and return to MAS, if appropriate.

(j) **CWR Installation that is Unacceptable:**

(1) Fill out Track Disturbance Report (Form "TD")

(2) CWR not installed in compliance with Section 3.0.

(3) A protective slow order not to exceed 25F and 30P MPH until the CWR is installed and adjusted to the target neutral temperature of 105°F as per Section 3.0.

(k) **Anchor or Clip Removal that Disturbs CWR Track:**

(1) When more than eight ties per 39' of track have anchors or clips removed and/or missing; or,

(2) The required standard anchor pattern as in Section 4.0 does not exist, CWR track is disturbed; and

(3) Fill out Track Disturbance Report (Form "TD")

(4) **Protective Slow Order (Ambient >80°F):** If anchor/clip replacement is not accomplished before the ambient temperature exceeds 80°F (rail temperature >110°F), a slow order not to exceed 25F and 30P MPH and shall be in effect until the proper number of anchors or clips are applied and/or re-applied in the pattern as described in Section 4.0.

(5) Install all missing anchors and/or clips.

(6) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(7) Following steps (3) through ((6), the track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

(l) **Cribbing that Disturbs CWR Track:**

(1) Cribbing more than three ties in a row in 39'; or

(2) Cribbing four or more ties with less than four undisturbed ties between ties cribbed.

(3) In all cases no more than three successive ties or more than four ties per 39' of track can be cribbed in one pass.

(4) Track with the cribs reduced in the rail seat area for the mechanical installation of rail anchors on properly adjusted CWR does not require a slow order for improper ballast section, if this is the only ballast section deficiency and the track has not had lateral resistance reduced.

(5) If the ambient temperature is greater than 80°F (rail temperature greater than a neutral temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division.

(6) Fill out Form "TD" Track Disturbance Report.

(7) The track must be inspected by a person qualified under FRA §213.7 to ensure that the track is safe for the passage of the first train.

(8) Wood or concrete tie track will be returned to service:

(i) When all the cribs are filled with new ballast and dressed and mechanically tamped.

(9) **Protective Slow Order (at any ambient temperature):** Not to exceed 25F and 30P MPH for a period of 24 hours and the passage of 12 trains over the affected track, re-inspect and return track to MAS, as appropriate.

(10) Following steps (6) through (9), track will be returned to MAS unless deficiencies or defects are observed and then appropriate remedial action shall be taken in accordance with FRA Part 213.

6.4 Suspension of Work Due to Heat Where Ambient Temperature >80°F or Rail Temperature >110°F

(a) The following work which can reduce the stability of CWR at higher temperatures will be suspended (except under a continuous track outage) or unless there is an emergency, when air temperatures are expected to be above 80ºF (rail temperature greater than a rail temperature of 110°F):

(1) Tie Renewal

(2) Tie Renewal in Curves

(3) Surfacing, Smoothing and/or Lining

(4) Out-of-face Curve Re-aligning

(5) Cut and Throw of Track

(6) Installation of Track or Switch Panels

(7) Undercutting

(8) Out-of-Face Shoulder Ballast Cleaning

(9) Cribbing

6.5 Protection of Work Areas for Latent Heat Effects

(a) **This requirement applies for work that has been done that disturbs CWR track until seven days of traffic has been accumulated over the work area, or the period of high heat ends.**

(b) The speed restriction shall be placed by a person qualified on FRA §213.7(a)(b)(c), if appropriate, on a case-by-case basis if the air temperature is at 80ºF or above (rail temperature >110°F).

(c) Each Operating Railroad qualified employee in a work block is responsible for the protection and inspection requirements of this Section, as they relate to the work conducted under the railroad's control.

(d) In the case where a Foreman is working in an out-of-service block of track under the control of another Foreman, but at a separate location from the Foreman providing protection:

(1) This Foreman will inspect and report the findings, if any, to the Foreman in charge of the track before reporting clear of the track.

(2) This report must include any required speed restrictions and any other information that would affect the safe movement of trains.

7.0 SPECIAL INSPECTIONS OF CWR TRACK

(a) **Special Inspection in Hot Weather**

(1) When the air temperature is ≥95ºF or the rail temperature is ≥125°F, all main tracks with CWR shall be inspected by qualified Operating Railroad personnel qualified on Track Safety Standards, Part 213, §213.7(a)(b)(c) and in accordance with currently established inspection procedures, outlined in this Appendix.

(2) During periods of extreme heat, when air temperatures exceed 95ºF or the rail temperature is ≥125°F, the Operating Railroad qualified employee should make Special Inspections and place appropriate speed restrictions (TSR) and take remedial action, as required.

(3) Determination of Temperature: The rail temperature is the preferred temperature and is taken with an approved rail thermometer. The air temperature is as reported by the National Weather Service.

(4) Operating Railroad personnel shall make out a "Special Track Inspection Report" (see Appendix F, "Forms") for this inspection and retain a copy for the duration of the Operating Contract that can be reviewed by the MassDOT Rail and Transit Division.

(5) During this inspection, the track inspector must be particularly alert for wavy track, longitudinal rail movement, kinked joints in compression and evidence of lateral track movement. The track inspector must also be aware that the following conditions increase the possibility of buckling:

(i) Recently worked track

(ii) Fouled ballast and mud spots

(iii) Gaps in the ballast at the ends of the ties indicating tie movement

(iv) Existing deformations in line and surface

(v) Rail canting and/or lifting out of the tie plates

(vi) Shiny marks on the base of the rail indicating that the rail is sliding through the anchors and/or clips

(vii) Kinky or wavy rail

(viii) Bottom of sag curves

(ix) In areas of heavy braking and acceleration

(x) Higher degree curves

(xi) Fixed facilities (i.e., turnouts, road crossings, bridges, etc.)

(xii) Sub-standard ballast section

(xiii) Sub-standard anchor/clip pattern

(xiv) Sub-standard tie conditions

(6) If track is identified as having any conditions which indicate the possibility of buckling, remedial action must be taken immediately by Operating Railroad personnel qualified in FRA §213.7(a)(b)(c).

(b) **Special Inspection in Cold Weather**

(1) When the air temperature or the rail temperature is ≤10°F, all main CWR and jointed tracks will be inspected by qualified Operating Railroad personnel in accordance with currently established inspection procedures, outlined in this Appendix.

(2) Determination of Temperature: The rail temperature is the preferred temperature and is taken with an approved rail thermometer. The air temperature is as reported by the National Weather Service.

(3) Operating Railroad personnel shall make out a "Special Track Inspection Report" (see Appendix F, "Forms") for this inspection and retain a copy for the duration of the Operating Contract that can be reviewed by the MassDOT Rail and Transit Division.

(4) Inspectors will inspect, at a minimum, for:

(i) Broken rails

(ii) Canted rails out of the plates on curves

(iii) Bent bolts

(iv) Pull-aparts

(v) Broken welds

(vi) Wide gap between rail ends

(vii) Cracked or broken joint bars (conventional and insulated)

(viii) Curve movement to the inside

(c) **Semi-Annual Inspections**

(1) A Spring inspection, between April 1 and May 30 (before air temperature of 80°F or a rail temperature of 110°F), and a Fall inspection between October 15 and November 15, shall be made by walking or by a hy-rail on all CWR main track. This inspection shall made using the "Report of Semi-Annual Inspection of CWR Track" found in Attachment E. The Inspection shall be made by a Manager of the Operating Railroad qualified under FRA §213.7(a)(b)(c).

(2) The inspection will concentrate on compliance with standards in the following areas:

(i) Anchor pattern

(ii) Anchor position

(iii) Resilient fasteners

(iv) Tie condition

(v) Ballast condition

(vi) Ballast section

(vii) Joint condition

(viii) Evidence of longitudinal rail movement, particularly at fixed locations, such as turnouts and grade crossings and open deck bridges.

(ix) Drainage condition

(x) Overall roadbed stability

(xi) Curve movement

(xii) Alinement deviations

(3) The Operating Railroad Manager will, within 30 days from the completion of the inspection, submit inspection information to the MassDOT Rail and Transit Division. Some of the information to be included is:

(i) A report of the special inspection that identifies track inspected by number and milepost limits;

(ii) The name of the individuals inspecting;

(iii) Date inspected;

(iv) Any exceptions found; and

(v) Protective and corrective action identified.

(d) **Protection of CWR Track with Deficiencies**

(1) When making Special Inspections (Hot and Cold Weather), Bi-Annual Inspections (Spring and Fall) and/or regular scheduled inspections in CWR track, if any of the above conditions described above in this paragraph are found to exist:

(i) Remedial action shall be taken, if required, as per FRA §213.5 by an individual qualified as per FRA §213.7(a)(b)(c).

(2) It is extremely important that noted deficiencies be corrected before the air temperature is expected to be above 80°F or the rail temperature expected to be above 110°F.

(3) If deficiencies are not corrected before the air temperature is expected to be above 80°F or the rail temperature above 110°F, appropriate remedial action shall be taken as per FRA§213.5, by an individual qualified as per FRA §215.7(a)(b)(c), if warranted.

(4) Determination of Temperature: The rail temperature is the preferred temperature and is taken with an approved rail thermometer. The air temperature is as reported by the National Weather Service.

8.0 JOINTS IN CWR TRACK

8.1 New Installations of CWR

(a) Joints in CWR track when installing CWR:

(1) When a joint or joints are installed in CWR during installation of CWR, one of the following actions per FRA 213.119(c)(2) shall be undertaken within 60 days:

(i) Weld the joint;

(ii) Install additional bolts in the joint bar so that all holes (6 holes) in the bar contain a bolt; or

(iii) Fully box anchor every tie for 195' in both directions from the joint.

8.2 Service Failures in Existing Previously Installed CWR

(a) Bolted joints in existing CWR that experience a service failure:

(1) In the case of a bolted joint in CWR experiencing service failure or a failed bar with a rail gap present, within 30 days either of the following actions per FRA 213.119(c)(3) shall be taken:

(i) Weld the joint;

(ii) Replace the broken bar(s), replace the broken bolts, adjust the anchors and, within 30 days, weld the joint;

(iii) Replace the broken bar(s), replace the broken bolts, install one additional bolt per rail end, and adjust anchors.

(iv) Replace the broken bar(s), replace the broken bolts, and anchor every tie 195' in both directions from the CWR joint; or

(v) Replace the broken bar(s), replace the broken bolts, add rail with provisions for later adjustment pursuant to FRA §213.119(d)(2) and reapply anchors.

8.3 Service Failure of Joint Bars and/or Track Bolts in a CWR Joint

(a) Minimum remedial action required:

(1) In the event of:

(i) Cracked or broken joint bar or bars, and

(ii) Bent and/or broken joint bolt or bolts,

(iii) Take the appropriate minimum remedial action given below and as shown in Attachment D, "Joint Defect Guidelines/Maximum Allowable Temporary Speed Restrictions (TSRs)".

(b) Number of bolts in rail ends required:

(1) In CWR track each rail end shall be bolted with at least two bolts at each bolted joint used to connect CWR strings, or CWR strings to conventional rail.

(2) Where either of the following conditions are found to exist, the track must be protected by the appropriate remedial action until the condition is corrected:

(i) Less than two bolts, but at least one bolt in a rail end: fix or place a TSR of no more than 10F/15P MPH until repaired.

(ii) One rail end unbolted (see Attachment D).

(3) Each joint bar must be held in position by track bolts or fasteners, and tightened sufficiently to provide support for abutting rail ends.

(4) When no-slip, or joint-to-joint rail contact exists by design; these locations are considered to be CWR track, and must meet all the requirements for CWR in this Appendix.

(c) Cracked or broken joint bars (see Attachment D):

(1) If a joint bar is cracked, broken or because of wear allows vertical movement of either rail when all bolts are tight, it shall be replaced.

(2) If a joint bar is cracked between the middle two bolt holes it shall be replaced.

(3) If between the middle two bolt holes, both joint bars are found to be cracked or one joint bar is found to be broken entirely through, trains may not be operated and the track taken out of service (see Attachment D) until the joint bars are replaced.

(4) If both joint bars are found to be broken entirely through between the middle two bolt holes, trains may not be operated and the track taken out of service (see Attachment D) until the joint bars are replaced.

(d) Opening (gap) of joints in CWR (see Attachment D):

(1) Bolted Rail Ends (Both Ends): The gap between rail ends shall be less than 1-1/2". If a joint is found to be open 1-1/2", a maximum 25F and 30P MPH temporary speed restriction shall be applied if there are two effective bolts in each rail end.

(2) Bolted Rail Ends (One End): If the gap between the rail ends is 1-1/2" but less than 2", a person designated under FRA §213.7(a)(b)(c)(d), shall visually supervise each train move. Repair the joint within 24 hours.

(3) Bolted Rail Ends (One End): If the gap between the rail ends is greater than 2" but 4" or less, a person designated under FRA §213.7(a)(b)(c)(d) shall visually supervise each train move. Repair the joint within 24 hours.

(4) Bolted Rail Ends (One End): If the gap between the rail ends is 4" or greater, the track shall be taken out of service until the joint is repaired.

8.4 Inspection of Joints In CWR Track

(a) Joints in CWR track must be inspected on foot according to §213.119. Rail joints in CWR track within turnouts, track crossings, expansion joints or lift rail assemblies need not be inspected during the walking inspection as they shall be inspected monthly in accordance with §213.235.

(b) The limits of the turnout for the purpose of this part are defined as a point 50 feet in advance of the points to the last long timber, or the heel of the frog if weave timbers are found at the heel.

(c) The limits of a track crossing, expansion joint, or lift rail assembly will be any joint within 20 ft. of the device.

(d) This inspection results shall be recorded on the Operating Railroad's Turnout Inspection Form.

(e) During walking inspections of joints in CWR particular attention must be paid to the following conditions of the joint and the track surrounding the joint:

(1) Cracks in the joint bar

(2) Evidence of movement of the bars in relation to the rail ends in the fishing areas ("loose" joints)

(3) Loose, bent or missing joint bolts

(4) Rail end batter

(5) Rail end mismatch

(6) Track surface, particularly hanging ties at the joint

(7) Evidence of excessive longitudinal movement of rail noted by the displacement of rail anchors, or "polished" areas at the ends of the bars or at rail anchors or clips

(f) All requirements per FRA Part 213 applying to Gage, Track Surface, Crossties, Defective Rails, Rail End Mismatch, Rail Joints, Rail End Batter, Tie Plates, and Rail Fasteners still apply. If there is a combination of conditions that substantially increases the chance of a broken joint bar an appropriate speed restriction should be applied.

8.4.1 Embedded Joints

(a) Permanently Embedded Joints:

(1) Where embedded joints exist, it is not necessary to disassemble or remove the track structure (e.g., remove pavement or crossing pads), to conduct an inspection of CWR joints unless there a deficiency or defect is suspected. Every effort must be made to inspect the visible portions of the joint bar and/or joint in embedded track construction.

(2) In new construction there shall be no embedded joints without the permission of the MassDOT Rail and Transit Division.

(b) Temporarily Embedded Joints:

(1) Joints may be embedded in a temporary crossing.

(2) Every effort should be made to keep the joint bar visible for inspection through the use of flangeway protection such as timbers, etc.

8.4.2 Joint Inspection in CWR

(a) Each joint in CWR shall be identified by using:
   (1) Route;
   (2) Track designation;
   (3) Milepost;
   (4) Joint type;
   (5) Rail designation; or
   (6) Other information so that the joint can be identified in the field.

(b) The Operating Railroad Company will maintain a computer-based inventory of each joint and furnish a copy to MassDOT Rail and Transit Division annually. The annual report shall also include the past five years of data as developed by the Operating Railroad Company.

(c) Each time a joint is removed from track by welding and/or is removed by the installation of rail that eliminates the joint, a Report of Joint Elimination by Field Welding shall be filled out (see Attachment E). The disposition of joints in track removed shall be noted on the next report when inspecting joints in CWR. By doing this, joints in CWR are reported from the time they are introduced until the time they are removed from track.

(d) The joint inventory will not contain those joints considered part of a turnout, track crossing, expansion joint, or lift rail assembly as the inspection of these joints is contained on the Monthly Switch Inspection Form as per §213.235.

8.4.3 Record of Inspections

(a) Each walking inspection of a joint in CWR track shall be recorded on the Operating Railroad Company's Special Track Inspection Report.

(b) The information on the Form shall include at a minimum, the Joint Identification Number, the route, the track, the milepost, the rail type, and any defects that require a remedial action and/or a permanent repair.

9.0 TRAINING

(a) To be considered qualified under §213.7 to supervise or conduct the installation, maintenance, adjustment and inspection of CWR track; individuals will receive instruction in, and be tested on, the **Operating Railroad's Approved CWR Plan.**

(b) All Operating Railroad MW employees responsible for the inspection, installation, adjustment, or maintenance of CWR track must successfully complete training on the Operating Railroad's Approved CWR Plan every calendar year.

(c) In addition, Operating Railroad MW employees shall be provided with a copy of these procedures which they shall make available at any CWR job site, if requested.

(d) The Operating Railroad shall maintain a list of those employees qualified to supervise restorations and inspect track in CWR territory. The Operating Railroad shall make this list available upon request.

(e) Annual CWR training programs will address the following:
   (i) The Operating Railroad's Approved CWR Plan and the application of written CWR procedures issued by the Operating Railroad.
   (ii) The qualification and designation of the Operating Railroad's MW personnel to:
      - Know and understand the requirements of the Operating Railroad's CWR Plan; and
      - Have the ability to detect deviations from the Operating Railroad's CWR Plan; and

- Can prescribe appropriate remedial action when deviations are discovered from the Operating Railroad's CWR Plan; and
- Have written authorization from the Operating Railroad to prescribe remedial action and/or make necessary repairs.

(iii) Subjects to be discussed during the annual training on the Operating Railroad's CWR Plan include, but are not limited to, the following:

- Installation and Adjustment of CWR
- Anchoring of CWR
- Maintenance of Desired Rail Neutral Temperature in Previously Installed CWR
- Trackwork That Disturbs CWR Track and Protection of Disturbed Track
- Special Inspections of CWR Track
- Joint Inspections in CWR Track
- Training
- Record Keeping

10.0 REPORTING REQUIREMENTS FOR CWR TRACK

(a) **Report of Disturbance of CWR Track (Form "TD") (Attachment E)**

(1) When any maintenance operations are considered to have disturbed CWR track as per Section 6.0, or if any rail is cut in CWR track or a service failure occurs in CWR track, a "Report of Track Disturbance", Form "TD", will be filled out by the Operating Railroad.

(i) Part A of this Form shall be completed for any work listed in Section 6.0 above which causes the CWR track to be considered disturbed.

(ii) Part B shall be completed whenever there is a Service Failure or CWR in main track is cut or broken for any reason.

(iii) The "Report of Track Disturbance Form" with instructions is found in Attachment E.

(iv) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the MassDOT Rail and Transit Division.

(b) **Report of Track Movement (Form "TM") (Attachment E)**

(1) During out-of-face surfacing operations and/or the out-of-face installation of ties, the neutral temperature can be adversely affected on curved track. The track may be line in and/or the track may pull in due to reduced longitudinal and lateral resistance of the track structure.

(i) For curves of 3° and greater, a "Report of Track Movement, Form "TM" shall be made out when the curve is surfaced out-of-face or when more than 540 ties per mile are installed.

(ii) This report shall be required in addition to the Report of Track Disturbance of CWR Track (Form "TD").

(iii) The curve shall be stationed at key geometric locations. Reference stakes shall be added to the field side of the high side of the curve so that curve movement during and/or after maintenance work is performed can be obtained.

(iv) This report shall be completed by the Contractor or Operating Railroad Company on whose territory the work is being performed. The "Report of Track Movement" Form with instructions is found in Attachment E.

(v) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Operating Railroad Company.

(c) **Report of Joint Elimination by Field Welding (Form "JE") (Attachment E)**

(1) Any time a field weld is made to eliminate a joint, either by the thermite or flash butt method, Form "JE" must be completed by the Contractor/Operating Railroad Company in charge of the work.

(i) The "Report of Joint Elimination by Field Welding" is found in Attachment E.

(ii) This report shall be required in addition to the Report of Track Disturbance of CWR Track (Form "TD").

(iii) This report shall be completed by the Contractor/Operating Railroad Company on whose territory the work is being performed.

(iv) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Mass DOT Rail and Transit Division.

(d) **Report of Rail Clipping/Anchoring (Form "RC") (Attachment E)**

(1) Any time CWR is adjusted according to the requirements of Section 3.0 of this document the Form, "Record of Rail Clipping/Anchoring," Form "RC," must be completed by the Contractor/Operating Railroad Company in charge of the work.

(i) The "Record of Rail Clipping/Anchoring", Form "RC" with instructions, is found in Attachment E.

(ii) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Operating Railroad Company.

(e) **Report of Semi-Annual (Spring/Fall) Inspection of CWR Track (Form "CWR") (Attachment E)**

(1) Any time CWR is inspected annually either in the Spring and/or the Fall according to the requirements of Section 7.0 of this document the Form, **"**Report of Semi-Annual (Spring/Fall) Inspection of CWR Track," Form "CWR" must be completed by the Contractor/Operating Railroad Company in charge of the work.

(i) The **"**Report of Semi-Annual (Spring/Fall) Inspection of CWR Track," Form "CWR", is found in Attachment E.

(ii) When this report is completed, a copy shall be retained on file for the duration of the Operating Contract for review by the Operating Railroad Company.

(f) **Special Inspections – Earthquakes**

(1) When an earthquake occurs, each quake's magnitude – or inherent strength is measured and reported by the National Earthquake Information Service operated by the U.S. Geological Survey in Golden, Colorado.

(2) The Richter scale gages the energy released by an earthquake, as measured by the ground motion recorded on a seismograph. The magnitude of an earthquake is the same no matter where one is located. Its intensity – or the degree to which it is felt in a specific location – varies depending on one's distance from the earthquake's epicenter, or center of energy.

(3) When an earthquake is reported, the Operating Railroad notifies Maintenance-of-Way to begin a Special Track Inspection.

(4) Use the criteria in the Table below to determine whether a special inspection is warranted.

Magnitude (Richter Scale)	Initiate Special Track Inspection	Criteria/Action
Unknown	Yes	Reports of ground shaking in a geographic area. Trains stop within 50-mile radius of reported shaking until inspection is complete.
0.1 to 4.9	No	No action required.
5.0 to 5.4	Yes	When track is within a 30-mile radius of the epicenter, trains in affected areas slow to restricted speed until inspection is complete.
5.5 to 5.9	Yes	When track is within a 50-mile radius of the epicenter, trains stop in the affected area until inspection is complete.
6.0 to 6.9	Yes	When track is within a 100-mile radius of the epicenter, trains stop in the affected area until inspection is complete.
7.0 and above	Yes	When track is within a 150-mile radius of the epicenter, trains stop in the affected area until inspection is complete.

(5) Special inspections shall identify hazards and identify necessary remedial action(s) to protect the safety of trains operating in the affected areas.

(6) When conducting a special inspection, check the following:

- Materials fouling the track, such as trees, pole lines, wires, etc.
- Alignment, cross level, and profile of the track.
- Bridge piers, abutments, and bulkheads for signs of structural damage.
- Substructure and superstructure for damage from large objects falling into structures.
- Piers, bents, and bridge members for missing components.
- Signal outages and malfunctions.
- Landslides in cuts and slope failures in fills.

(7) Fill out "Special Track Inspection Report" and retain for duration of Operating Contract.

11.0 RECORD KEEPING

(a) **Report of CWR Installations**

(1) Rail temperature, neutral temperature, location, and date of CWR installations must be recorded in system logs or data management system and must be retained by the Operating Railroad for the duration of the Contract with the MassDOT Rail and Transit Division.

(b) **Report of Maintenance Work in CWR**

(1) Because track maintenance can substantially impact CWR stability and safety, the following records of work done must be recorded on Form "TD" and must be kept by the Operating Railroad for the duration of the Contract with the MassDOT Rail and Transit Division.

(i) Rail that is added for any reason.

(ii) Repair of broken or defective rails, pull-aparts and welding of rail joints, and changing glued plug insulated joints.

(iii) A record of pre-break/cut RNT when rail has pulled apart, broken, or been cut for defect removal (see Attachment C).

(iv) A record of the readjusted RNT after a rail has pulled apart, broken, or been cut for defect removal (see Attachment C).

(v) Where a curve has been staked and the curve has chorded as a result of surfacing and lining track (Form "TM", Attachment E).

(vi) CWR installation or maintenance work that does not conform to Appendix "A" procedures.

(2) Any time work is performed in CWR territory by a Contractor and/or the Operating Railroad, an Operating Railroad qualified person under FRA §213.7(c) shall make out a Track Disturbance Form (Form "TD", Attachment E).

(3) The Contractor and/or the Operating Railroad shall review the Form "TD" to ensure necessary corrections and adjustments and permanent repairs are made so as to maintain the overall stability of CWR track.

This page intentionally left blank

ATTACHMENT A

DETERMINATION OF ESTIMATE OF PRE-BREAK / PRE-CUT NEUTRAL TEMPERATURE FOR A SERVICE FAILURE IN CWR

(a) General

(1) In line with Section 5.0's requirements, the RNT will be estimated and recorded on Form "TD" where a weld has broken or a rail has pulled apart, broken or been cut for defect removal (service failure).

(2) This attachment addresses how to calculate the rail's neutral temperature before the break or before the cut for defect removal.

(3) Attachment A provides an estimate of neutral temperature based on the measured field gap size, rail size and fastener type.

(4) The rail size is given in terms of a 6" base rail (i.e., for rail sizes above 115# rails) and for 5-1/2" rail (i.e., for 115# and below).

(5) The fastener types are given as EOTA (every other tie anchored) and ETA (every tie anchored).

(6) Concrete tie elastic fasteners, CTEF, and elastic fasteners on wood ties (such as Pandrol type) fall into the ETA category.

(7) The pre-break/pre-cut estimated RNT must be recorded on Form "TD" when making field repairs and kept in a data base by the Operating Railroad for managing subsequent readjustments.

(b) Use of the following tables: **NOTE**

(1) For wood tie tracks 200' from a fixed point (switches, turnouts, crossings, bridges, tunnels, etc.) they **DO NOT apply**. For such the data entry on the Form "TD" should be: ***NA**.

(2) For wood tie tracks between 200' - 400' of a fixed point apply EOTA tables, but data entry Form "TD" should be: ***AP** (for approximate)

(3) Tables for concrete ties and for wood ties with elastic fasteners, apply 200' beyond a fixed point, but **DO NOT apply within 200'**. For the latter, data entry on Form "TD" should be: ***NA**.

(4) For wood or concrete tie tracks where breaks/cuts on the same rail are clustered in close proximity (i.e., within 800' of each other). The data entry on Form "TD" should be: ***NA**.

(5) For iced rail/frozen ballast, tables **DO NOT apply**. For such, data entry on Form "TD" should indicate: ***FB**.

This page intentionally left blank

Table 1a. 6" Base Rail
Wood Tie Track / Every Other Tie Anchored (EOTA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5**	**7**	**7.5**	**8**	**8.5**	**9**
60	84	94	102	109	114	119	124	129	133	137	140	144	147	151	154			
55	79	89	97	104	109	114	119	124	128	132	135	139	142	146	149	152		
50	74	84	92	99	104	109	114	119	123	127	130	134	137	141	144	147	150	153
45	69	79	87	94	99	104	109	114	118	122	125	129	132	136	139	142	145	148
40	64	74	82	89	94	99	104	109	113	117	120	124	127	131	134	137	140	143
35	59	69	77	84	89	94	99	104	108	112	115	119	122	126	129	132	135	138
30	54	64	72	79	84	89	94	99	103	107	110	114	117	121	124	127	130	133
25	49	59	67	74	79	84	89	94	98	102	105	109	112	116	119	122	125	128
20	44	54	62	69	74	79	84	89	93	97	100	104	107	111	114	117	120	123
15	39	49	57	6	69	74	79	84	88	92	95	99	102	106	109	112	115	118
10	34	44	52	59	64	69	74	79	83	87	90	94	97	101	104	107	110	113
5	29	39	47	54	59	64	69	74	78	82	85	89	92	96	99	102	105	108
0	24	34	42	49	54	59	64	69	73	77	80	84	87	91	94	97	100	103
-5	19	29	37	44	49	54	59	64	68	72	75	79	82	86	89	92	95	98
-10	14	24	32	39	44	49	54	59	63	67	70	74	77	81	84	87	90	93
-15	9	19	27	34	39	44	49	54	58	62	65	69	72	76	79	82	85	88
-20	4	14	22	29	34	39	44	49	53	57	60	64	67	71	74	77	80	83
-25	-1	9	17	24	29	34	39	44	48	52	55	59	62	66	69	72	75	78
-30	-6	4	12	19	24	29	34	39	43	47	50	54	57	61	64	67	70	73
-35	-11	-1	7	14	19	24	29	34	38	42	45	49	52	56	59	62	65	68
-40	-15	-6	2	9	14	19	24	29	33	37	40	44	47	51	54	57	60	63
-45	-21	-11	-3	4	9	14	19	24	28	32	35	39	42	46	49	52	55	58
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

Table 1b. 5-1/2" Base Rail
Wood Tie Track / Every Other Tie Anchored (EOTA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5**	**7**	**7.5**	**8**	**8.5**	**9**
60	86	97	106	113	119	125	130	135	139	144	148	152	155					
55	81	92	101	108	114	120	125	130	134	139	143	147	150	154				
50	76	87	96	103	109	115	120	125	129	134	138	142	145	149	153			
45	71	82	91	98	104	110	115	120	124	129	133	137	140	144	148	151		
40	66	77	86	93	99	105	110	115	119	124	128	132	135	139	143	146	149	152
35	61	72	81	88	94	100	105	110	114	119	123	127	130	134	138	141	144	147
30	56	67	76	83	89	95	100	105	109	114	118	122	125	129	133	136	139	142
25	51	62	71	78	84	90	95	100	104	109	113	117	120	124	128	131	134	137
20	46	57	66	73	79	85	90	95	99	104	108	112	115	119	123	126	129	132
15	41	52	61	68	74	80	85	90	94	99	103	107	110	114	118	121	124	127
10	36	47	56	63	69	75	80	85	89	94	98	102	105	109	113	116	119	122
5	31	42	51	58	64	70	75	80	84	89	93	97	100	104	108	111	114	117
0	26	37	46	53	59	65	70	75	79	84	88	92	95	99	103	106	109	112
-5	21	32	41	48	54	60	65	70	74	79	83	87	90	94	98	101	104	107
-10	16	27	36	43	49	55	60	65	69	74	78	82	85	89	93	96	99	102
-15	11	22	31	38	44	50	55	60	64	69	73	77	80	84	88	91	94	97
-20	6	17	26	33	39	45	50	55	59	64	68	72	75	79	83	86	89	92
-25	1	12	21	28	34	40	45	50	54	59	63	67	70	74	78	81	84	87
-30	-4	7	16	23	29	35	40	45	49	54	58	62	65	69	73	76	79	82
-35	-9	2	11	18	24	30	35	40	44	49	53	57	60	64	68	71	74	77
-40	-14	-3	6	13	19	25	30	35	39	44	48	52	55	59	63	66	69	72
-45	-19	-8	1	8	14	20	25	30	34	39	43	47	50	54	58	61	64	67
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

Table 2a. 6" Base Rail
Wood or Concrete Tie Track / Every Tie Anchored (ETA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
60	90	102	111	119	126	133	139	144	149	154	159							
55	85	97	106	114	121	128	134	139	144	149	154	158						
50	80	92	101	109	116	123	129	134	139	144	149	153	157					
45	75	87	96	104	111	118	124	129	134	139	144	148	152	156				
40	70	82	91	99	106	113	119	124	129	134	139	143	147	151	155			
35	65	77	86	94	101	108	114	119	124	129	134	138	142	146	150	154		
30	60	72	81	89	96	103	109	114	119	124	129	133	137	141	145	149	153	
25	55	67	76	84	91	98	104	109	114	119	124	128	132	136	140	144	148	151
20	50	62	71	79	86	93	99	104	109	114	119	123	127	131	135	139	143	146
15	45	57	66	74	81	88	94	99	104	109	114	118	122	126	130	134	138	141
10	40	52	61	69	76	83	89	94	99	104	109	113	117	121	125	129	133	136
5	35	47	56	64	71	78	84	89	94	99	104	108	112	116	120	124	128	131
0	30	42	51	59	66	73	79	84	89	94	99	103	107	111	115	119	123	126
-5	25	37	46	54	61	68	74	79	84	89	94	98	102	106	110	114	118	121
-10	20	32	41	49	56	63	69	74	79	84	89	93	97	101	105	109	113	116
-15	15	27	36	44	51	58	64	69	74	79	84	88	92	96	100	104	108	111
-20	10	22	31	39	46	53	59	64	69	74	79	83	87	91	95	99	103	106
-25	5	17	26	34	41	48	54	59	64	69	74	78	82	86	90	94	98	101
-30	0	12	21	29	36	43	49	54	59	64	69	73	77	81	85	89	93	96
-35	-5	7	16	24	31	38	44	49	54	59	64	68	72	76	80	84	88	91
-40	-10	2	11	19	26	33	39	44	49	54	59	63	67	71	75	79	83	86
-45	-15	-3	6	14	21	28	34	39	44	49	54	58	62	66	70	74	78	81
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

Table 2b. 5-1/2" Base Rail
Wood or Concrete Tie Track / Every Tie Anchored (ETA)

Field Measured Rail Break/Rail Cut Temp (°F)	Measured Rail Gap (in)																	
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
60	92	106	116	125	133	139	146	152										
55	87	101	111	120	128	134	141	147	152									
50	82	96	106	115	123	129	136	142	147	153								
45	77	91	101	110	118	124	131	137	142	148	153							
40	72	86	96	105	113	119	126	132	137	143	148	152						
35	67	81	91	100	108	114	121	127	132	138	143	147	152					
30	62	76	86	95	103	109	116	122	127	133	138	142	147	151				
25	57	71	81	90	98	104	111	117	122	128	133	137	142	146	151			
20	52	66	76	85	93	99	106	112	117	123	128	132	137	141	146	150		
15	47	61	71	80	88	94	101	107	112	118	123	127	132	136	141	145	149	153
10	42	56	66	75	83	89	96	102	107	113	118	122	127	131	136	140	144	148
5	37	51	61	70	78	84	91	97	102	108	113	117	122	126	131	135	139	143
0	32	46	56	65	73	79	86	92	97	103	108	112	117	121	126	130	134	138
-5	27	41	51	60	68	74	81	87	92	98	103	107	112	116	121	125	129	133
-10	22	36	46	55	63	69	76	82	87	93	98	102	107	111	116	120	124	128
-15	17	31	41	50	58	64	71	77	82	88	93	97	102	106	111	115	119	123
-20	12	26	36	45	53	59	66	72	77	83	88	92	97	101	106	110	114	118
-25	7	21	31	40	48	54	61	67	72	78	83	87	92	96	101	105	109	113
-30	2	16	26	35	43	49	56	62	67	73	78	82	87	91	96	100	104	108
-35	-3	11	21	30	38	44	51	57	62	68	73	77	82	86	91	95	99	103
-40	-8	6	16	25	33	39	46	52	57	63	68	72	77	81	86	90	94	98
-45	-13	1	11	20	28	34	41	47	52	58	63	67	72	76	81	85	89	93
Estimated RNT in °F																		

Note: For rail temperatures above 60°F, the estimated RNTs must be developed by interpolating the existing table.

ATTACHMENT B

RECOMMENDED PROCEDURES FOR DISTRESSING CONTINUOUS WELDED RAIL (CWR) PREVIOUSLY LAID IN TRACK (IN CONFORMANCE WITH SECTION 5.0 REQUIREMENTS)

(a) MassDOT's CWR Policy prescribes distressing requirements for newly installed CWR as per Section 3.0, including a general procedure for distressing rail.

(1) **Attachment B provides more detailed Recommended Procedures for distressing CWR previously laid in track based on current industry best practice guidelines.**

(b) **Definition**: Distressing is the operation of removing (or sometimes adding) rail in CWR to make the longitudinal thermal stress (force) to be zero at a prescribed temperature.

(1) MassDOT's preferred Rail Laying Temperature (RLT) is 105°F.

(c) **Common Distressing Types for Existing CWR in Track:**

(1) There are typically three types, or categories, of distressing which are driven by specific maintenance needs:

(i) **programmed distressing**,

(ii) **reactive or emergency distressing**, and

(iii) **curve distressing**. (Note: although curve distressing can be both programmed and reactive, a separate category is given here due to its general complexity).

(2) **Programmed distressing** is when one or more strings of rail are deemed to be sufficiently below (or above) RLT to warrant rail neutral temperature (RNT) adjustment. When several strings require distressing on MassDOT-owned rail lines, often the out-of-face distressing shall be accomplished by a Contractor working directly for MassDOT Rail and Transit.

(3) **Reactive or emergency distressing** is an imminent action that addresses tight, wavy, kinky rail, and other buckling prone conditions. This type of work on MassDOT-owned rail lines is usually accomplished by the Operating Railroad Personnel.

(4) **Curve distressing** applies to stress adjustments of curves due to cold temperature chording-in or to excessive curve movements resulting from maintenance actions performed when rail is in tension. This type of work on MassDOT-owned rail lines is usually accomplished by Operating Railroad Personnel or by a Contractor working directly for MassDOT Rail and Transit.

(d) **General Guidelines for Programmed Distressing of CWR Strings In Track Up to 1600' In Length.**

(1) **Programmed Distressing may be used for:**

(i) Rail that was laid at colder temperatures sufficiently below a target RNT of 105°F; or

(ii) Rail laid at "hot" temperatures, which exhibits excessive rail movement (running rail); or

(iii) Locations where recent track maintenance (lining, surfacing, lifting, etc.) has lowered RNT below RLT -10°F or 95°F; or

(iv) Locations where the Operating Railroad and/or MassDOT Rail and Transit Division deems it necessary.

(2) The following applies when distressing:

(i) The means, methods, and equipment used when distressing rail shall be approved by MassDOT Rail and Transit or its representative.

(ii) The range of rail temperature at which rail is distressed shall be approved by MassDOT Rail and Transit or its representative.

(iii) Distressing should be scheduled and completed when the ambient temperature provides sufficient heat so that the rail temperature is as near as possible to the target RLT of 105°F; unless approved by MassDOT Rail and Transit.

(iv) **No more than 1,600' of rail may be distressed at any given time (1,600' strings).** This is a continuous 1600' string and/or a 1600' string with a cut or joint in the middle (800'+/- each side of cut and/or joint).

(3) The following preparatory work shall be performed:

(i) Make reference match marks around the existing joint or rail cut location:

- On the base of rail and tie plates on unanchored ties within 10'+/- of the joint and/or cut in the rail; or
- On the left side of the elastic fastener tie plate or the side opposite the drive on elastic fastener or clip within 10'+/- of the joint and/or cut in the rail; and

(ii) When distressing one or more strings, mark the quarter points of the string to be distressed.

(iii) When out-of-face distressing, set offset stakes at the far end of the rail to be distressed to measure any rail panel “pull” back at the end of the CWR string where the rail is cut and/or a joint is located.

(iv) Rail panel “pull back” is often associated with wood tie track anchored on every tie with elastic fasteners or in areas with weak crib ballast.

(v) Rail panel “pull back” movements (inches) shall be measured after:

- The rail has been correctly expanded at the quarter points and at the end by using the ambient temperature, a rail heater and/or a. hydraulic rail puller, and;
- The CWR string has been anchored and/or clipped.

(vi) Rail panel “pull back” measured is the same as ADDING RAIL and the CWR shall have to be unclipped and expanded again to eliminate any pull back when it is finally anchored and clipped before it is finally jointed and/or welded.

(vii) Measured rail end movements away from the joint or cut at the end of the CWR string at the match marks is the same as ADDING RAIL. The CWR shall have to be unclipped and expanded again to eliminate any rail end movement away from the joint and/or cut before the CWR is finally jointed and/or welded.

(viii) The total expansion length required, using the temperature differential, shall be calculated so as to achieve a target RLT of at least 105°F.

(ix) The amount of rail to be expanded when using the temperature differential moved can be determined by using the Report of Rail Clipping/Anchoring, Form “RC” found in Attachment E.

(x) To improve RNT, the total required expansion for any string, shall consist of the following:

- The calculated expansion required from the temperature "differential", and;
- Any measured "rail panel pull back", and;
- Any measured rail end movements away from the joint and/or cut.

(xi) If in compression, the rail shall be cut with a torch (see Paragraph (g) below) and placed in a position that will permit the rail ends to bypass each other, so as to permit the rail to expand freely.

(xii) If in compression, the rail shall be unanchored or unclipped from the cut or joint at the end of the string to be expanded back to the beginning of the string.

(xiii) If the base of rail is caught in the elastic rail fastener plates, the rail shall be raised from the tie plates or tie pads. Place base of rail on risers (spikes and/or rollers) to allow the rail to expand freely; risers shall be placed every 12^{th} to 15^{th} tie (especially in areas of elastic fastener plates). There may be a need to add additional risers at closer intervals on curves.

(xiv) If risers are required, all rail anchors, clips and insulators must be removed and risers placed to ensure the base of the rail is free to move relative to the tie plate and/or tie seat (i.e., stress free).

(xv) If power vibrators are used, it may not be necessary to place the rail on risers in areas of cut spikes and conventional tie plates.

(xvi) Ensure that vibrated rail is totally free to expand/contract longitudinally (i.e., stress free).

(e) **Programmed Distressing: Adjusting Short CWR Lengths (Spot Distressing) Already in Track in Wood and Concrete Tie Territory)**

(1) This method is generally used by the Operating Railroad MW forces to repair a service failure such as a pull-apart, broken rail, or broken weld and to remove a defective rail and/or add a plug rail or by making a cut in CWR.

(2) When distressing short lengths Operating Railroad MW forces generally use the ambient temperature and/or a rail puller to obtain the expansion required.

(3) In this case, the rail to be distressed should be centered, if possible, on an existing joint that can be removed and/or a cut made in the CWR string. Approximately 50% of the area to be distressed should be on either side of the joint and/or cut.

(4) In this case, the rail on either side of the joint and/or cut is expanded towards the rail cut and/or joint location.

(5) The base of the rail and plate should be marked at or within 10' of either side of the joint or cut and then at 50' stations or the quarter points for the full length of the rail to be expanded.

(6) Generally the amount of rail to be expanded on either side of the joint and/or cut is from 195' (380' total) to 390' (780' total). However, longer lengths of CWR, up to 800' (1600' total) may be distressed by this method.

(7) The movement at these stations should be recorded when the joint is removed and/or the rail is cut and recorded on Form "TD."

(8) A rail puller can be used, along with the ambient temperature and/or a heater, to increase the RNT, to at least **RLT -10°F**, when making repairs.

(9) Because of the need to expand rail in two directions, it may be somewhat easier to achieve the required expansion by using the ambient temperature in warmer periods of the year and/or by using a rail puller. A rail heater is more problematic because of the need to have the heater working on both sides of the joint and/or cut and having to move the heater over the joint or cut to expand rail in two directions.

(10) See Attachment C "Recommended Procedures for Adjusting CWR After a Break (Service Failure) or Cut Below the Target RLT (105°F)."

(f) **Programmed Distressing: Adjusting Numerous CWR Strings Out-of-Face Already in Track in Wood and Concrete Tie Territory (Preferred Method)**

(1) This procedure applies to distressing CWR in track as part of programmed maintenance when a length of rail(s) is deemed to be sufficiently below (or above) the target RLT of105°F to warrant RNT readjustment.

(2) The preferred way to expand rail is to heat the rail naturally or with a rail heater. A rail puller may be used when expanding rail to help achieve the required expansion and/or hold the expanded rail in place while installing anchors and/or clips.

(3) The rail to be distressed is usually expanded from the starting point to the end of the string being distressed in one continuous direction.

(4) The maximum length of rail to be distressed at any time in 1600'.

(i) Once a string to be distressed is identified, the end of the string at an existing joint, or a location where the rail is cut, shall have the rail ends mismatched to allow unobstructed movement of the rail string. Then, as the rail is heated naturally by sunlight and/or with a rail heater, the rail is expanded in the direction towards the joint and/or cut.

(ii) Before expanding the rail string, anchors, and/or clips shall be removed starting at the far end of the string at the joint and/or rail cut back to the beginning of the rail string.

(iii) Measure the existing rail temperature and subtract from the target RLT of at least 105°F to determine the temperature differential to be used. See the Report of Rail Clipping/Anchoring (Form "RC") in Attachment E to calculate the total expansion required. The expansion required depends upon the rail temperature differential and total length of the CWR string. The required amount of expansion shall be marked at the one-quarter points on the base of the rail and plates.

(iv) Mark the quarter points on the base of the rail and tie plates of rail strings to be expanded.

(v) Expanding rail continuously in one direction allows MW crews to mark and expand rail at the quarter points and then re-clip rail in a continuous motion from the point of beginning to the end of the string at the joint and/or cut in the CWR.

(vi) Heat (natural or with a rail heater) should be uniformly applied along the string to be distressed until the required expansion has been obtained at the quarter points to include the end of the string at the joint and/or cut rail.

(vii) When using a rail heater, if any quarter point does not have the required expansion, either before or after anchoring/clipping, the string shall have to be reheated. The rail heater will back over the portion that needs to be reheated without applying heat.

(viii) Then the heater shall work towards the end of the string at the joint or rail cut applying heat until the required expansion is obtained.

(ix) Re-clip and/or re-anchor the rail as soon as expansion at the quarter points has been achieved. Clip and/or anchor using the standard anchor patterns given in Section 4.0 "Anchoring of Rail."

(x) The CWR shall not be considered to be distressed until the required expansion at all the quarter points have been realized. When distressing strings of CWR, rail expansion, and not rail temperature, determines if a string of CWR has been distressed.

(xi) A rail puller can be used to hold the required expansion and/or to help get the required expansion. At least 20 ties on the next string to be distressed should be solid box anchored and/or clipped to provide sufficient holing power for the rail puller to hold or pull the string being expanded.

(g) **Torch Cutting CWR in Track**

(1) The preferred method of cutting CWR in compression is with a torch.

(2) Rail shall only be torch cut in an emergency to relieve thermal stress in the rail prior to expanding and then cutting with a rail saw.

(3) Operating Railroad personnel and/or Contractors shall be trained to cut rail with a torch in accordance with their in-house Safety Procedures.

(4) Operating Railroad personnel and/or Contractors shall not cut rail with a torch on MassDOT property unless trained to do so by their respective companies.

(5) A recommended procedure for torch cutting rail in compression is illustrated in Attachment F "Torch Cutting Rail."

(6) Person making torch cut:

(i) Shall stand on opposite side of rail from which it is expected to move when making torch cut.

(ii) In curve if buckle/alignment is on high side of curve; stand on low side of curve.

(iii) In tangent track, stand on side opposite from misalignment or buckle.

(7) Initially, remove anchors only in an area large enough to facilitate the torch cut. Do not remove any additional anchors until the torch cut is made.

(8) Clear personnel from misalignment area when rail is cut as rail/track may move suddenly when compressive stress is relieved by torch cutting.

(9) Additional anchors shall be removed after the rail is torch cut to facilitate the necessary rail expansion movement, the misalignment of rail ends and repair.

(10) If a torch cut rail is to be welded within 15 minutes of cutting, it shall be trimmed back at least 3/8" on each rail end with a saw before welding. **This practice requires the approval of the local MassDOT Rail and Transit Field Representative.**

(11) All torch cut rail ends shall be trimmed back:

(i) At least 2" (AREMA Chapter 4.7.3) and/or;

(ii) Beyond the heat affected zone on either side of the torch cut which will appear as a different color on the web of the rail; or whichever is greater;

(iii) With a rail saw before a field weld is made and/or a joint is applied.

(12) If necessary, in an emergency, to pass a train over a torch cut rail end, before the torch cut ends are trimmed back:

(i) Joint bars may be installed with at least two bolts in each rail end, if possible.

(ii) Each train may be passed over the joint at a maximum of 10F/15P provided the move is under the supervision of a qualified person under FRA §213.217(a)(b)(c)(d).

(h) **Reactive or Emergency Distressing: Cutting Tight Track/CWR in Compression**

(1) If a misalignment (wavy, kinky or nervous rail) is found in track that exceeds values for any class of track found in FRA §213.55, Alinement, take appropriate remedial action per FRA §213.9.

(2) Locate point of maximum misalignment.

(3) Fill out Form "TD" and include rail temperature and alinement deviation/defect as per FRA §213.55.

(4) Select a point to make a torch cut. It may be advisable to cut at a point near, but not exactly at the center of the misalignment where compressive stresses may be the highest.

(5) A recommended procedure for torch cutting rail in compression is illustrated in Attachment F "Torch Cutting Rail." See additional torch cutting information found in (g).

(6) Make repairs in accordance with, "Reactive or Emergency Distressing" (see Example 3).

(i) **Reactive Distressing: Adjusting Tight, Wavy Nervous Rail: Procedures**

(1) Reactive distressing consists of actions taken to address tight, wavy, kinky rail conditions seen in CWR track. Usually tight, wavy, or nervous rail is discovered when the rail temperatures are warm.

(2) Such conditions typically are associated with large reductions in rail temperatures and indicate a possible imminent track buckle.

(3) First establish the length of rail exhibiting the tight, wavy condition (i.e., the length of rail requiring neutral temperature adjustment through distressing).

(4) **The total length for distressing is a recommended minimum of 1.5 times the estimated tight, wavy length (although 2 times is the MassDOT preferred).**

(5) **Note: 400' of unfastening (200' either side of torch cut) is a *minimum* distance.** More length is required if the estimated $L_{distress}$ is longer than **260'**, in which case the unfastening length rule of thumb is:

Unfastening Length = 1.5 x $L_{distress}$

(6) Generally *both* rails should be distressed unless otherwise dictated.

(7) The procedure to follow is as described below.

(i) Estimate the length of the tight, kink, wavy rail segment; locate the midpoint where rail is to be cut.

(ii) Record the length of rail to be distressed (i.e., $L_{distress}$ = _____ ft.).

(iii) Cut rail. (**Note: typically torch cutting is required)** and misalign rail ends.

(iv) Keep cutting rail with rail saw until it stops moving; this may require several cuts.

(v) **After rail stops moving, unfasten rail for minimum required distance on both sides of the cut starting at the cut and working away from the cut.**

(vi) After unfastening CWR, continue cutting rail out until there is no more movement; at this point the rail ends should just be touching.

(vii) Measure and record the rail temperature.

(viii) Refer to MassDOT's preferred RLT (105°F) and compare it with the measured rail temperature to determine the distress *temperature differential*. If the measured rail temperature is *lower* than the RLT, proceed to Form "RC," "Report of Rail Clipping/Anchoring" in Attachment E to determine the additional rail to be removed.

(ix) If the measured rail temperature is *above* RLT, no additional rail needs to be removed, and proceed to next step.

(8) Rail shall be expanded by ambient temperature and/or pulled with a rail puller.

(9) f CWR is cut with a torch, both rails on either side of the torch cut shall have to be cut back at least 2" with a rail saw (see Paragraph (g) above).

(10) A plug rail **shall** have to be added. A minimum 18' plug in tangent track shall be installed.

(11) Rail to be cut out when an 18' plug rail is installed includes:

(i) The length of the plug rail.

(ii) The amount that the rails on either side of the torch cut are to be expanded from Form "RC," "Report of Rail Clipping/Anchoring." See Attachment E.

(iii) An additional 1" allowance for each end of the plug if it is to be field welded (2x1" = 2").

(iv) If installed plug rail is to be jointed and not welded, no additional rail for welding needs to be removed. Comply with FRA §213.119(c).

(v) DO NOT ADD RAIL.

(12) If field welding, add the weld allowance (usually 1") to the CWR rail expansion value and cut out the indicated amount of rail.

(13) Make the weld or install joint bars and reapply rail fasteners or anchors. (Note: some pulling of the rail may be required to close rail to welding gap.)

(14) Record distress temperature differential, distress length, unfastening length, the readjusted RNT, and the amount of rail removed on Form "TD."

(15) Proceed to distress the other rail.

(j) Distressing Curves Procedures:

(1) Curve distressing may be required in curves when curves have chorded in or moved in during cold temperatures or due to heavy maintenance activities in curves such as:

(i) Out-of-face surfacing and aligning of track

(ii) Out-of-face tie installation

(iii) Undercutting of track

(iv) Shoulder ballast cleaning

(2) Heavy maintenance activities performed when CWR is in tension generally makes curve move in and/or chord in.

(3) More specifically, when curves undergo lateral movements due to temperature changes, either naturally or due to maintenance, the result can be substantial changes in neutral temperature which requires readjustment by distressing.

(4) There are two methods of distressing curves: (1) cutting rail out (preferred), and (2) curve realignment out.

(5) Distressing via curve realignment is the easier of the two methods, but requires knowledge of the curve position (i.e., the amount of movement), hence, requires curve staking, monitoring, record keeping, and correct tamper lining management.

(6) Appendix "A" addresses the need to stake curves ≥3°. **At a minimum, curves ≥3° shall be staked when surfacing and aligning when the rail temperature is below 55°F or 50°F below the preferred RLT of 105°F.** See Form "TM," "Report of Track Movement" in Attachment E.

(7) Staking of curves: At a minimum, stake curves ≥3° prior to out-of-face surfacing and lining.

(8) MassDOT Rail and Transit Division may require the staking of curves for other types of work as given in (j) (1).

(9) Place a minimum of three reference stakes uniformly spaced around the curve. Additional stakes may be required due to the overall length of the curve (see Form "TM," Attachment E).

(10) Inspecting for curve movement: Inspect for curve movement periodically after the work, especially during periods of large temperature changes. **Where a curve has been staked and curve has chorded 3" or more (≥3") to the inside, the curve shall be lined out and/or distressed.**

(11) **A temporary speed restriction (TSR) of 40F/40P MPH or less shall be applied if the curve is not lined out or the rail is not distressed when the rail temperature reaches the target RLT of 105°F.** Take additional remedial action as required.

Example 1: Programmed Distressing (spot distressing): It is suspected that a 1,000' section of rail on wood ties with cut spikes and DSC plates and anchors was laid "cold" (well below the territory's RLT), and it needs to be distressed to readjust to RLT = 105°F. The rail is being cut for distressing at a rail temperature of 70°F. How to proceed?

Step 1: Add match marks on both sides and within 10' of the rail to be cut. From these match marks determine the amount of rail moving together when the rail is cut. Place marks at 50' stations for up to 200' on either side of the proposed rail cut to monitor and record rail movement when rail is cut and then when rail is expanded to a RNT of 105°F.

Step 2: Add "witness stakes" in area where rail is to be cut. Measure any panel "pull back" on both sides of rail cut. Panel "pull back," if any in inches, must be added to required rail expansion discussed below. **DO NOT ADD RAIL**

Step 3: For this example assume that the rail is in compression. Cut rail at midpoint with a rail saw if possible and bypass rail ends. If the rail is in compression, torch cutting may be required. If torch cutting is required an 18' plug or larger shall have to be cut in because the minimum cut back with a rail saw on either side of a torch cut is 2" or a minimum of 4" of rail plus the width of the torch cut is removed.

Step 4: For this example assume the rail was able to be cut with a saw. This means that the rail had a neutral temperature just below 70°F.

Step 5: From match marks determine amount of rail moving together.

Step 6: Unfasten 500' in both directions starting from the rail cut and working away from the rail cut. After anchors are removed, tap or vibrate rail and let rail continue to run. Place base of rail on spikes and/or rollers to get rail out of plates if that helps to expand rail. Add spikes and/or rollers starting at joint or cut and working backwards to beginning of string to be expanded.

Step 7: Record total rail movement on Form "TD" at a rail temperature of 70°F.

Step 8: Cut out the excess rail moved together, leaving the rail ends just touching. At this point this unfastened rail has a neutral temperature of 70°F which needs to be raised to RLT=105°F.

Step 9: Check rail temperature and refer to "Report of Rail Clipping/Anchoring," Form "RC" in Attachment E to compute required expansion in inches for a temperature differential of 105°F - 70°F = 35°F and calculate the gap required for two pieces at 500' or; 2 x 1-3/8" = 2-6/8" or 2-3/4".

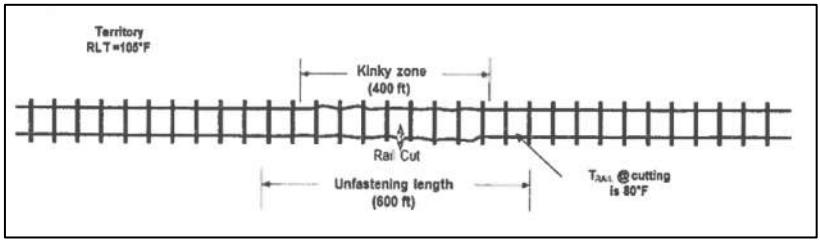
Step 10: Expand rail with ambient temperature and/or rail puller.

Step 11: Cut out the 2-3/4" + 1" for field weld allowance; pull the rail together for the 1" gap, field weld and reapply anchors.

Step 12: Record total amount of rail removed, distressing temperature, temperature differential, and the readjusted neutral temperature on Form "TD."

Step 13: Proceed to distress the other rail.

Example 2: Reactive Distressing: Adjusting Tight, Wavy, Nervous Rail: There is a 400' rail segment exhibiting a wavy/tight rail condition or rail kink. A kink is a formation or a misalignment greater than 1" on track not related to work done by MW Forces. A kink normally occurs when rail temperatures are thought to be high. The territory's RLT is 105°F, and the distressing is done at a rail temperature of 80°F. How to proceed with the distressing?



Step 1: Distress length is 400'; cut rail out with torch at midpoint until no more rail movement.

Step 2: Remove fasteners for 1.5 x kinky zone or 600' (300' on either side of cut note 600' = 1.5 x 400). Start at the torch cut and remove fasteners moving away from the cut. Keep letting rail run until no more rail movement.

Step 3: Measure rail temperature (here 80°F); and compare with RLT = 105°. The temperature differential is 25°F.

Step 4: Here the rail temperature is **lower** than laying temperature; therefore more rail needs to be removed. So rail needs to be expanded. See Form "RC," Attachment E.

Step 5: Proceed to Attachment E to determine additional rail to cut out for a 25°F distress temperature differential and the (2x300') 600' length, this is 1-1/4".

Step 6: Cut out the rail expansion required of 1-1/4" plus the 1" weld allowance if rail is to be field welded.

Step 7: If CWR is torch cut, both rails on either side of the torch cut shall have to be cut back at least 2" with a rail saw. Because only 1-¼" of expansion is required, a plug rail will have to be cut in. A minimum of 18' plug shall be installed in tangent track. Rail to be cut out if an 18' plug rail is installed includes:

- The length of the plug rail.
- The amount that the rails on either side of the torch cut are to be expanded from Form "RC." In this case 2 x 5/8" = 1-1/4" total.

- An additional 1" allowance for each end of the plug if it is to be field welded (2X1" = 2").
- If the plug is to be jointed and not welded, no additional rail other than the plug length and the required expansion amount of 1-¼" needs to be removed. Comply with FRA §213.119(c).
- **DO NOT ADD RAIL.**

Step 8: Expand rails (both sides of torch cut) by the ambient temperature and with a rail heater and/or rail puller, cut in plug rail, reapply anchors or fasteners, make field welds and/or drill rail ends and apply 6 hole joint bars.

Step 9: Record rail temperature (80°F); RLT (105°F); distress length (400'); unfastening length (600') and 1-1/4" rail cut out on Form "RC."

Step 10: Proceed to distress other rail.

ATTACHMENT C

RECOMMENDED PROCEDURES (RPS) FOR READJUSTING/DISTRESSING CONTINUOUS WELDED RAIL (CWR) AFTER A BREAK, PULL-APART (SERVICE FAILURE) OR CUT BELOW THE TARGET RAIL LAYING TEMPERATURE (RLT = 105°F)

(a) **Definitions:**

(1) The "Rail Laying Temperature" (RLT) is the target installation temperature of welded rail for the MassDOT Rail and Transit Division.

(2) For existing CWR in track, when service failures are repaired and cuts in CWR are made by Railroad Operating Companies, the minimum acceptable RLT to be achieved when making repairs and/or cuts is RLT -10°F or 95°F.

(3) All readjustments/distressing of CWR on MassDOT Rail and Transit Division shall be made to achieve a target RLT of at least 105°F.

(4) As per Section 3.0, "Installation and Adjustment of CWR," MassDOT requires rail to be installed at RLT=105°F with construction tolerance of -10 to +10°F (i.e., 95°F to 115°F).

(5) The "Rail Neutral Temperature" (RNT) is the rail temperature at which the net longitudinal force in the rail is zero, and is referred to as rail neutral temperature.

(b) **Overview:**

(1) These procedures address readjusting the RNT under the following conditions:

(i) Service Failures:

- Broken joint bars
- Broken welds/field or plant
- Pull-aparts with broken bolts and bent bolts
- Broken rails
- Defective glued plug insulated joint rails

(ii) Rail defect or rail removals (cutting rail).

(iii) Cutting rails and installing plug rails.

(2) Rail that has pulled apart, broken, or been cut for defect removal must be readjusted to the RLT -10 safe range prior to rail temperatures exceeding those outlined in Table 1 below.

Table 1. Temperature When CWR (RNT) Must be Adjusted or Speed Restrictions Applied For Rail Breaks on One Rail Only

Rail Temperature (°F) at Which Rail Break or Cut Occurred	Rail Temperature (°F) at Which to Readjust or Apply Temporary Speed Restriction (TSR)
60	110*
50	110*
40	110*
30	110*
20	110*
10	110*
0	105*
-10	100*
-20	95*
-30	90*
*Table based on FRA/RSAC, but modified for MassDOT Rail and Transit Division requirements.	

Note: For the special case where both rails break and/or are cut within 200' of each other and when both rail's readjustment and permanent repairs are deferred to warm temperatures, the following formula shall apply:

T Return = (T RB1 + T RB2)/ 2 +70°F, and T Return shall not exceed 110°F.

(As an example, rail 1 breaks at 10°F, and rail 2 at 30° F, the return temperature is 90°F, and NOT as would be individually designated by Table 1)

(3) If rail RNT has not been adjusted prior to rail return temperatures exceeding the values in Table 1:

(i) **A temporary speed restriction (TSR) of not more than 25F/25P MPH shall be applied**, or

(ii) A temporary speed restriction of not more than 40F/40P MPH can be applied when a mandatory daily inspection is conducted during the heat of the day.

(iii) **If rail return temperatures do not exceed Table 1 values, the RNT shall be readjusted within 365 days.**

(4) The following data must be recorded on Form "TD" at the time of the break, pull-apart, and/or cut:

(i) Rail temperature at the time of the pull-apart/break/cut,

(ii) Gap size (as measured within ± 1/32"),

(iii) Rail size,

(iv) Tie type (wood or concrete),

(v) Anchor/fastener type (anchors or elastic fasteners); and the condition as described by "weak", "average", and "strong" as described below:

- Weak: missing anchors; the majority are not tight against the ties; evidence of rail slipping or moving longitudinally through anchors/clips;

crib ballast more than 2" below the tops of the ties; poor tie condition; more than half of the tie insulators are cracked, broken or not seated in the shoulder; tie pads are slipping or deteriorated; evidence of rail seat abrasion.

- Average: anchors are in place and tight against the ties; no evidence of rail creep; tie condition is good; full ballast section; most insulators are sound and seated correctly; tie pads are not worn or moving in the rail seat; no evidence of rail seat abrasion.
- Strong: new construction or relay rail with new anchors or fasteners; full ballast section and well consolidated AND which do not exhibit any of the "weak" or "average" characteristics.

(vi) The anchor pattern (every tie versus every other tie), and

(vii) If any "special conditions" apply* (see (5) below).

(5) Attachment A tables for the determination of pre-break/cut RNTs, do not apply for "special conditions" which are defined as:

(i) Breaks/cuts clustered in "close" proximity to each other on the same rail (i.e., within 800' of each other);

(ii) Breaks/cuts are within 400' of a "fixed" point; or

(iii) Breaks/cuts in iced rail/frozen ballast conditions.

(6) Use the tables in Attachment A to determine the pre-break/cut RNT, but note special conditions and/or exclusions (as above). Table 2 provides a guide as to the information found and where it is located in Attachment A (see below):

Table 2. Attachment A Table Use

Rail Base Size	Rail Weight	Anchorage Type	Attachment A Table to Use
6"	136/132	Every other tie anchored	1A
5-1/2"	115/100	Every other tie anchored	1B
6"	136/132	Every tie anchored*	2A*
5-1/2"	115/100	Every tie anchored*	2B*
* Use for concrete ties, and for wood ties with elastic fasteners.			

(7) 6" base rail found in Attachment A is currently the standard rail being purchased and installed by the MassDOT Rail and Transit Division.

(8) 5-½" base rail found in Attachment A was laid on MassDOT Rail and Transit owned rail lines and is still in track.

(c) **Procedures Used to Readjust Rail When A Service Failure Occurs and/or CWR Is Cut**

(1) The procedures used to readjust rail after a break or cut vary based upon Table 3's summary below.

Table 3 – RNT Readjustment Procedures Summary

APPLICATION	DESCRIPTION
Attachment A + Tables 1 & 2	Evaluation of pre-break/cut RNTs and return temperatures for adjustment. Results are required inputs Scenarios 1-3.
Scenario 1a	RNT readjustment procedure when repairing broken/defect cut rail when it can be performed at the time of break/cut. Such requires a pre-break/cut RNT in the RLT-10 range thus allowing rails to be pulled together through anchors and fasteners for an RNT restoration to RLT-10
Scenario 1b	Same as 1a, but when additional rail removal is required for readjustment, and when rail is pullable through anchors/fasteners. This Scenario provides additional rail removal required for RNT restoration to RLT-10
Scenario 2	Procedure for readjusting RNT after rail break/defect cut when interim repairs are required (such rail addition via plug) and when RNT readjustment are deferred for a later time as per Table 1 at which time conventional destressing of 780 ft of rail is required to RLT
Scenario 3	Readjustment procedure for special cases when Attachment A is NOT applicable. These include: (a) Multiple breaks on same rail within close proximity (800 ft) of each other (b) Breaks/cuts within 400 ft of fixed points (bridges, tunnels, crossings, switches/turnouts, etc.) (c) Extremely stiff, frozen rail/ballast conditions

Notes: (i) if for any reason in 1a or 1b the rail gap to be closed for adjustment is NOT pullable through anchors/fasteners, revert to Scenario 2, (ii) Scenario 3's (a) and (b) reverts to Scenario 2, and (iii) Scenario3's (c) is as indicated in Table 5

(2) **Scenario 1a: Breaks or cuts occurring when the pre-break/neutral temperature was within the RLT -10°F range when a permanent repair is possible**. Repairs can be made at the time of the break/cut by pulling rail ends together with a rail puller without any removal of anchors or clips. Attachment A is used to determine existing and final (repaired) RNT.

(3) **Scenario 1b: Breaks or cuts occurring when the pre-break/cut neutral temperature was below the RLT -10°F range when a permanent repair is possible by cutting additional rail out**. Repairs can be made at the time of the break/cut by pulling rail ends together with a rail puller without any removal of anchors or clips. Attachment A is used to determine extra rail to cut out, and existing and final (repaired) RNT. If repairs cannot be made by pulling, then see Scenario 2 under (4).

(4) **Scenario 2: Breaks or cuts occurring, when permanent repairs cannot be made at the time of the break/cut.** If a plug is added (RAIL IS ADDED), or the rail pulled together and bolted as an interim repair, then permanent repairs or adjustments to the RNT shall be made before reaching the rail return temperature in Table 1, and by distressing 780' of rail.

Note that under this Scenario:

(i) the readjustment here is to RLT (and NOT to RLT-10), and

(ii) the potential benefit of the single joint interim repair approach versus the plug rail (i.e., offering the 1 weld vs. 2 welds later upon readjustment), and

(iii) the interim benefit of rail pulled together approach's resetting reduced RNT to the pre-break value.

(5) **Scenario 3: For "Special Cases"** where breaks or cuts occur:

(i) in close proximity on the same rail, or;

(ii) near fixed structures, or;

(iii) in extremely stiff or frozen rail/ballast conditions.

NOTES:

(a) **IN THE ABOVE CASES, TABLES IN ATTACHMENT "A" DO NOT APPLY (I.E. PRE-BREAK/CUT RNTs CANNOT BE DETERMINED.)**

(b) **SCENARIO 3 ADJUSTMENT OF RLT IS AS GIVEN IN SCENARIO 2 (I.E. REQUIRING RETURN TEMPERATURES AS PER TABLE 1, AND UNFASTENING/DISTRESSING 390' OF RAIL ON EITHER SIDE OF THE BREAK/CUT, OR 780' TOTAL, WITH THE EXCEPTION OF (iii) WHICH ADOPTS TABLE 5 FOR DISTRESS LENGTHS). SEE BELOW.**

(d) **Recommended Procedures to Readjust Rail RNT.** The procedures used to readjust rail after a break and/or service failure or cut are given below for the above Scenarios:

(1) **Scenario 1a: Single Break/Cut Occurred when the RNT was Within 10° of the RLT (105°-10=95°F), when a permanent repair is possible at the time of break/cut. Note the following:**

(i) Rail can be pulled together through the anchors or fasteners and the gap can be closed. A minimal amount of anchors are removed around the service failure and/or at the cut in CWR.

(ii) Permanent repair is made when service failure is discovered or CWR is cut.

(iii) RNT is restored to within the range of RLT -10°F.

(iv) No rail is added.

(v) No additional repairs are required (except for repositioning displaced anchors/fasteners resulting from rail pulling).

(vi) Following are the steps to be followed when making a repair:

- Step 1: Obtain the rail temperature at the time of the break/cut, gap size, rail size, tie type (wood or concrete), anchor/fastener type, and the anchor pattern (every tie versus every other tie) and record on Form "TD."
- Step 2: Use Table 2 above to determine which table in Attachment A should be used to determine the pre-break/cut RNT.
- Step 3: determine if the pre-break/cut temperature is within 10°F of the RLT. If so, proceed to Step 5.
- Step 4: If not, proceed to Scenario 1b or 2 depending upon the conditions.
- Step 5: No adjustment is required for breaks or cuts that occurred when the pre-break/cut RNT was within the RLT -10°F. The gap can be closed using the following procedures:
  - Remove a limited number of anchors or fasteners (~5-10 ties) either side of the break/cut (to facilitate an easier rail pull).
  - Cut 1" for the weld allowance if the rail ends are to be welded.

- Use a rail puller to close the gap or to leave the 1" weld allowance. If the gap closes, apply joint bars or make the weld and record all pertinent data.
- If the gap does not close, close the gap by adding a plug rail. Record the gap size, temperature, and the rail added, and return later to readjust using Scenario (2).
- After applying joint bars or making the weld, record the gap size, pre-break/cut RNT, the restored RNT and rail temperature on Form "TD." Permanent repairs at the service failure, break and/or cut location shall be made within 30 days in accordance with FRA §213.119(c)(3).
- If working in a curve, proceed to check alignment to be sure rail has not chorded in after pulling rail with a rail puller. Realign if necessary.

(vii) Above procedure requires pulling rail through the anchors or fasteners; hence, needing sufficient puller/tensor capacity especially in concrete tie track or on wood ties with elastic fasteners. If puller capacity is not adequate or puller is not available, use procedures in Scenario 2

(viii) MassDOT Rail and Transit Division requires that all permanent repairs that can be made immediately (Scenario 1), be accomplished by adjusting RNT to at least RLT -10°F or 95°F.

(ix) ILLUSTRATIVE EXAMPLE OF SCENARIO 1a:

Consider a rail break or defect removal on wood tie, every other tie anchored (EOTA) 136# rail segment, when the rail broke/cut at 40°F, and the resulting gap size is 3 inches. How to make the repair/readjustment?

ANSWER: from Table 1a (ATTACHMENT "A") the pre-break cut RNT is: 99°F. This is within MassDOT's RLT-10 safe range (i.e. within 105 – 10), hence a candidate for Scenario 1a! After cutting an extra inch for the weld allowance, close the gap to the 1" weld gap via rail puller (without any anchor removal), and proceed to make the weld. Record all pertinent data, and be sure to reposition any moved/displaced anchors. Then the readjusted RNT here is 99°F.

Note: if for any reason the rail could not be pulled together, proceed to make an interim repair via a plug rail requiring adding 3" of rail, and then apply Scenario 2 to readjust before rail temperature exceed 110°F (as per Table 1)

(2) **Scenario 1b: Single Break/Cut RNT is below the RLT -10°F Range (<95°F), when a permanent repair is still possible. Note the following:**

(i) This is a modification of Scenario 1a as it requires more rail to be cut out to compensate for the RNT being below RLT -10°F. As such, this requires pulling rail together through "*larger*" gaps. The gap now consists of the sum of present break/cut gap, and the additional rail removal required to compensate for pre-break/cut RLT being below RLT -10°F as well as the 1" weld allowance if field welding. The **Required Steps When RNT is below RLT -10°F Range (<95°F):**

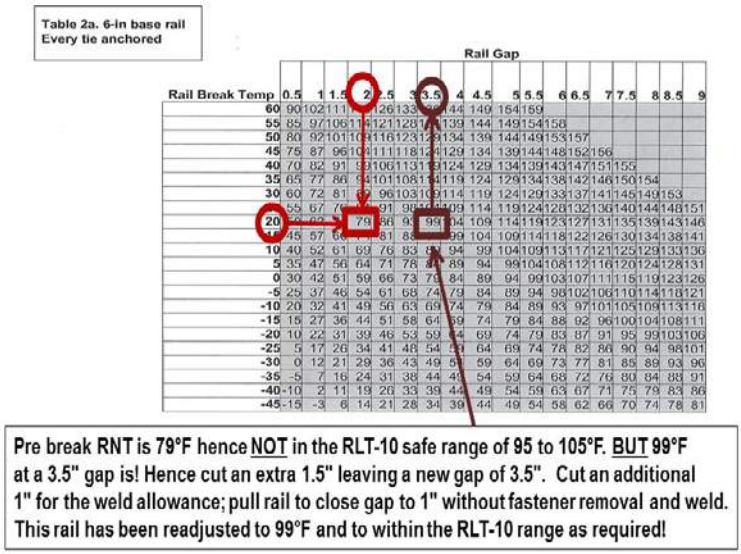
- Step 1: Measure/record the rail temperature at the time of the break/cut, gap size, rail size, tie type (wood or concrete), anchor/fastener type, and the anchor pattern (every tie versus every other tie) and record on Form "TD."

- Step 2: Use Table 2 information to choose appropriate table in Attachment A to determine the pre-break/cut RNT.
- Step 3: Determine if the pre-break/cut temperature is below the RLT -10°F. If so proceed to Step 4. If above the RLT -10°F range, proceed to Scenario 1a depending on the conditions and schedule readjustments in compliance with the rail return temperature in Table 1. **Step 4: Use the selected table in Attachment A to determine the *additional* amount of rail to cut out to readjust to at least 95°F.** Add this amount rail to be removed to the existing gap size plus the 1" weld allowance, if a weld is to be made. This is known as the final pull-gap amount (i.e., FG.).
- Step 5: Determine if FG is *pullable,* with the rail puller on site, to the 1" gap required for welding or closing the gap if joint bars are to be added, remembering that rail is to be pulled through the anchors/fasteners without removal. If gap is pullable, proceed to Step 6.
- Step 6: Cut out additional rail required for expansion and closing the joint by adding joint bars or by field welding. Pull rail through the anchors to close the gap for joint bars and/or leave 1" to close with a field weld.
- Step 7: If required gap cannot be closed, there are two possible temporary repairs. They are:
  - Only close the gap that was found in the field when the rail broke and/or was cut. The RNT will be the existing RNT when the rail broke and/or was cut as determined from Attachment A. Return to make permanent repair in accordance with Scenario 2 and Step 8.
  - If initial gap observed when rail broke and/or was cut cannot be closed, add rail by installing a plug rail. The RNT will be the existing rail temperature when the rail broke and/or was cut. Return to make permanent repair in accordance with Scenario 2.
- Step 8 After making permanent repairs as in Step 6, inspect fasteners and readjust (reposition anchors) where necessary so they are tight against the tie.
- Step 9: If working in a curve, proceed to check the alignment to determine if the rail has chorded in. Realign if necessary and or take appropriate remedial action.

(3) ILLUSTRATIVE EXAMPLE OF SCENARIO 1b:

Consider a 136# rail is cut for a defect removal at a rail temperature of 20°F in an every tie fastened rail segment resulting in a rail gap of 2". The territory's designated laying temperature is 105°F. How to make readjustment in line with the RLT-10 criterion at the time of defect cut?

Answer: apply Scenario 1b (as illustrated below)



Pre break RNT is 79°F hence NOT in the RLT-10 safe range of 95 to 105°F. BUT 99°F at a 3.5" gap is! Hence cut an extra 1.5" leaving a new gap of 3.5". Cut an additional 1" for the weld allowance; pull rail to close gap to 1" without fastener removal and weld. This rail has been readjusted to 99°F and to within the RLT-10 range as required!

(e) **Procedures to Readjust Rail RNT for Scenario 2**

(1) Scenario 2: Breaks or cuts occurring when permanent repairs cannot be made at the time of the break/cut. If a plug is added as an interim fix, then permanent repairs or adjustments to the RNT shall be made before reaching the rail return temperature in Table 1.

(i) Step 1: Use Attachment A Tables to document pre-break RNTs.

(ii) Step (2): **If a plug rail is cut in, record the amount of rail added on Form "TD."**

(iii) Step (3): A special requirement of Scenario 2 is to distress by removing anchors or clips on 390' of CWR on both sides of plug or joint (for a total of 780') when returning for repair, and readjusting to RLT of 105 **°F** (and not to RLT-10)

(2) ILLUSTRATIVE EXAMPLE OF SCENARIO 2:

***Example**: a 136# rail is cut for a defect removal at a rail temperature of 20°F in a concrete tie territory resulting in a rail gap of 2". The territory's designated laying temperature is 105°F. Scenario 1b was attempted but the rail could not be pulled together to close the 3.5"gap (see example above). How to proceed?*

***ANSWER:** follow Scenario 2 (with Options 1 or 2 below):*

OPTION 1 - in case rail could not be pulled together to close the 3.5" gap, the procedure is to apply Scenario 2. This requires recording/documenting all pertinent data, and making interim plug repair of adding 2" of rail and applying Table 1 to establish return temperature for adjustment (i.e. in this case prior to rail temperatures exceeding 110°F). Return at or prior to this rail temperature and make adjustment as per Scenario 2 which requires adjustment by destressing via unfastening ± 390 ft of rail (total of 780 ft).

OPTION 2 - instead of making interim plug repair of adding 2" of rail as per above, consider pulling rail together through the 2" gap (without unfastening) and closing rail via bolted joint. This restores RNT to 79°F. It is still required to return for a later adjustment, but Table 1 doesn't apply anymore in this case, hence more flexibility on when to return for the final adjustment. The required unfastening length is still ±390ft (780ft total).

Note: Option 2 has the benefit of some immediate *partial RNT restoration* (thereby offering some interim safety against a buckling potential during the onset of warm temperatures), and an easier final adjustment of requiring one weld versus two.

(f) **Procedures to Readjust Rail RNT for Scenario 3 (Special Cases) when:**

(1) Case 1: Multiple breaks/cuts occurring in "close" proximity on the same rail (i.e., within 800' of each other).

(2) Case 2: Breaks/cuts within 400' of "fixed structures/locations."

(3) Case 3: Breaks/cuts in iced rail/frozen ballast conditions.

(4) Case 4: Where the break/cut occurs on both rails within 200' of each other.

(5) For detailed readjustment procedure for Special Cases 1 and 2 above refer to conventional distressing procedure and application of Scenario 2 as in (e) above, requiring the adjustment of 780' of rail and cutting rail out as dictated by the temperature differential (TD).

(6) Use Table 4 below with the caveat that additional rail removal may be required if the end points at ±390 are measured to be moving in when applying the rail puller to close the gap.

Table 4. Special Cases: Additional Rail to Remove for Readjustment for the 780' of Unfastening Length

Temperature Differential (°F)*	Additional Rail to Remove (inches)
5	1/4
10	1/2
15	1
20	1-1/4
25	1-1/2
30	1-3/4
35	2-1/4
40	2-1/2
45	2-3/4
50	3-1/4
55	3-1/2
60	3-3/4
65	4
70	4-1/2
*MassDOT Rail and Transit Division Preferred Rail Laying Temperature (RLT=105°F)	

Note: The above procedures for Scenario 2 and Scenario 3"s Special Cases 1 and 2 are based on best practice engineering assumption, that for **all** rail break/defect cut/pull-apart cases, **one** unfastening length of 390' on either side of the cut/break is adequate for readjustments. Although some break/cut influence zones can be longer, hence requiring longer unfastening lengths, the 780' total length is an acceptable "best practice" compromise. For "*bad*" breaks (i.e., break gaps exceeding 3"), longer unfastening lengths are recommended. Additionally, note that the above Scenario 2 procedure readjusts to RLT instead of the RLT -10°F value! This is for "added safety" to counteract the "*one unfastening length of ± 390' satisfying all break/cut influence zone"* assumption.

(g) **Procedures to Readjust Rail RNT Scenario 3:** For Special Case 3 (breaks/cuts in frozen rail/ballast conditions):

(1) Apply Scenario 2 as per (e) above; however, the recommended unfastening lengths are reduced as per Table 5 below.

(2) Use Form "RC" in Attachment E to calculate the required expansion amounts that correspond to the unfastening lengths given in Table 5.

Table 5. Unfastening Lengths for Frozen Ballast Conditions

Measured Gap Size (in) when Broke/Cut	Unfastening Length (ft) in Each Direction
<1/2	100
½ - 1	150
>1	200

(h) **Procedures to Readjust Rail RNT Scenario 3:** For Special Case 4 where the break/cut occurs on both rails within 200' of each other.

(1) Use Scenarios 1-3 as applicable for rail breaks on each individual rail.

(2) The return/readjustment time (return rail temperature) given in Table 1 is not applicable for this Special Case 4 when both rails have breaks in close proximity (within 200' of each other).

(3) The following formula must be used to determine the "return rail temperature."

$$T_{RETURN} = (T_{RB_1} + T_{RB_2})/2 + 70°F$$

Where T_{RB1} is the rail break temperature of one rail, and T_{RB2} is the rail break temperature of the other (opposite) rail.

(4) Example: One rail breaks or is cut for defect removal at 10°F and left for a later adjustment in line with Scenarios 2 or 3. The other rail breaks or is cut later at 30°F which is also deferred for later return adjustment. If both repairs were not made at the time of the rail break and/or cut, but were deferred to at a later date, then the return temperature is at/below a rail temperature of 90°F. The calculation is shown below:

T_{RETURN} = (10°F +30°F)/2 + $70°F$ or 20°F+70°F = 90°F

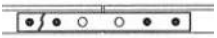
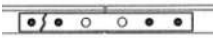
Note that this is a lower return temperature than either individual breaks/cut temperature given by Table 1.

This page intentionally left blank

ATTACHMENT D

JOINT DEFECT GUIDELINES / MAXIMUM ALLOWABLE TEMPORARY SPEED RESTRICTIONS (TSR's)

Joint Defect Guidelines in CWR Track

Condition	FRA Part 213 Reference	Illustration****	Action
One Broken Joint Bar Not Between Middle Holes	§213.121(b) §213.121(e)		10F/15P MPH* (per FRA §213.9(b))
One Broken Joint Bar Between Middle Holes	§213.121(c)		Out of Service until Repaired (per FRA §213.9(b)) and Visually Supervise**
Both Joint Bars Broken Not Between Middle Holes	§213.121(b) §213.121(e)		10F/15P MPH* (per FRA §213.9(b))
Both Joint Bars Broken Between Middle Holes	§213.121(c)		Out of Service until Repaired (per FRA §213.9(b))and Visually Supervise**
Less than Two Bolts in Rail End	§213.121(e)		10F/15P MPH* (per FRA §213.9(b))
Unbolted Rail End Pulled Apart 1-1/2" - 2"	§213.121(e)		Inspect (per FRA §213.9(b)) Repair within 24 hrs.
Unbolted Rail End Pulled Apart 2" - 4"	§213.121(e)		Visually Supervise** Must maintain continuous communications w/train crew (per FRA §213.9(b)) Repair within 24 hrs.
Unbolted Rail End Pulled Apart >4"	§213.121(e)		Out of Service until Repaired

Notes:

* All speeds shown are maximum allowable. Qualified employees may impose more stringent remedial action (FRA §231.7(a)(b)(c)(d)), depending on the presence of a combination of defects or particular site conditions.

** "Visually supervise" means that an employee qualified under FRA §213.7(a)(b)(c) must observe each operation over the defect and/or in accordance with FRA §213.7(d).

*** Solid circle is bolt hole with bolt. Open circle is bolt hole without bolt.

**** Track surface and joint tie conditions shall be considered when determining temporary slow order (TSO) maximum speeds.

This page intentionally left blank

ATTACHMENT E

PREPARATION OF FORMS

This page intentionally left blank

FORM "TD"
REPORT OF DISTURBANCE OF CWR TRACK

Part A: CWR Track Disturbance Due to Track Work					
Route:		**Date:**		**Rail Temp**	**Time:**
M.P. Location From:		**To:**		**Track No:**	
Type of Work Performed:					
Additional Repairs Required:					
Remedial Action Required:					
Part B: Rail Cut Or Service Failure in CWR Territory					
Route:		**Date:**		**Rail: North / South / East / West**	
M.P. Location From:		**To:**		**Track No:**	
Type of Work Performed:					
Additional Repairs Required:					
Remedial Action Required:					
Operating Railroad Employee (Print):					
Operating Railroad Employee (Signature):					

ATTACHMENT E

**INSTRUCTIONS FOR PREPARATION OF THE
REPORT OF DISTURBANCE OF CWR TRACK (FORM "TD")**

A report of disturbed track , Form "TD", shall be made out as required by Section 10.0. The report will be completed and signed by the Contractor/Operating Railroad Employee in charge of the work as follows:

Part A - This part will be completed in its entirety any time heavy maintenance work is performed on CWR track. See Section 6.0, "Trackwork that Disturbs CWR Track and the Protection of Disturbed Track" for the information required on Form "TD", Part A.

Part B - This part will be completed any time main track CWR is cut or broken and/or there is a service failure.

A. See Section 5.0, "Maintenance of the Desired Rail Neutral Temperature in Previously Installed CWR" for the information required on Form "TD", Part B.

B. See Attachment C, "Recommended Procedures for Readjusting Continuous Welded Rail (CWR), After a Break, Pull-Apart (Service Failure) or Cut Below the Target Rail Laying Temperature (105°F)" for the information required on Form "TD", Part B.

C. See Attachment A, "Determination of Estimate of Pre-Break/Pre-Cut Neutral Temperature for a Service Failure in CWR" for the information required on Form "TD", Part B.

Parts A & B

A. Form "TD" shall be filled out in accordance with Section 10.0, "Reporting Requirements for CWR Track."

B. Form "TD" shall be filled out and kept by the Operating Railroad in accordance with Section 11.0, "Record Keeping."

FORM "TM"
REPORT OF TRACK MOVEMENT: CURVES ≥3°

Route:		**Type of Work Performed*:**	**Surfacing ☐ Install Ties ☐**	**Date of Work:**	
M.P. Location :	**From:**		**To:**	**Track No:**	
Curve No:		**Degree of Curve:**		**Elevation:**	
Rail Temperature at which Surfacing Tie Installation was Done:					

Distance from Reference
(Reference Points Must be no Further than 200 ft. apart):

Reference Point Number	Location of Reference Point	Before Work	After Work	Movement	Within 7 Days	Movement
TS (Tangent to Spiral Tag)						
SC (Spiral to Curve Full Body Tag)						
Additional Full Body Tag As Required**						
Additional Full Body Tag As Required**						
CS (Curve to Spiral Full Body Tag)						
ST (Spiral to Tangent Tag)						
Uniform Movement	----------	----------				

***Types of work that requires a Form "TD." Out-of-face surfacing and alinement and installing more than 540 ties per mile.**

Railroad Employee Making Measurements (Print Name): _____

Railroad Employee Making Measurements (Signature): _____

Railroad Employee in Charge of Surfacing (Print Name): _____

Railroad Employee in Charge of Surfacing (Signature): _____

**Use additional sheets if the number of stations exceeds the number of lines.

ATTACHMENT E

INSTRUCTIONS FOR PREPARATION OF THE REPORT OF TRACK MOVEMENT DUE TO SURFACING OR OUT-OF-FACE TIE RENEWAL (FORM "TM")

(a) In curves of 3° or over, prior to the start of high speed surfacing, or installing more than 540 ties per mile, the Operating Railroad and/or Contractor shall set reference points each curve at the locations given on Form "TM" along the gage side of the high rail of the curve.

In no case may the points be more than 200' apart.

(1) In no case will the points be more than 200' apart.

(2) In addition, offset stakes shall be set at each of the reference mark locations. These stakes will be set to the outside (high side) of the track, and out of the way of regulators or other equipment.

(3) In multiple track locations, a mark on the high rail or a tack in a tie on an adjacent and/or parallel track, may be used as an offset location.

(4) Adjacent and/or parallel tracks may be used for offset locations only if the track is not to be disturbed or will have any maintenance work performed when it is being used as for offset locations.

(5) Initial measurements shall be made from the reference points to the offset locations before any heavy maintenance work (The "Work") is performed and shall be recorded on Form "TM".

(b) Immediately after completion of the Work, the Operating Railroad Employee in charge of the track surfacing or tie installation will again measure and record the distances from the reference point to the offset locations. Both the distances and any movement shall be recorded on Form "TM".

(c) Within seven days after the Work, the Operating Railroad will again measure and record the distance from the reference point to the offset locations. Again, both distances and movement shall be recorded on Form "TM".

(d) If the curve has moved and/or chorded in at any location is 3" or more (≥3"), the curve shall be distressed by lining out and/or distressing the rail prior.

(e) The lining out of the curve and/or distressing of the curve shall be accomplished before:

(1) If the ambient temperature is greater than 80°F (rail temperature greater than a temperature of 110°F), no work shall be done unless it is an emergency or as directed by MassDOT Rail and Transit Division and; or

(2) If the ambient temperature and/or rail temperature is less than 40°F, all work will be suspended unless it is an emergency or directed by the MassDOT Field Representative.

(f) **Temporary Speed Restriction:** A temporary speed restriction (TSR) shall be placed if the curve has moved inward 3" or more in accordance with Section 6(e), until the curve is lined out and/or distressed. The curve will be considered to have lost its neutral temperature if movement is recorded as given below:

Curves 3° and Over	Measured Curve Movement that Requires Lining Out the Curve and/or Distressing the Rail
	3" or greater (≥3") to the inside

FORM "JE"
REPORT OF JOINT ELIMINATION BY FIELD WELDING
THERMITE (T) / FLASH BUTT (FB)

Track Name/No.	Rail (N/S/E/W)	MP	Rail Weight	Date/ Weld No.	Field Weld Type(2)	Mold Date	Portion Date	Weld Company/ Welder's Name	Weather/ Rail Temp °F	Rail Cut Out / or Consumed and/or Added (Inches)	Remarks	Weld Inspections			Results
												Date Inspected	Inspection Company	Test Results	

Notes:
(1) Reason for weld:
EJ – Eliminate Joint
EPR – Eliminate Plug Rail
EDW – Eliminate Defective Weld
RNT – Increase Rail Neutral Temperature
(2) Field Weld Types:
T – Thermite
FB – Flash butt
(3) A Form "TD" shall be made out when rail is cut and/or broken.

Operating Railroad Contractor's Signature: _____ **Date:** _____

Operating Railroad Contractor's Name (Print): _____

ATTACHMENT E

INSTRUCTIONS FOR THE PREPARATION OF THE REPORT OF JOINT ELIMINATION BY FIELD WELDING (FORM "JE")

(a) A Report of Joint Elimination by Field Welding shall be made out as required in Section 10.0. The report shall be completed by the Contractor/Operating Railroad Employee in charge of the work.

FORM "RC"
REPORT OF RAIL CLIPPING/ANCHORING

Operating Railroad/Contractor:	**Weather:**
Line Segment:	**Copy sent to MassDOT Rail and Transit Division (Yes/No)"**

Date	Rail[6]	String Number	Start MP	End MP	String Length (Feet)	Rail Temp (°F)[(1)]	Required Temp. Change (°F)[(2)]	Required Expansion (Inches)[(3)]	Method of Expansion[(5)]	String Vibrated (Y/N)	Time Started/ Finished Clipping	Actual Expansion Recorded (Inches) Obtained at ¼ Points[(4)]				Notes
												1/4	1/2	3/4	Full	

Notes:
(1) Temperature to be measured with approved rail thermometer.
(2) Required temperature change in °F is preferred RNT of 105°F minus the actual rail temperature at the time of expansion.
(3) See formula and table on reverse side of Form.
(4) After string is anchored and/or clipped.
(5) Method of Expansion: Natural (N); Rail Heater (RH); Rail Puller (RP); Cooled (C).
(6) Rail locations" N, S, E, W

Operating Railroad Contractor's Signature: _____ **Date:** _____

Operating Railroad Contractor's Name (Print): _____

ATTACHMENT E

INSTRUCTIONS FOR THE PREPARATION OF THE REPORT OF RAIL CLIPPING/ANCHORING (FORM "RC")

Formula for Coefficient of Linear Expansion of Rail:

$A = 0.000078 \times (T_D - T_E) \times L$

A	=	Adjustment or Required Expansion amount for rail string (in inches)
T_D	=	Desired RNT which should be 105°F if possible as conditions permit
T_E	=	Existing or Actual Rail Temperature (°F) prior to heating or expansion measured with an approved rail thermometer
L	=	Length of string to be adjusted (in feet)

Calculations:

Change In Rail Length Due to Change In Rail Temperature

A = Change In Rail Length In Inches = 0.000078ΔT x L
L = Length of Rail to be Expanded in Feet
ΔT = Change in Temperature in Degrees Fahrenheit: Desired RNT minus Actual Rail Temperature

Length of Rail (ft)	Change in Temperature in Degrees Fahrenheit															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Change in Rail Length in Inches															
100	1/8	1/8	1/8	1/4	1/4	1/4	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8	5/8
200	1/8	1/4	1/4	3/8	1/2	1/2	5/8	5/8	3/4	7/8	7/8	1	1-1/8	1-1/8	1-1/4	1-1/4
300	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8	1-7/8
400	1/4	3/8	1/2	5/8	7/8	1	1-1/8	1-1/4	1-1/2	1-5/8	1-3/4	1-7/8	2-1/8	2-1/4	2-3/8	2-1/2
500	1/4	1/2	5/8	7/8	1	1-1/4	1-3/8	1-5/8	1-7/8	2	2-1/4	2-3/8	2-5/8	2-3/4	3	3-1/8
600	1/4	1/2	3/4	1	1-1/4	1-1/2	1-3/4	1-7/8	2-1/8	2-3/8	2-5/8	2-7/8	3-1/8	3-3/8	3-5/8	3-3/4
700	3/8	5/8	7/8	1-1/8	1-3/8	1-3/4	2	2-1/4	2-1/2	2-3/4	3-1/8	3-3/8	3-5/8	3-7/8	4-1/8	4-3/8
800	3/8	5/8	1	1-1/4	1-5/8	1-7/8	2-1/4	2-1/2	2-7/8	3-1/8	3-1/2	3-3/4	4-1/8	4-3/8	4-3/4	5
900	3/8	3/4	1-1/8	1-1/2	1-7/8	2-1/8	2-1/2	2-7/8	3-1/4	3-5/8	3-7/8	4-1/4	4-5/8	5	5-3/8	5-5/8
1000	1/2	7/8	1-1/4	1-5/8	2	2-3/8	2-3/4	3-1/8	3-5/8	4	4-3/8	4-3/4	5-1/8	5-1/2	5-7/8	6-1/4
1100	1/2	7/8	1-3/8	1-3/4	2-1/4	2-5/8	3-1/8	3-1/2	3-7/8	4-3/8	4-3/4	5-1/4	5-5/8	6-1/8	6-1/2	6-7/8
1200	1/2	1	1-1/2	1-7/8	2-3/8	2-7/8	3-3/8	3-3/4	4-1/4	4-3/4	5-1/4	5-5/8	6-1/8	6-5/8	7-1/8	7-1/2
1300	5/8	1-1/8	1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8	4-5/8	5-1/8	5-5/8	6-1/8	6-5/8	7-1/8	7-5/8	8-1/8
1400	5/8	1-1/8	1-3/4	2-1/4	2-3/4	3-3/8	3-7/8	4-3/8	5	5-1/2	6-1/8	6-5/8	7-1/8	7-3/4	8-1/4	8-3/4
1440	5/8	1-1/8	1-3/4	2-1/4	2-7/8	3-3/8	4	4-1/2	5-1/8	5-5/8	6-1/4	6-3/4	7-3/8	7-7/8	8-1/2	9
1600	5/8	1-1/4	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8	7-1/2	8-1/8	8-3/4	9-3/8	10

FORM "CWR"

REPORT OF SEMI-ANNUAL INSPECTION (SPRING/FALL) OF CWR TRACK

Operating Railroad/Contractor:	**Weather:**
Line Segment:	**Copy sent to MassDOT Rail and Transit Division (Yes/No):**

Track No.	Rail (N/S/E/W)	MP (Start)	MP (Finish)	Ties		Ballast		Anchors			Longitudinal Rail Movement					Remarks/ Remedial Action Required
				Type	Condition	Crib	Shoulder	Type	Pattern	Position	Turnouts	Crossovers	Grade X-ings	Open Deck Bridges	Other	

Operating Railroad Contractor's Signature: _____ **Date:** _____

Operating Railroad Contractor's Name (Print): _____

ATTACHMENT E

INSTRUCTIONS FOR THE PREPARATION OF THE
REPORT OF SEMI-ANNUAL INSPECTION (SPRING/FALL) OF CWR TRACK

(FORM "CWR")

(a) A Report of Semi-Annual Inspection (Spring/Fall) of CWR Tack shall be filled out as required in Section 10.0. The report shall be completed by the Operating Railroad Employee making the inspection.

ATTACHMENT F

TORCH CUTTING RAIL (FIGURE/REMARKS)

(a) General: Cutting Continuous Welded Rail (CWR) In Compression:

(1) Cut rail with a torch any time the existing rail temperature is suspected of being above the Rail Neutral Temperature (RNT) and/or the rail is in tension.

(2) Rail in compression has many forms to include:

(i) Tight rail

(ii) Nervous/wavy rail

(iii) Kinky rail

(iv) Misaligned track

(v) Buckled track

(3) The area where the rail is in compression may exhibit the following characteristics:

(i) Rail is lifting out of the tie plates; or,

(ii) Rail is bunching and/or crowding shoulders of the tie plates; or,

(iii) Rail is moving longitudinally in anchors and/or elastic fasteners; or,

(iv) Ties are skewing; or,

(v) Crib and/or shoulder ballast is pushing due to longitudinal and/or lateral track movement; or,

(vi) There are numerous consecutive high spikes; or

(vii) The rail appears to be kinking; or

(viii) One rail appears to be straighter than the other opposite rail; or

(ix) There is noticeable variation in track gage.

(b) The Contractor and Operating Railroad shall have their own specific Safety Procedures developed for torch cutting rail.

(c) The Contractor and/or Operating Railroad shall designate personnel that are qualified and are trained on an annual basis to torch cut rail using the above Safety Procedures.

(d) Minimum Recommended Procedures When Torch Cutting CWR:

(1) Locate the area where the rail appears to be in compression; and

(2) If the track is already misaligned and/or buckled:

(i) Line track out at misalignment and/or buckle to reduce compressive stresses in the rail; and

(ii) Make cut away from misalignment and/or buckle area to make cut in an area of potentially reduced compressive forces.

(3) In all cases, make the torch cut, as shown below, before removing any spikes, lags or fasteners; and

(4) In all cases, make the torch cut, as shown below, before removing any joints and/ or anchors or elastic fasteners; and,

(5) In all cases, make the torch cut in the rail as described and shown below.

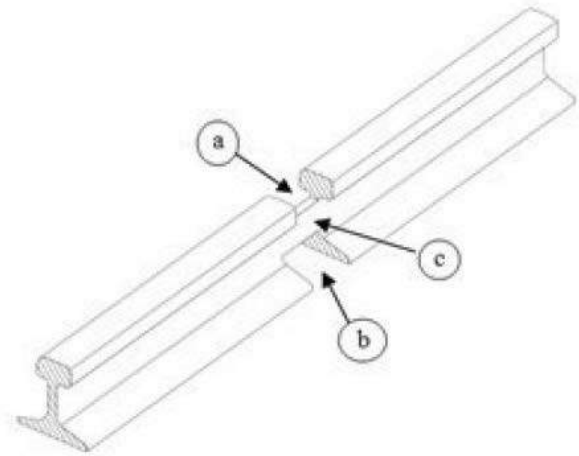
(e) Torch Cutting Rail In Compression: Use the so called “H” Pattern Method:

(1) First, cut and remove the rail head as shown in “a”; then

(2) Second, cut and remove both sides of the base as shown in “b”; then

(3) Third, cut and remove the remaining portion of the web from the top of the web near the rail head towards the base of the rail as shown in “c”.

(4) Note: Removing the rail head and then both sides of the rail base, before removing the web of the rail, is preferred, in order, if possible, to minimize excessive vertical and/or lateral movement of the rail when the rail is cut.



(f) After Torch Cutting Rail:

(1) If the rail that is torch cut is to be field welded and/or jointed:

(i) Trim or cut back the torch cut rail ends with a rail saw.

(ii) Remove all indication of the torch cut and/or heat affected zone which can be accomplished by:

- Cutting back a minimum of 2" behind the torch cut on each rail end (AREMA Chapter 4); and/or
- Cutting back the heat affected zone from behind the torch cut on each rail end;
- Use whichever cut back amount is larger.

(iii) Also see Attachment B, Paragraph (g) “Torch Cutting CWR in Track.”

APPENDIX B

UNDERBALANCE TABLES
MAXIMUM ALLOWABLE OPERATING SPEED ON CURVES

APPENDIX B

UNDERBALANCE TABLES
MAXIMUM ALLOWABLE OPERATING
SPEED ON CURVES

Page

Table 1 3" Underbalance Table..... B-1

Notes:

(a) The enclosed tables can be used to determine V_{max} in accordance with FRA §213.57.

(b) The Chief Engineer shall maintain a list of curves and the designated “underbalance” to be used.

(c) To operate at speeds which use “underbalance” greater than 3", the equipment must be qualified and approved by the Federal Railroad Administration.

(d) The Chief Engineer shall authorize all elevations in excess of 4".

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		0-0	0-1/4	0-1/2	0-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	80	83	86	89
0° 50'	0.83	71	74	77	80
1° 00'	1.00	65	68	70	73
1° 15'	1.25	58	60	63	65
1° 30'	1.50	53	55	57	59
1° 45'	1.75	49	51	53	55
2° 00'	2.00	46	48	50	51
2° 15'	2.25	43	45	47	48
2° 30'	2.50	41	43	44	46
2° 45'	2.75	39	41	42	44
3° 00'	3.00	37	39	40	42
3° 15'	3.25	36	37	39	40
3° 30'	3.50	34	36	37	39
3° 45'	3.75	33	35	36	37
4° 00'	4.00	32	34	35	36
4° 15'	4.25	31	33	34	35
4° 30'	4.50	30	32	33	34
4° 45'	4.75	30	31	32	33
5° 00'	5.00	29	30	31	32
5° 30'	5.50	27	29	30	31
6° 00'	6.00	26	27	28	29
6° 30'	6.50	25	26	27	28
7° 00'	7.00	24	25	26	27
7° 30'	7.50	23	24	25	26
8° 00'	8.00	23	24	25	25
8° 30'	8.50	22	23	24	25
9° 00'	9.00	21	22	23	24
9° 30'	9.50	21	22	22	23
10° 00'	10.00	20	21	22	23
10° 30'	10.50	20	21	21	22
11° 00'	11.00	19	20	21	22
11° 30'	11.50	19	20	20	21
12° 00'	12.00	18	19	20	21
12° 30'	12.50	18	19	20	20
13° 00'	13.00	18	18	19	20
13° 30'	13.50	17	18	19	19
14° 00'	14.00	17	18	18	19
14° 30'	14.50	17	17	18	19
15° 00'	15.00	16	17	18	18

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		1	1-1/4	1-1/2	1-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	82	85	87	90
1° 00'	1.00	75	77	80	82
1° 15'	1.25	67	69	71	73
1° 30'	1.50	61	63	65	67
1° 45'	1.75	57	58	60	62
2° 00'	2.00	53	55	56	58
2° 15'	2.25	50	51	53	54
2° 30'	2.50	47	49	50	52
2° 45'	2.75	45	46	48	49
3° 00'	3.00	43	44	46	47
3° 15'	3.25	41	43	44	45
3° 30'	3.50	40	41	42	44
3° 45'	3.75	39	40	41	42
4° 00'	4.00	37	38	40	41
4° 15'	4.25	36	37	38	39
4° 30'	4.50	35	36	37	38
4° 45'	4.75	34	35	36	37
5° 00'	5.00	33	34	35	36
5° 30'	5.50	32	33	34	35
6° 00'	6.00	30	31	32	33
6° 30'	6.50	29	30	31	32
7° 00'	7.00	28	29	30	31
7° 30'	7.50	27	28	29	30
8° 00'	8.00	26	27	28	29
8° 30'	8.50	25	26	27	28
9° 00'	9.00	25	25	26	27
9° 30'	9.50	24	25	26	26
10° 00'	10.00	23	24	25	26
10° 30'	10.50	23	24	24	25
11° 00'	11.00	22	23	24	24
11° 30'	11.50	22	22	23	24
12° 00'	12.00	21	22	23	23
12° 30'	12.50	21	22	22	23
13° 00'	13.00	20	21	22	22
13° 30'	13.50	20	21	21	22
14° 00'	14.00	20	20	21	22
14° 30'	14.50	19	20	21	21
15° 00'	15.00	19	20	20	21

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		2	2-1/4	2-1/2	2-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	90	90	90	90
1° 00'	1.00	84	86	88	90
1° 15'	1.25	75	77	79	81
1° 30'	1.50	69	70	72	74
1° 45'	1.75	63	65	67	68
2° 00'	2.00	59	61	62	64
2° 15'	2.25	56	57	59	60
2° 30'	2.50	53	54	56	57
2° 45'	2.75	50	52	53	54
3° 00'	3.00	48	50	51	52
3° 15'	3.25	46	48	49	50
3° 30'	3.50	45	46	47	48
3° 45'	3.75	43	44	45	46
4° 00'	4.00	42	43	44	45
4° 15'	4.25	40	42	42	43
4° 30'	4.50	39	40	41	42
4° 45'	4.75	38	39	40	41
5° 00'	5.00	37	38	39	40
5° 30'	5.50	36	36	37	38
6° 00'	6.00	34	35	36	37
6° 30'	6.50	33	33	34	35
7° 00'	7.00	31	32	33	34
7° 30'	7.50	30	31	32	33
8° 00'	8.00	29	30	31	32
8° 30'	8.50	28	29	30	31
9° 00'	9.00	28	28	29	30
9° 30'	9.50	27	28	28	29
10° 00'	10.00	26	27	28	28
10° 30'	10.50	26	26	27	27
11° 00'	11.00	25	26	26	27
11° 30'	11.50	24	25	26	26
12° 00'	12.00	24	25	25	26
12° 30'	12.50	23	24	25	25
13° 00'	13.00	23	24	24	25
13° 30'	13.50	23	23	24	24
14° 00'	14.00	22	23	23	24
14° 30'	14.50	22	22	23	23
15° 00'	15.00	21	22	22	23

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		3	3-1/4	3-1/2	3-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	90	90	90	90
1° 00'	1.00	90	90	90	90
1° 15'	1.25	82	84	86	87
1° 30'	1.50	75	77	78	80
1° 45'	1.75	69	71	72	74
2° 00'	2.00	65	66	68	69
2° 15'	2.25	61	62	64	65
2° 30'	2.50	58	59	60	62
2° 45'	2.75	55	56	58	59
3° 00'	3.00	53	54	55	56
3° 15'	3.25	51	52	53	54
3° 30'	3.50	49	50	51	52
3° 45'	3.75	47	48	49	50
4° 00'	4.00	46	47	48	49
4° 15'	4.25	44	45	46	47
4° 30'	4.50	43	44	45	46
4° 45'	4.75	42	43	44	45
5° 00'	5.00	41	42	43	43
5° 30'	5.50	39	40	41	41
6° 00'	6.00	37	38	39	40
6° 30'	6.50	36	37	37	38
7° 00'	7.00	34	35	36	37
7° 30'	7.50	33	34	35	35
8° 00'	8.00	32	33	34	34
8° 30'	8.50	31	32	33	33
9° 00'	9.00	30	31	32	32
9° 30'	9.50	30	30	31	31
10° 00'	10.00	29	29	30	31
10° 30'	10.50	28	29	29	30
11° 00'	11.00	27	28	29	29
11° 30'	11.50	27	27	28	28
12° 00'	12.00	26	27	27	28
12° 30'	12.50	26	26	27	27
13° 00'	13.00	25	26	26	27
13° 30'	13.50	25	25	26	26
14° 00'	14.00	24	25	25	26
14° 30'	14.50	24	24	25	25
15° 00'	15.00	23	24	24	25

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)			
		4	4-1/4	4-1/2	4-3/4
		Speed in Miles Per Hour (V_{max})			
0° 10'	0.17	90	90	90	90
0° 20'	0.33	90	90	90	90
0° 30'	0.50	90	90	90	90
0° 40'	0.67	90	90	90	90
0° 50'	0.83	90	90	90	90
1° 00'	1.00	90	90	90	90
1° 15'	1.25	89	90	90	90
1° 30'	1.50	81	83	84	85
1° 45'	1.75	75	76	78	79
2° 00'	2.00	70	71	73	74
2° 15'	2.25	66	67	69	70
2° 30'	2.50	63	64	65	66
2° 45'	2.75	60	61	62	63
3° 00'	3.00	57	58	59	60
3° 15'	3.25	55	56	57	58
3° 30'	3.50	53	54	55	56
3° 45'	3.75	51	52	53	54
4° 00'	4.00	50	50	51	52
4° 15'	4.25	48	49	50	51
4° 30'	4.50	47	47	48	49
4° 45'	4.75	45	46	47	48
5° 00'	5.00	44	45	46	47
5° 30'	5.50	42	43	44	44
6° 00'	6.00	40	41	42	42
6° 30'	6.50	39	39	40	41
7° 00'	7.00	37	38	39	39
7° 30'	7.50	36	37	37	38
8° 00'	8.00	35	35	36	37
8° 30'	8.50	34	34	35	36
9° 00'	9.00	33	33	34	35
9° 30'	9.50	32	33	33	34
10° 00'	10.00	31	32	32	33
10° 30'	10.50	30	31	31	32
11° 00'	11.00	30	30	31	31
11° 30'	11.50	29	30	30	31
12° 00'	12.00	28	29	29	30
12° 30'	12.50	28	28	29	29
13° 00'	13.00	27	28	28	29
13° 30'	13.50	27	27	28	28
14° 00'	14.00	26	27	27	28
14° 30'	14.50	26	26	27	27
15° 00'	15.00	25	26	26	27

[1] In degrees and minutes
[2] In decimals

Table 1.
Maximum Allowable Operating Speed on Curves
Underbalance = 3" (E_u)

Degree Curve (D)[1]	Degree Curve (D)[2]	Superelevation in inches (E_a)				
		5	5-1/4	5-1/2	5-3/4	6
		Speed in Miles Per Hour (V_{max})				
0° 10'	0.17	90	90	90	90	90
0° 20'	0.33	90	90	90	90	90
0° 30'	0.50	90	90	90	90	90
0° 40'	0.67	90	90	90	90	90
0° 50'	0.83	90	90	90	90	90
1° 00'	1.00	90	90	90	90	90
1° 15'	1.25	90	90	90	90	90
1° 30'	1.50	87	88	89	90	90
1° 45'	1.75	80	82	83	84	85
2° 00'	2.00	75	76	77	79	80
2° 15'	2.25	71	72	73	74	75
2° 30'	2.50	67	68	69	70	71
2° 45'	2.75	64	65	66	67	68
3° 00'	3.00	61	62	63	64	65
3° 15'	3.25	59	60	61	62	62
3° 30'	3.50	57	58	58	59	60
3° 45'	3.75	55	56	56	57	58
4° 00'	4.00	53	54	55	55	56
4° 15'	4.25	51	52	53	54	55
4° 30'	4.50	50	51	51	52	53
4° 45'	4.75	49	49	50	51	52
5° 00'	5.00	47	48	49	50	50
5° 30'	5.50	45	46	46	47	48
6° 00'	6.00	43	44	44	45	46
6° 30'	6.50	41	42	43	43	44
7° 00'	7.00	40	41	41	42	42
7° 30'	7.50	39	39	40	40	41
8° 00'	8.00	37	38	38	39	40
8° 30'	8.50	36	37	37	38	38
9° 00'	9.00	35	36	36	37	37
9° 30'	9.50	34	35	35	36	36
10° 00'	10.00	33	34	34	35	35
10° 30'	10.50	32	33	34	34	34
11° 00'	11.00	32	32	33	33	34
11° 30'	11.50	31	32	32	32	33
12° 00'	12.00	30	31	31	32	32
12° 30'	12.50	30	30	31	31	32
13° 00'	13.00	29	30	30	31	31
13° 30'	13.50	29	29	29	30	30
14° 00'	14.00	28	29	29	29	30
14° 30'	14.50	28	28	28	29	29
15° 00'	15.00	27	28	28	28	29

[1] In degrees and minutes
[2] In decimals

APPENDIX C

GLOSSARY

APPENDIX C

GLOSSARY

TABLE OF CONTENTS

Page

- A - C-1
Adjusting/De-stressing C-1
Alignment – General C-1
Alignment – Line C-1
Aggregate C-1

- B - C-1
Ballast C-1
Ballast Cleaning C-1
Ballast Section C-1
Ballast Shoulder C-1
Bar – Joint C-1
Batter – Rail C-1
Braking Force C-1
Bridge – Ballast Deck C-2
Bridge Timber C-2
Buckling Incident C-2

- C - C-2
Cant C-2
Clip C-2
Clip – Switch C-2
Closure Rail C-2
Coefficient of Thermal Expansion – Rail C-2
Compression C-2
Compromise Joint Bar C-2
Continuous Welded Rail (CWR) C-2
Crossing – At Grade (Highway) C-2
Crossing – At Grade (Track) C-2
Crosslevel C-3
Crossover C-3
Curvature – Degree of C-3
Curve – Compound C-3
Curve – Reverse C-3
Curve – Simple (Horizontal) C-3
Curve – Vertical C-3

- D - C-3
Derail C-3
Derailment C-3
Desired Rail Installation Temperature Range (DRTR) C-3
Deviation C-3
Disturbed Track C-3
Dynamic Train Loading C-3

- E - C-4
Elastic Rail Fastener C-4
Engine Burn C-4
Expansion Joint C-4

TABLE OF CONTENTS
(Continued)

Page

- F - C-4
Facing Point C-4
Federal Railroad Administration (FRA) C-4
Fishing Space C-4
Flangeway C-4
Flow of Metal (Rail) C-4
Fracture – Detail C-4
Frog C-4
Frog – 1/2" Point C-4
Frog – Railbound Manganese (RBM) C-4
Frog – Self-Guarded (SGM) C-4
Frog – Spring C-5
Frog – Theoretical Point C-5
Frog – Throat of C-5
Frogs – End C-5
Frog Angle C-5
Frog Number C-5

- G - C-5
Gage Line C-5
Gage of Track C-5
Gage Rod C-5
Gaging of Track C-5
Grade C-5
Grade Line C-5
Grade Rail C-5
Guard Rail – Frog C-5
Guard Rail – Inner Track C-6
Guard Rail – Outer Track C-6

- H - C-6
Head Block – Switch C-6
Head or No. 1 Rod C-6
Heel Block – Fixed C-6
Heel Block – Floating C-6
Heel Length – Frog C-6
Heel of Frog C-6
Heel of Switch C-6
Heel Spread – Frog C-6
Heel Spread – Switch C-6
Highway – Crossing Warning Devices (Active) C-6

- I - C-6
Interlockings C-6

- J - C-7
Joint Bar C-7
Joint Bar – Compromise C-7
Joint – Frozen C-7
Joint – Insulated C-7
Joints – Supported and Suspended C-7
Joint Tie C-7

TABLE OF CONTENTS
(Continued)

Page

- L - C-7
Latch – Switch Stand C-7
Lateral Acceleration C-7
Lateral Resistance C-7
Lead (Conventional) C-7
Lead – Theoretical (Tangential) C-7
Level Board C-7
Lift Rail C-8
Line C-8
Line Rail C-8
Lining Track C-8
Longitudinal Resistance C-8
L/V Ratio C-8

- M - C-8
Maximum Authorized Speed C-8
Mechanical Stabilization C-8
Middle Ordinate C-8
Miter Rail C-8
Moveable Bridge C-9

- N - C-9
Neutral Temperature C-9
Neutral Temperature Management C-9
Number – Turnout C-9

- O - C-9
Out-of-Face Surfacing or Lining C-9
Out-of-Face Tie Renewal C-9
Out-of-Face Undercutting C-9

- P - C-9
Post – Bumping C-9
Preferred Rail Laying Temperature (PRLT) C-9
Profile C-9

- R - C-9
Rail – High C-9
Rail – Low C-9
Rail – Nervous Track C-9
Rail – Scrap C-9
Rail Anchors C-10
Rail Bender C-10
Rail Bond C-10
Rail Brace C-10
Rail Brand C-10
Rail Fastening System C-10
Rail Joint – Pumping C-10
Rail Section C-10
Rail Stretcher Expander C-10
Rail Temperature C-10
Rail Weight C-10
Relay Material C-10

TABLE OF CONTENTS
(Continued)

Page

Roadbed C-10
Rod – Operating C-10
Running Rail C-11
Runoff – Curve C-11
Runoff – Surface C-11

- S - C-11
Scrap C-11
Screw – Lag C-11
Shim – Track C-11
Side Planning – Undercutting C-11
Spot Surfacing C-11
Spot Tie Renewal C-11
Stock Rail C-11
Stock Rail Bend C-11
Stringlining C-11
Sub-ballast C-11
Sub-grade C-12
Superelevation – Equilibrium C-12
Superelevation C-12
Switch C-12
Switch – Insulated C-12
Switch – Spiked/Clamped C-12
Switch – Throw of C-12
Switch Heater C-12
Switch Lock C-12
Switch Machine C-12
Switch Machine Rod Basket C-12
Switch Obstruction Test C-12
Switch Plate C-12
Switch Point C-13
Switch Point – Undercut C-13
Switch Point Guard C-13
Switch Point Lug (Clips) C-13
Switch Point with Graduated Risers C-13
Switch Point with Uniform Risers C-13
Switch Rod C-13
Switch Stand C-13
Switch Target C-13

- T - C-13
Tension C-13
Thimble (Insulated Joints) C-13
Throat of Frog C-13
Tie C-13
Tie – Centerbound C-13
Tie Plate C-14
Tie Plate – Twin C-14
Tie Plug C-14
Tie Spacing C-14
Toe End of Frog C-14
Toe Spread C-14
Track C-14
Track Buckling C-14

TABLE OF CONTENTS
(Continued)

Page

Track Lateral Resistance C-14
Track Longitudinal Resistance C-14
Track – Skeletonized C-14
Track Spike (Cut Spike) C-14
Track – Surface C-14
Tractive Force C-14
Trailing Point C-14
Train-induced Forces C-14
Transition Rail C-15
Transition Spiral C-15
Transpose Rail C-15
Turnout (TO) C-15
Turnout (Premium Design) C-15
Turnout – Conventional C-15

- U - C-15
Underbalance C-15

- W - C-15
Washer – Spring (Lock) C-15
Weld – Flash Butt C-15
Weld – Thermite C-15
Wheel Tread C-15
Wing Rail C-15

APPENDIX C

GLOSSARY

- A -

Adjusting/De-stressing
The procedure by which a rail's temperature is re-adjusted to the desired neutral temperature range. It typically consists of cutting the rail and removing rail anchoring devices, which provides for the necessary expansion, and then re-assembling the track.

Alignment – General
The physical appearance of the railroad as viewed from above, which consists of a series of straight lengths of track, referred to as tangents and spirals, connecting simple, compound or reverse curves.

Alignment-Line
The condition of track in regard to uniformity of direction over short distances on tangents and in curves.

Aggregate
The sand, gravel, broken stone or combinations thereof with which the cementing material is mixed to form a mortar or concrete. The fine material used to produce mortar for stone and brick masonry and for the mortar component of concrete is commonly termed "fine aggregate," while the coarse material used in concrete only is termed "course aggregate."

- B -

Ballast
Select material placed on the roadbed to support and hold track in line and surface. Ballast preferably consists of sized hard particles that distribute the load, drains well and maintains proper line and surface.

Ballast Cleaning
The process of separating contaminants from the ballast by shaking and then depositing stone back onto the track.

Ballast Section
The cross section of a track between and under the crossties and between the ballast shoulders.

Ballast Shoulder
The portion of ballast between the end of the tie and the bottom of the ballast slope. It distributes the traffic load over a greater width of roadway and helps hold the track in alignment by providing lateral resistance.

Bar - Joint
Bars that are used to physically connect two rail ends and ensure proper rail head and gage face alignment. Also called a joint bar.

Batter - Rail
Deformation of the surface of the rail head, usually close to the end of the rail, caused generally by wheel impact loads.

Braking Force
The longitudinal and lateral force induced into the rail as a result of the brake application of a train.

Bridge - Ballast Deck
A bridge with a solid floor provided with drains and covered with ballast to provide uniform support for track.

Bridge Timber
A sawed tie usually pre-framed on all four sides and of the size and length required for track on an open deck bridge.

Buckling Incident
The formation of a lateral misalignment sufficient in magnitude to cause a general instability of track which may constitute a deviation from Class requirements specified in §213.55 of Part I. These normally occur when rail temperatures are relatively high and are caused by high longitudinal compressive forces.

- C -

Cant
Tilt or inclination of the base of the rail. Canting of the rail is achieved with the use of a tie plate or rail seat designed to cant the rail inward towards the center-line of track and should be installed accordingly. Typical cant is 1:40.

Clip
An elastic fastener that is applied parallel or perpendicular to the base of the rail and replaces and eliminates the need for a cut spike and anchor. A clip can be used on wood or concrete ties.

Clip - Switch
The device by which the switch rod is joined to the switch points. It is normally connected to the switch points by bolts protected by cotter keys or pins. It sometimes has staggered bolt holes in the horizontal leg for making detailed adjustments in the positions of the switch points.

Closure Rail
The lead rails connecting the heel end of the switch with the toe ends of a frog.

Coefficient of Thermal Expansion – Rail
A multiplier based on the physical properties of rail steel used to calculate the change in rail length with change in temperature. The coefficient is 0.000078 when the length of the rail is in feet.

Compression
A uniform axial force within the rail caused by equal and opposite forces pushing at the ends of the rail.

Compromise Joint Bar
See Joint Bar – Compromise

Continuous Welded Rail (CWR)
Rail that has been welded together into lengths exceeding 400 feet. See Part I, §213.119.

Crossing – At Grade (Highway)
A crossing or intersection of a railroad and a highway at the same level or grade.

Crossing – At Grade (Track)
A structure, used where one track crosses another at grade, which consists of four connected frogs. Crossing angles can be defined as:

Low angle:	Up to and including 30°
Medium angle:	31° to 60°
High angle:	61° to 90°

Crosslevel
The difference in elevation between the rails at the same location.

Crossover
Two turnouts with the track connected at their frogs, arranged to form a passage between two nearby and generally parallel tracks.

Curvature - Degree of
A measure of the sharpness of a simple curve where a 1" offset at the mid-point of a 62' chord is equal to 1°.

Curve - Compound
A curve composed of two or more simple curves that are joined by easement spirals and that lead in the same general direction (i.e., to left or right, but each with different radii).

Curve - Reverse
A curve composed of two simple curves that are joined by a common tangent point or by a short tangent track which bear in opposite directions.

Curve - Simple (Horizontal)
A curve in the form of a circular arc that is bounded by two tangents. By definition these curves do not have spirals and may be found in yards and on secondary track.

Curve - Vertical
A curve in the profile of a track to connect intersecting grade lines and to permit safe and smooth operation of trains over summits and across sags.

- D -

Derail
A track device to guide rolling stock off the rails at a selected spot and divert the rolling stock away from the track that is being protected. Derails provide protection against collisions or side swipes. Derails are generally of three kinds: the “split switch,” the “sliding block,” and the “hinged block” type.

Derailment
Anytime a wheel of a car or engine comes off the head of the rail.

Desired Rail Installation Temperature Range (DRTR)
The rail temperature range, within a specific geographical area, at which forces in CWR should not cause a buckling incident in extreme heat, or a pull apart during extreme cold weather. Definition from FRA Part 213, §213.119(g).

Deviation
Difference between a design or published standard and actual measurement at any one location.

Disturbed Track
The disturbance of the roadbed or ballast section, as a result of track maintenance or any other event, which reduces the lateral and longitudinal resistance of the track.

Dynamic Train Loading
Vertical, horizontal and longitudinal forces that are imparted to the track structure during the passing of a train due to wheel action and vehicle response.

- E -

Elastic Rail Fastener
A rail hold down system that secures the running rail to wood or concrete ties and/or a concrete slab. The fastener uses rail clips and a base plate with or without resilient pads. This system provides lateral, longitudinal and vertical rail restraint during the passage of trains. (See additional information under “Rail Fastening System.”)

Engine Burn
Damage to the rail head metal caused by slipping or “spinning” powered wheels. Engine burn fracture is a rail break caused by an engine burn.

Expansion Joint
A device that allows thermal movement in rail to be relieved by allowing the rail on one side of the joint to freely expand and contract. Often installed on the approaches to moveable bridges so that thermal forces and movements in continuous welded rail adjacent to the bridge cannot be transferred into the bridge or the miter rail assembly, where it could jam and prevent needed movement.

- F -

Facing Point
A facing point move is one where the rail vehicle moves over the switch points and then the frog.

Federal Railroad Administration (FRA)
A government agency in the U.S. Department of Transportation.

Fishing Space
Space between the head and base of a rail occupied by a splice bar (angle bar, joint bar).

Flangeway
Measured space between running rail, guard rail, frog casting, frog wing rail and road crossing to provide clearance for passage of wheel flanges.

Flow of Metal (Rail)
Deformation of the top of the rail head on the crown of a rail toward the gage or field side. Common on the low side of a curve where trains run at less than balanced speed.

Fracture – Detail
A progressive transverse fracture originating in the head of a rail.

Frog
A device used where two running rails intersect, with flangeways to permit wheels and wheel flanges on either rail to cross one another.

Frog – 1/2" Point
The 1/2" point of frog is the point at which the spread between gage lines is 1/2". All measurements in the field are usually made from the 1/2" point of frog.

Frog – Railbound Manganese (RBM)
A frog assembly that consists of wing rails surrounding a manganese casting with a rigid frog point and flangeways. A conventional guard rail is used with this type of frog.

Frog – Self-Guarded (SGM)
A frog with a guard member for guiding the flange of a wheel past the point of frog by engaging the tread rim of the wheel in a horizontal plane above the top of the running surface of the frog. This makes a conventional guard rail unnecessary.

Frog – Spring
An appliance that contains, among other things, a fixed frog point, a moveable spring wing rail, a rigid wing rail, frog hold-down assemblies, and spring box. The frog makes use of a long guard rail (on the straight side). The spring frog design provides a continuous bearing surface for the wheel tread as it traverses through the frog point area on the straight side of the turnout.

Frog – Theoretical Point
The theoretical point of the intersection of the gage lines. The theoretical frog point is at a distance, in inches, ahead of the 1/2" point which is equal to one-half the frog number (i.e., number 10 frog is 5").

Frog – Throat of
Point at which the converging wings of a frog are closest together.

Frogs – End
The two frogs at the opposite ends of the long diagonal of a crossing or slip.

Frog Angle
Angle formed by intersecting gage lines of the rails in a frog.

Frog Number
The frog angle expressed as the number of units of centerline length in which the spread is one unit (i.e., 10:1 is a number 10 frog).

- G -

Gage Line
A line 5/8" below the running surface of a rail on the side of the head nearest the track center. The line from which measurements of gage are made.

Gage of Track
Distance between gage lines of rails laid in track.

Gage Rod
A device for holding track to correct gage, generally consisting of 1-1/4" rod with a forged jaw on one end and a malleable jaw on the other end, adjustable through a locknut. Sometimes consists of a rod made in two parts with a solid jaw on each end, united by a turnbuckle.

Gaging of Track
Bringing the rail heads of a track into their correct distance apart.

Grade
Rate of rise or fall of the grade line, expressed as a percentage of the feet of rise or fall per 100' of length. A steady rise or fall of 1' per 100' is a 1% grade.

Grade Line
The line representing top-of-rail elevations and the profile of the track.

Grade Rail
The rail first surfaced to track elevation; the line rail on tangents, the inner or low rail on curves.

Guard Rail - Frog
A rail section assembly used in a turnout with a railbound manganese (RBM) frog, spring rail frog, or in track crossings. The guard rail is designed to guide the wheel set through the proper flangeway of the frog. The guard rail prevents the wheel flange from wearing, striking or picking the frog point.

Guard Rail – Inner Track
An additional rail or rails laid parallel to and between the running rails of bridges, bridge approaches, and at other critical locations to prevent derailed equipment from striking a bridge or other structure and to keep the derailed wheels on the ties of the bridge.

Guard Rail – Outer Track
Additional timber laid parallel to the running rails of long-span viaducts.

- H -

Head Block - Switch
Ties used to support the switch-point operating mechanism (powered or unpowered) and the switch stand.

Head or No. 1 Rod
The switch rod nearest the point of a switch, usually placed between the two head block ties.

Heel Block - Fixed
A rigid heel block assembly at the switch heel to maintain the proper horizontal heel spread between the switch rail and stock rail. The heel block limits the amounts of longitudinal movement between the switch point and stock rail. The heel block is bolted to the switch rail and stock rail.

Heel Block - Floating
An assembly at the switch heel to maintain the proper horizontal heel spread between the switch rail and stock rail. If the assembly is bolted to the switch rail only, the switch heel "floats" and is called a floating heel block.

Heel Length - Frog
Distance between the heel end and half-inch point of a frog measured along gage lines.

Heel of Frog
The end of a frog farthest from the switch point.

Heel of Switch
The end of the switch where the switch point connects to the closure rails (see Heel Block – Fixed and Floating). The heel of the switch can be either fixed to the stock rail or allowed to float freely.

Heel Spread - Frog
Distance between gage lines at the heel end of a frog.

Heel Spread - Switch
The distance between the gage lines of the stock rail and switch rail at the heel of the switch.

Highway-Crossing Warning Devices (Active)
An arrangement of one or more highway-crossing signals, with or without gates at a highway grade crossing.

- I -

Interlockings
An arrangement of signals, switch locks, and signal appliances so interconnected that their movements succeed each other in a predetermined order. It may be operated manually or automatically.

- J -

Joint Bar
A steel angle bar or other shape used to fasten together the ends of rails in a track. They are used in pairs and are designed to fit the space between head and base of rail (fishing space) closely. They are held in place by track bolts. Also called angle bar, rail joint bar and splice bar.

Joint Bar – Compromise
A special rail joint, sometimes called a step joint, for joining rails of different sections. The joint is made so that it brings gage faces and rail heads into line so that a continuous smooth surface is present for the treads and flanges of passing wheels. The hand of a compromise joint is designated by standing in the gage of track at the small rail section looking or facing towards the heavier rail section to be joined or compromised. In this location in track, the right hand compromise joint is on the right and left hand is on the left. A compromise joint is described by indicating the heavier rail section and then the light rail section to be compromised (i.e., 136/115).

Joint – Frozen
A joint so tight that the rails cannot move within the joint bar as temperature varies.

Joint – Insulated
A rail joint designed to prevent the flow of electric current from rail to rail by means of insulation so placed as to separate the rail ends and other connecting metal parts at the joint.

Joints – Supported and Suspended
A supported rail joint has a tie directly under the rail ends. A suspended joint is one in which ends of the rail joint are not resting on a tie.

Joint Tie
A cross tie used under a rail joint.

- L -

Latch - Switch Stand
A device for catching and holding the lever of switch stand in position, also called a switch keeper. Two latches are used at each switch stand.

Lateral Acceleration
The horizontal acceleration experienced by a rail vehicle that is perpendicular to the direction of travel. Lateral acceleration is a measure of ride quality and measured in units of ft./sec^2(g).

Lateral Resistance
The ability of the track structure to remain in position under the influence of in-service forces that are generated in a plane perpendicular to the line of the rail. Lateral resistance is a product of interaction of the ballast with the sides, bottom and end face of the tie.

Lead (Conventional)
The length between the actual point of switch and the 1/2" point of frog, measured on the line of the straight track.

Lead – Theoretical (Tangential)
The length between the actual point of switch and the theoretical point of a moveable point frog, measured on the line of the straight track.

Level Board
A tool used to determine the cross-level or super elevation of a track.

Lift Rail
The portion of a miter rail assembly that is attached to the moveable span of a moveable bridge. Sometimes called the bridge rail or moveable rail.

Line
The condition of a track in regard to uniformity in direction over short distances on tangents or uniformity in variation in direction over short distances on curves.

Line Rail
The rail on which alignment is based; the east rail of tangent track running north and south, the north rail of tangent track running east and west, the outer rail on curves, or the outside rails in multiple track territory.

Lining Track
Shifting the track laterally to conform to an established alignment. Maintenance lining is ordinarily done during repairs. Lining is done to make the track conform to predetermined alignment.

Longitudinal Resistance
The ability of the track structure to remain in position under the influence of train and temperature forces that run parallel with the rail. Longitudinal resistance is a product of the interaction of the ballast, the tie, rail anchors, rail clips and other elastic fasteners.

L/V Ratio
The relationship of lateral force on the rail to the vertical force on the rail, which is produced by the wheel of railroad rolling stock, locomotives, work equipment and other equipment moving along the track.

- M -

Maximum Authorized Speed (MAS)
That maximum speed for a portion of track as specified in the current Employee's Timetable.

Mechanical Stabilization
A procedure used to restore lateral and longitudinal stability of disturbed track following maintenance operations. This procedure may incorporate dynamic track stabilizers which are units of work equipment that are used as a substitute for the action provided by the passage of tonnage trains.

Middle Ordinate
The distance measured from gage line of rail to the middle of a string drawn taut and held to contact with the gage line of rail at its end. The middle ordinate provides a means of measuring curvature. Can also be used in bending rails to a desired curvature.

Miter Rail
A rail assembly on a moveable bridge that spans the gap between the moveable span and the adjacent stationary portion of the bridge. The miter rail typically consists of two pieces. One rail is stationary or fixed and attached to the non-moving portion of the bridge and the second rail is attached to and moves with the moving portion of the bridge.

The term miter is used because typically the abutting ends of the two portions of the miter rail assembly, rather than being cut square as in a conventional rail joint, are cut at an acute angle or "mitered" relative to each other. The miter can provide the wheels with continuous support over the rail gap.

Because one rail must be able to move relative to the other when the bridge is being opened, the abutting ends of the miter rail assembly are not bolted to each other as in a conventional rail joint, but rather sit in bed plates that align one end of the miter rail relative to the other.

Moveable Bridge
Any bridge span over a navigable waterway that can be moved to accommodate the passage of vessels taller than the normal underclearance of the bridge.

- N -

Neutral Temperature
The temperature at which rail is secured in a stress-free condition.

Neutral Temperature Management (See Appendix A)
Maintaining the condition of the track structure so that the neutral temperature of the rail remains within the acceptable neutral temperature range.

Number - Turnout
The number corresponding to the number of the frog used in a turnout.

- O -

Out-of-Face Surfacing or Lining (See Appendix A)
The continuous surfacing and/or lining of a piece of track greater than 200' in length.

Out-of-Face Tie Renewal (See Appendix A)
Tie replacement at the rate of more than six (6) ties per 39' of rail. Not more than two (2) consecutive ties nor more than six (6) ties per 39' of rail can be replaced in any one pass.

Out-of-Face Undercutting (See Appendix A)
Undercutting of more than two (2) consecutive ties or more than six (6) ties in 39' of track.

- P -

Post – Bumping
A device at the end of stub track to prevent rolling stock from going off the ends of the rails.

Preferred Rail Laying Temperature (PRLT)
The desired temperature (i.e., 95ºF) at which continuous welded rail (CWR) is to be laid. The PRLT is region-specific and is the temperature at which there will be no stress in the CWR.

Profile
A longitudinal section through a track that shows elevation of the grade rails. The profile is usually obtained from levels taken on top of the rail.

- R -

Rail - High
The outer or elevated rail of a curved track, which is maintained as the line rail.

Rail - Low
The inner rail of a curve which is maintained as the grade rail.

Rail – Nervous Track
CWR which exhibits minute alignment irregularities which indicate that the rail is in a considerable amount of compression.

Rail - Scrap
Rails of standard section not fit for use as relayer rail.

Rail Anchors
Those devices which are attached to the base of the rail and bear against the side of the crosstie to control longitudinal rail movement. Certain types of rail fasteners also act as rail anchors and control longitudinal rail movement by exerting a downward clamping force on the upper surface of the rail base.

Rail Bender
A tool for bending stock rails.

Rail Bond
A device used to transfer an electric circuit across rail ends at a rail joint or discontinuity in the rail.

Rail Brace
A device used at switches, moveable-point frogs, guardrails, etc., in combination with switch, tie or gage plates, for holding rail in place in the plate and preventing lateral displacement.

Rail Brand
An identification mark, including manufacturer's name or initials, month and year the rail was rolled, manufacturer's identification label, weight per lineal yard, initials of section, number of the heat, portion of the ingot and process of manufacture.

Rail Fastening System
The hold-down appliances that provide the required combination of horizontal, lateral and vertical restraint to permit the safe operation of rail vehicles. Examples of conventional systems found include the cut spike and rail anchor. Examples of elastic fastening systems include the Pandrol "e" clip, fast clip with a pin (lock spike) or lag screw.

Rail Joint - Pumping
A poorly supported rail joint that has excessive up and down movement under the passage of trains.

Rail Section
The pattern of dimensional details of rail, such as width of base, height of rail, thickness of web, width and thickness of head, angle of head and angle of base. Each particular pattern is identified by a brand name or symbol, such as ASCE, AREA, ARA, PRR, PS, etc., in addition to its weight per yard.

Rail Stretcher Expander
A rail puller/expander operated by hand or by machine that is used to increase or decrease the gap between adjoining rail ends.

Rail Temperature
The temperature of the rail, measured with a rail thermometer on the shaded side of the web.

Rail Weight
The weight of a three (3) foot-long section of rail expressed in pounds per yard.

Relay Material
Useable secondhand rail, ties or other track material (OTM).

Roadbed
The finished sub-grade surface upon which the track and ballast rest.

Rod - Operating
A rod attached to a switch, derail, or other device, for moving it from one position to another. The operating or throw rod can be reset to adjust the amount of throw occurring at the switch.

Running Rail
The rail or surface on which the wheel bears.

Runoff - Curve
The change in superelevation in the spiral/easement from the full body of a curve to tangent or between compound curves.

Runoff - Surface
An area of grade change in track where the raised portion of a track is connected with the existing grade. The runoff between the two elevations is made along the two rails at a designated rate of change per 31' station for comfort and safety.

- S -

Scrap
Rail, ties or other track materials (OTM) that are not suitable for reuse.

Screw - Lag
A cylindrical threaded steel spike with a square head designed to be turned with a special appliance into holes bored into ties.

Shim - Track
A bearing piece, usually wood or metal of various thickness, at least equal to the width and length of the tie plate, for temporary use between the tie plate and ties to raise (surface) the rail to a desired relative elevation. Usually used to spot surface a track when the roadbed is frozen and the ties cannot be tamped and surfaced.

Side Planing - Undercutting
Cuts made on sides of the head of the switch rail to form a taper from the full width of the head to the switch point. Also used in a stock rail to match undercut switch points.

Spot Surfacing (See Appendix A)
Surfacing a piece of track up to 200' in length.

Spot Tie Renewal (See Appendix A)
The installation of six (6) or less ties per 39' of rail with no more than two adjacent ties replaced in a row. The new ties must be promptly tamped and the ballast properly dressed.

Stock Rail
The two running rails that support the operation of the switch points. The straight stock rail is on the straight side of a lateral turnout The bent stock rail or curved rail is on the diverging side of the turnout. The switch points fit securely against or are undercut into the stock rail to permit the transfer of wheel load from the stock rail to the switch point. An equilateral turnout has two straight stock rails.

Stock Rail Bend
The bend or set that must be given the stock rail to allow the switch point to follow the gage line through the turnout. Usually, the stock rail on the diverging side of a turnout is bent. The opposite stock rail is straight .

Stringlining
A method for determining the alignment of a curve, by measuring mid-ordinates to the outer rail with string and paddles.

Sub-ballast
Any approved granular material which is placed between the ballast and finished sub-grade of the roadbed, to provide distribution of the load to the roadbed, better drainage, and prevent upheaval of the sub-grade by frost.

Sub-grade
The top of natural materials, gravel or crushed rock, usually inferior to ballast or sub-ballast, placed in fills or at the bottom of cuts that lie directly below the sub-ballast and ballast.

Superelevation – Equilibrium
The elevation of the outer rail which balances the centrifugal forces while negotiating a curve at a given design speed.

Superelevation
The height at which the outer rail is raised above the inner or grade rail on curves to resist the centrifugal force of moving trains.

Switch
A connection between two lines of track to permit flange wheeled rail vehicles to pass from one track to another.

Switch – Insulated
A switch in which the fixtures, principally the gage plates and the switch rods connecting one rail to the other, are provided with insulation so that electric currents will not be shunted.

Switch – Spiked/Clamped
A switch point that is secured in one position through the use of spikes, blocks and clamps.

Switch – Throw of
The distance measured between the switch point and stock rail at the point of switch.

Switch Heater
A device for melting snow with heat generated by an electric current, gas or propane. This device enables a switch which is so equipped to be thrown in inclement weather when there are accumulations of sleet, ice or snow.

Switch Lock
A fastener, usually a spring padlock used to secure the switch or derail stand in place.

Switch Machine
The signal appliance that powers and provides for the positive movement and locking of the switch points and/or moveable point frog to permit the safe, uninterrupted movement of rail vehicles through a turnout.

Switch Machine Rod Basket
The appliance that connects the operating rod to the No. 1 tie rod in the switch or to the frog point lug of a moveable point frog

Switch Obstruction Test
This test is used as part of the criteria to determine if the switch points in signal territory are properly fitting up against the straight and bent stock rails or if the moveable point of a moveable point frog fits against the moveable point frog housing. This test ensures that the proper signal indication is being conveyed as the points move and are seated.

Switch Plate
A special metal tie plate for use on switch ties, each plate being long enough to extend not only under the stock rail and its supporting braces, but also under the switch point in the open position. Switch plates are furnished in sets to correspond with switch length. There are two plates to each tie. However, at the point of switch and at helper locations, the two plates may be replaced by a gage plate(s) that carries both switch points. A type of high-profile switch plate used in some turnouts which contain two elastic clips to secure the stock rail to the switch plate.

Switch Point
The moveable rail of a switch which determines the direction of train movement.

Switch Point – Undercut
A switch point that is planed on the field side to fit securely against an undercut stock rail.

Switch Point Guard
A structure made of rail or manganese steel secured to the field side of the running rail at the point of switch, with suitable flares to engage the tread rims of wheels and guide the wheel past the switch point. This appliance is intended to reduce or eliminate switch point contact and wear. This appliance is to be used where operating speeds are 15 mph and less.

Switch Point Lug (Clips)
The lug attached to a switch point, to which the front rod is connected.

Switch Point with Graduated Risers
A switch in which the switch points are gradually elevated by means of graduated riser plates, until they reach the required height above a stock rail and sloping back to zero at the fixed heel block.

Switch Point with Uniform Risers
A switch in which the switch points have a uniform elevation on riser plates for the entire length of the switch, and therefore do not have a heel slope. The switch point rail rise is run off in back of the floating heel block.

Switch Rod
The rods that connect the left hand and right hand switch point to ensure proper gage, alignment and adjustment throughout the switch.

Switch Stand
A manually operated device by which a switch is thrown, locked, and its position indicated. It consists essentially of a base, spindle, lever, connecting rod and target.

Switch Target
A signal placed adjacent to or fixed on the spindle of a switch stand with reflective materials indicating the position of the switch.

- T -

Tension
An axial force caused by equal and opposite forces pulling at the ends of the rail.

Thimble (Insulated Joints)
The cylindrical pieces of an insulating joint that surround portions of the bolts.

Throat of Frog
The point at which the converging wing rails of a frog are close together just ahead of frog point.

Tie
A transverse support to which rails are fastened to keep them in line, gage and grade. Usually wooden or concrete.

Tie - Centerbound
Ballast condition where an unusually large percentage of the wheel load is carried at the center of the tie. This is an undesirable situation as compacted ballast under the rail seats should carry the load.

Tie Plate
A metal plate at least 6" wide and long enough to provide a safe bearing area on the tie, with a shoulder to restrain lateral movements of the rail.

Tie Plate - Twin
A tie plate in two parts that mate to form a combined width equal to that of the stand tie plate, for use back of the heel of switch to the point where standard tie plates may be applied.

Tie Plug
A wooden plug driven in to fill an unused spike hole or lag hole in a tie, to exclude moisture, prevent decay, and provide solid wood for re-driving of the spike. Usually supplied in the form of sticks containing several plugs.

Tie Spacing
The distances between tie centers in track or turnouts.

Toe End of Frog
The end of a frog nearest the switch.

Toe Spread
The distance between gage lines at the toe end of the frog.

Track
The rail, ties, rail fastenings, hardware and roadbed between points not less than 4' outside of each rail.

Track Buckling
The sudden formation of large lateral misalignments caused by high compressive forces, in the presence of some other influencing factors.

Track Lateral Resistance
The resistance provided to the rail/crosstie structure against lateral displacement.

Track Longitudinal Resistance
The resistance provided by the rail anchors/rail fasteners and the ballast section to the rail/crosstie structure against longitudinal displacement.

Track - Skeletonized
Track with ballast removed from the cribs between ties.

Track Spike (Cut Spike)
A rectangular metal fastener with an elliptical head designed to secure tie plates and/or rail to wood ties and timber.

Track - Surface
The condition of the track structure as to vertical evenness or smoothness.

Tractive Force
The longitudinal force induced into the rail as a result of the tractive effort exerted by the powered axles of rail vehicles.

Trailing Point
A trailing point move would pass over the frog and then the switch points.

Train-induced Forces
The vertical, longitudinal and lateral dynamic forces which are generated during train movement.

Transition Rail
A rail that joins two rails of different sections. It consists of two different rails flash butt welded to a middle forged section of rail. This rail is used in place of compromise bars.

Transition Spiral
An easement curve from the tangent to the curve.

Transpose Rail
Changing rail from one side to the other on curves because of headwear.

Turnout (TO)
An arrangement of a switch and a frog with closure rails, by which rolling stock can be diverted from one track to another.

Turnout (Premium Design)
A turnout that contains premium materials such as fully heat treated rail with elastic fasteners on wood and/or concrete ties. The design of premium turnouts may incorporate such things as tangential geometry, asymmetrical switch points and moveable point frogs or spring frogs.

Turnout – Conventional
A turnout whose transition from tangent to curve is abrupt because of alignment changes between the switch point and frog. These turnouts are usually constructed on wood ties, but can also be constructed on concrete ties. These turnouts usually have a “tee” rail switch point section and a self-guarded manganese (SGM) frog or railbound manganese (RBM) frog.

- U -

Underbalance
The difference between the actual superelevation and the amount of superelevation calculated for equilibrium conditions. Design underbalance on the MassDOT operated railroads is 1-1/2".

- W -

Washer – Spring (Lock)
A spring tensioned member designed to prevent movement of a nut and the loosening of a bolted member due to wear, stretch or other deterioration.

Weld – Flash Butt
A butt weld joining two abutting rails. This weld serves to join the rail ends using only parent materials. Electric flash_butt rail welding is accomplished with a stationary or portable electrical plant.

Weld - Thermite
A weld joining two abutting rails. The weld serves to unite the abutting rails with the introduction of metal weldment into a preset gap. This is an alumnothermic process that is accomplished by using weld kits..

Wheel Tread
The flat or tapered surface of a railway wheel that contacts the top surface of the rail head.

Wing Rail
The left and right rails that are run from the toe to the flared end of a moveable point frog, railbound manganese frog (RBM) or spring frog.

APPENDIX D

PLACEMENT OF TEMPORARY SPEED SIGNS

APPENDIX D

PLACEMENT OF TEMPORARY SPEED SIGNS

1.0 TEMPORARY SPEED RESTRICTION

(a) Protection shall be provided for any track that is considered not satisfactory for the passage of trains at maximum authorized speed, including placing an appropriate temporary speed restriction and notification to the Train Dispatcher.

(b) Portions of Tracks, on which temporary speed restrictions have been placed, are to be marked by placing a reflectorized Advanced Speed Limit sign, and Speed Limit and Resume Speed signs to the right of each track for both directions of traffic.

  (1) The general arrangement, details of construction and assembly, height and distance from the track, of signs, shall be as shown on the following plans.

  (2) Signs are to be placed so as to give the greatest practical unobstructed view considering alignment and other local physical conditions. Reflecting surfaces of signs must be kept clean to preserve their reflecting ability.

  (3) Speed Limit and Resume Speed signs are to be placed with the Speed Limit sign at the point where the actual restriction begins and the Resume Speed sign at the point where it ends.

  (4) Advanced Speed Limit signs, with numerals indicating the speed restriction, are to be placed far enough ahead of the Speed Limit signs in the direction from which trains are approaching to permit trains to reduce from normal speed to the speed permitted by the restriction.

(c) When a condition arises requiring a speed restriction, the following must be done:

  (1) Notification must be given to the dispatcher governing movement on the track where restriction is required.

  (2) Notification must be given to Track Supervisor.

  (3) Notification must include:

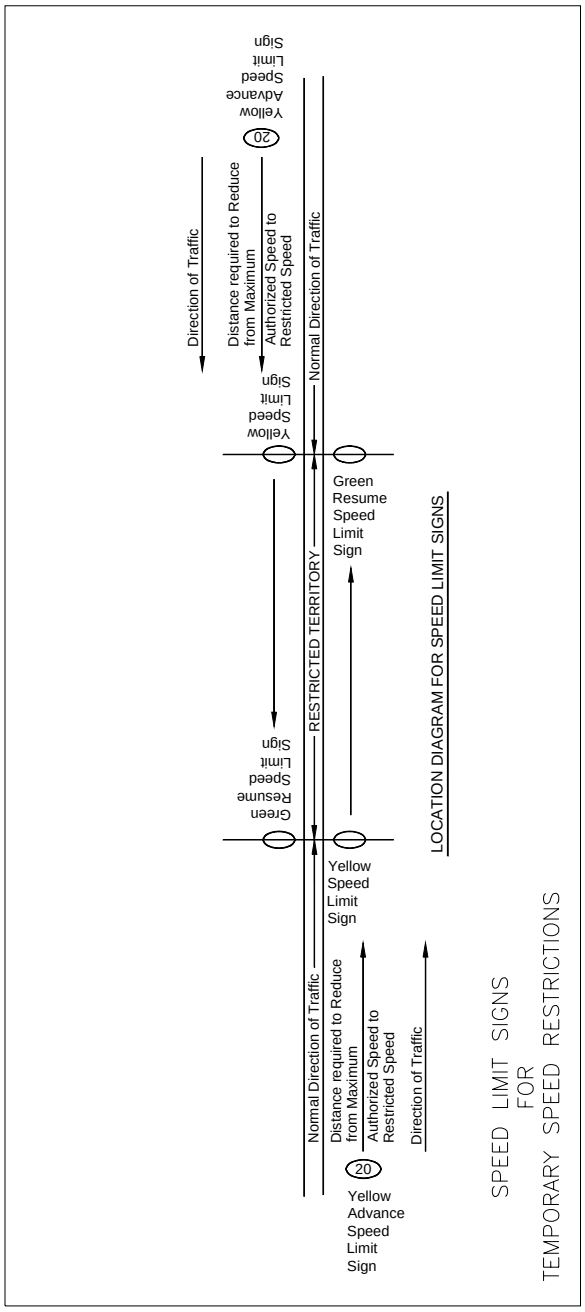
    (i) Limits of restriction by milepost station.

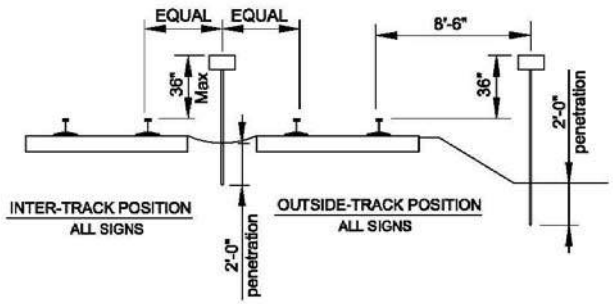
    (ii) Speed to which track is restricted.

    (iii) Reason for restriction.

    (iv) Action being taken to correct condition.

  (4) Immediate action must be initiated to remove restriction.


SPEED LIMIT SIGNS
FOR
TEMPORARY SPEED RESTRICTIONS
LOCATION DIAGRAM FOR SPEED LIMIT SIGNS
Yellow Advance Speed Limit Sign
20
Distance required to Reduce from Maximum Authorized Speed to Restricted Speed
Direction of Traffic
Normal Direction of Traffic
RESTRICTED TERRITORY
Yellow Speed Limit Sign
Green Resume Speed Limit Sign
Green Resume Speed Limit Sign
Yellow Speed Limit Sign
Distance required to Reduce from Maximum Authorized Speed to Restricted Speed
20
Yellow Advance Speed Limit Sign
Direction of Traffic
Normal Direction of Traffic



SPEED LIMIT SIGNS
FOR
TEMPORARY SPEED RESTRICTIONS

Note:
Where local conditions make it desirable, the Resume Speed Sign and The Speed Limit Sign may be mounted back to back on the same support

Temporary Speed Limit Signs

Advance Speed Limit sign with numerals indicating restricted speed shall be placed a sufficient distance in advance of restricted territory to permit a train to reduce from maximum authorized speed to the restricted speed.

Speed Limit sign shall be placed to mark the entrance to the restricted territory.

Resume Speed sign shall be placed to mark the end of restricted territory. When entire train has passed this point, speed may be resumed.

Advance Speed Limit sign shall have background of Flat Top Yellow Scotchlite. Superimposed on the yellow background shall be 7" high x 11-1/2" wide black numerals showing speed permitted over restricted territory. Numerals shall be furnished in multiples of 10 miles per hour.

Speed Limit sign shall have background of Flat Top Yellow Scotchlite.

Resume Speed sign shall have background of Flat Top Green Scotchlite.

(d) Marking of Temporary Speed Restrictions:

(1) Where it is anticipated that restriction will be of other than the most temporary nature, reflectorized slow boards will be used.

(2) Information concerning slow orders:

(i) Will be communicated to train and engine service personnel by train order or general notice.

(ii) Limits of slow orders in train order or general notice must be consistent with placement of slow boards on the ground, and order must so state.

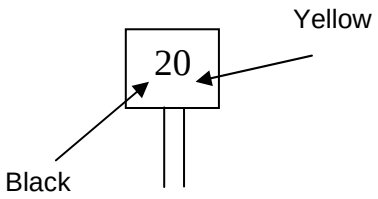
(iii) Where slow order is of short duration and is issued on train order, slow boards need not be displayed.

(3) Slow board placement:

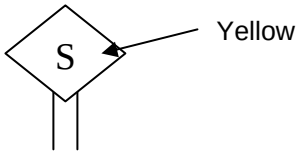
(i) Slow boards will be of reflectorized material, clean and in good repair.

(ii) They will be located to the right of and adjacent to the track protected, where they are unobstructed and can be clearly seen.

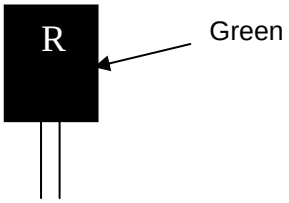
(iii) Advance Speed Limit Sign – a yellow sign with the speed to which trains are restricted displayed thereon in black numerals will be placed ahead of the point of restriction to allow a train moving at maximum authorized speed to reduce to the restricted speed at the point of restriction.



(iv) Yellow Speed Limit Sign – placed at the point at which restriction begins:



(v) Green Resume Sign – placed at the point at which restriction ends:



APPENDIX E

WEIGHTS AND MEASURES

This page intentionally left blank

APPENDIX E

WEIGHTS AND MEASURES

1. Tie Plates E-1
2. Joint Bars E-1
3. Ballast E-2
4. Fasteners E-2
5. Ties and Timbers E-2
6. Bonded Joints and Rails E-3
   6.a Bonded Insulated Rail Joints E-3
   6.b Rails E-3
7. Turnout Panels E-4
   7.a Conventional No. 8 on Wood Ties E-4
   7.b Conventional No. 10 on Wood Ties E-4
   7.c Conventional No. 15 on Wood Ties E-4
   7.d Conventional No. 20 on Wood Ties E-4
8. Hook Flange Guard Rails E-5
9. Railbound Manganese Frogs E-5
10. Diamond Track Crossings E-5
11a. AREMA Switch Rails (115-119 RE) E-6
11b. AREMA Switch Rails (136 RE) E-6
12. Wood-Tie Track Panels E-6
13. Highway Grade Crossings – Concrete E-7
14. Highway Grade Crossings – Rubber E-7
15. Decimals of an Inch E-8

This page intentionally left blank

APPENDIX E

WEIGHTS AND MEASURES

The weights contained in these tables are for informational purposes only. Before moving and handling materials, the weights should be ascertained by contacting the appropriate manufacturer and/or supplier.

1. TIE PLATES

Tie Plate Description Conventional	Length of Plate	Width of Plate	Rail Base	Approximate Weight (lbs)
SSC(1)	10"	7-1/2"	4-7/16" to 5-1/8"	11.3
SSC	11"	7-1/2"	5-1/8" to 5-1/2"	13.1
DSC(2)	12"	7-3/4"	5-3/8"	16.2
DSC	11"	7-3/4"	5-1/2"	13.6
DSC	12"	7-3/4"	5-1/2"	16.2
DSC	13"	7-3/4"	5-1/2"	19.9
DSC	14"	7-3/4"	5-1/2"	23.3
Pandrol	15-1/8"	7-3/4"	5-1/2"	23.5
Pandrol	15-3/4"	7-3/4"	6"	24.5

Notes:
(1) Single Shoulder Canted
(2) Double Shoulder Canted

2. JOINT BARS(1)

Rail Section	Length of Bar	Approximate Weight Per Single Bar (lbs)
115/119 RE	36"	46.9
136 RE	36"	55.2

Note:
(1) If handling compromise bars, use the heavier rail weight section for the estimate of the bar weight.

3. BALLAST

	Average Weight Per Cubic Foot		Average Weight Per Cubic Yard	
Type of Ballast	**Loose (lbs)**	**Compacted (1bs)**	**Loose (1bs)**	**Compacted (lbs)**
Granite	88	98	2,375	2,650
Trap Rock	104	114	2,800	3,075

4. FASTENERS

Type	Approximate Weight (lbs)
Fast Clips (Bag of 50)	75
“e” Clips (Bag of 50)	88
Track Bolts (including Keg) (1" x 5-1/2")	210
Track Spikes (including Keg)	210
Lag Screws (Bag of 100)	110
115/119 RE Rail Anchors (Bag of 50)	125
136 RE Rail Anchors (Bag of 50)	150

5. TIES AND TIMBERS

Type	Size	Approximate Weight (lbs)
Wood Cross Tie Red or White Oak	7"x 9" x 8'-6"	246
Concrete Cross Tie	8'-6"	780
Concrete Switch Tie	9' to 16'	105 lbs/ linear foot
Wood Switch Timber (7"x 9" x Length) Total Tie Weight	9' 10' 11' 12' 13' 14' 15' 16' 21' 22'	260 289 318 347 376 405 434 462 607 636

6.0 BONDED JOINTS AND RAILS

6.a BONDED INSULATED RAIL JOINTS

Rail Size	Rail Length	Approximate Total Weight (lbs)
115 RE	19'-6"	860
115 RE	26’	1,110
115 RE	39'	1,490
136 RE	19'-6"	995
136 RE	26'	1,290
136 RE	39'	1,880

6.b RAILS

Rail Size	Calculated Weight Per Yard (lbs)	Approximate Weight (lbs)
100 NH @ 33'	100.00	1,100
107 NH @ 39'	107.00	1,391
115 RE @ 39'	114.75	1,492
136 RE @ 39'	135.80	1,766

7.0 TURNOUT PANELS

7.a TURNOUT PANELS – Conventional No. 8 on Wood Ties

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	39'	7.5
Frog Panel	39'	9.2

7.b TURNOUT PANELS – Conventional No. 10 on Wood Ties

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	39'	7.5
Frog Panel	39'	10.8

7.c TURNOUT PANELS – Conventional No. 15 on Wood Ties (26' Curved Switch)

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	66'	11.5
Frog Panel	52'	15.0

7.d TURNOUT PANELS – Conventional No. 20 on Wood Ties (39' Curved Switch)

(136 RE)	Panel Length	Approximate Panel Weight (tons)
Nose Panel	70'	14.0
Frog Panel	44'	13.9

8. HOOK FLANGE GUARD RAILS

Length (136 RE)	Approximate Weight	
	(lbs)	(tons)
9'	950	0.5
13'	1,350	0.8
20'	2,100	1.1
27'	2,800	1.5

9. RAILBOUND MANGANESE FROGS[(1)]

Turnout No.	Length	Approximate Weight	
		(lbs)	(tons)
8	18'	4,025	2.1
10	23'	5,025	2.6
15	26'-8"	5,625	2.9
20	34'-2"	6,925	3.5

Note:
(1) Approximate weights are for maintenance frogs with extended wing rails.

10. DIAMOND TRACK CROSSINGS

3 Rail	Approximate Weight	
	(lbs)	(tons)
High Angle Crossing (Ties Not Included)	14,000	7.0
Low Angle Crossing (Ties Not Included)	18,000	9.0

11a. AREMA SWITCH RAILS (115-119 RE)

Turnout No.	Stock Rail			Split Switch Point		
	Length	Approximate Weight		Length	Approximate Weight	
		(lbs)	(tons)		(lbs)	(tons)
10	27'-0"	1071	0.55	16'-6"	655	0.35
15	38'-0"	1,507	0.75	26'-0"	1,031	0.55
20	59'-6"	2,360	1.2	39'-0"	1,547	0.78

11b. AREMA SWITCH RAILS (136 RE)

Turnout No.	Stock Rail			Split Switch Point		
	Length	Approximate Weight		Length	Approximate Weight	
		(lbs)	(tons)		(lbs)	(tons)
10	27'-0"	1,223	0.62	16'-6"	748	0.38
15	38'-0"	1,721	0.87	26'-0"	1,177	0.59
20	59'-6"	2,695	1.35	39'-0"	1,767	0.89

12. WOOD-TIE TRACK PANELS

(136 RE)	Approximate Weight (tons)
39' Panel Length[(1)] (w/o 3rd rail ties)	4.5
39' Panel Length[(1)] (with 3rd rail ties)	4.6

Note:
(1) Pandrol plates 6" base and 21-1/4" tie spacing

13. HIGHWAY GRADE CROSSINGS – CONCRETE

Std. Track Panel[(1)] (lbs/track foot)	Crossing Track Panel[(2,4)] (lbs/track foot)	Concrete Gage Crossing Module[(3,4)] (lbs/track foot)	Concrete Field Modules[(3,4)] (lbs/track foot)
490.5	629.1	458	247

Notes:

(1) Concrete ties 8'6" long, spaced at 24" o.c. with Pandrol fasteners including galvanized e-clips, and 136 RE CWR.
(2) Concrete ties 10'0" long, spaced at 24" o.c. with Pandrol fasteners including galvanized e-clips and 136 RE CWR.
(3) Concrete crossing modules (available 8' or 12' lengths) for gage of track or field side.
(4) Total approximate weight per track foot is the crossing panel weight, the gage crossing module weight and two (2) times the field module weight.

14. HIGHWAY GRADE CROSSINGS – RUBBER

Shipping Weight Average per Skid (lbs)	Full Depth Heavy Duty Rubber Gage Crossing Pad[(1,3)] (each)	Full Depth Heavy Duty Rubber Field Crossing Pad[(2,3)] (each)
3,111	595	224

Notes:

(1) Rubber gage pad 3' length x 58-1/2" width x 8-1/4" depth for 136 RE rail.
(2) Rubber field pad 3' length x 22" width x 8-1/4" depth for 136 RE rail.
(3) Total approximate weight per track foot is the crossing panel weight, the gage crossing module weight and two (2) times the field module weight.

15. DECIMALS OF AN INCH

Fraction (inches)	Decimal (inches)
1/32	0.03125
1/16	0.06250
3/32	0.09375
1/8	0.12500
5/32	0.15625
3/16	0.18750
7/32	0.21875
1/4	0.25000
9/32	0.28125
5/16	0.31250
11/32	0.34375
3/8	0.37500
13/32	0.40625
7/16	0.43750
15/32	0.46875
1/2	0.50000
17/32	0.53125
9/16	0.56250
19/31	0.59375
5/8	0.62500
21/32	0.65625
11/16	0.68750
23/32	0.71875
3/4	0.75000
25/32	0.78125
13/16	0.81250
27/32	0.84375
7/8	0.87500
29/32	0.90625
15/16	0.93750
31/32	0.96875
1	1.00000

APPENDIX F

FORMS

This page intentionally left blank

APPENDIX F

FORMS

These forms are typical forms used in the inspection of maintenance of track and special track work by the MassDOT Rail and Transit Division.

This page intentionally left blank

RAIL DEFECT INSPECTION REPORT

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Operating Railroad Name: _____ Date of Inspection: _____

Detector Car Operator Name: _____

Route Tested: _____ Track _____ MP _____ to MP _____

Inspection Company: _____ Track _____ MP _____ to MP _____

Detector Car #: _____ Track _____ MP _____ to MP _____

Detector Car Defect Number	Defect Type	Defect Size	Track Number	Mile Post	Immediate Corrective Action	Date	Final Corrective Action	Date

To be signed and submitted after all final active correction is complete:

*Operating Railroad Supervisor's Name: _____ Date: _____

*Operating Railroad Supervisor's Signature: _____

*NOTE: Operating Railroad Supervisor is the Railroad Supervisor riding the detector car.

This page intentionally left blank

SPECIAL TRACK INSPECTION REPORT

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Name of Operating Railroad:			
Date Inspection Made:		Line Segment:	
Reason for Inspection:		Weather:	Temperature:
Location		Conditions Noted / Repairs Made	
Track Name/No.	M.P. – M.P.		
Deficiencies/Defects Found		Corrective Action Taken	
Operating Railroad Inspector's Name: (Print)			
Operating Railroad Inspector's Signature:			

This page intentionally left blank

RAIL FAILURE REPORT

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

Name of Operating Railroad:			
Date Discovered:		**Date Repaired:**	
Line Segment:	**MP:**	**Track:**	**Rail:** N / S / E / W
Defect Location:			
Rail: Tangent	**Curve:** High Rail Low Rail	Degree of curve:	
Notes:			
Special Work Type:	**MP:**	**Turnout Name:**	
Notes:			
Detector Car Defect: No Yes		**Defect No:**	
Type of Defect:		**Size of Defect:**	
Service Failure Defect: No Yes	**Type:**	**Found by:**	
Type of Rail: Jointed CWR			
Rail Weight:	**Rail Section:**	**Manufacturer:**	
Year Rolled:	**Month Rolled:**		
Type of Weld: Field Plant		**Joint Bars to Weld:** No Yes	
Rail Information:			
Temporary Speed Restriction (TSR): No Yes _____ MPH			
Defective Glued Plugged Rail: No Yes Length _____			
CWR Plug Rail Installed: No Yes Length _____		**Plug Rail Number:** _____ - _____ - _____	
Boxed Anchored 200' from Joints: No Yes		**Form "TD" Required:** No Yes	
Rail Temperature when Anchoring:			
To be signed and submitted after all final active correction is complete:			
Operating Railroad Supervisor's Name: (Print)			
Operating Railroad Supervisor's Signature:		**Date:**	

This page intentionally left blank

CWR RAIL EXPANSION/HEAT RECORD REPORT

Operating Railroad/Contractor:		Weather:
Line Segment:	MP:	Track:

Date	Track Name/No.	Rail (N,S,E,W)	String Number	Start MP	End MP	Rail Temp. (°F)[1]	Req'd Temp. Change (°F)[2]	String Length (Feet)	Required Expansion (Inches)[3]	Installation Temp. Achieved (°F)	String Vibrated (Y/N)	Actual Expansion Recorded (Inches) Obtained at 1/4 Points[4]			
												1/4	1/2	3/4	Full

Notes:
(1) Temperature to be measured with approved rail thermometer.
(2) Required temperature change in °F is preferred rail neutral temperature of 110°F (RNT) minus the actual rail temperature at the time of expansion.
(3) See formula and table on reverse side of form.
(4) After string is anchored and/or clipped.

Operating Railroad Foreman's Signature: _____ **Date:** _____

Operating Railroad Foreman's Name (Print): _____

Formula for Coefficient of Linear Expansion of Rail:

$A = 0.000078 \times (T_D - T_E) \times L$

- A = Adjustment or Required Expansion amount of rail string (in inches)
- T_D = Desired Rail Neutral Temperature (RNT) should be 110°F if possible as conditions permit
- T_E = Existing or Actual Rail Temperature (°F) prior to heating or expansion measured with an approved rail thermometer
- L = Length of string to be adjusted (in feet)

Calculations:

Change in Rail Length Due to Change in Rail Temperature

A = Change in Rail Length in Inches = 0.000078ΔT x L
L = Length of Rail to be Expanded in Feet
ΔT = Change in Temperature in Degrees Fahrenheit: Desired RNT minus Actual Rail Temperature

Length of Rail (ft)	Change in Temperature in Degrees Fahrenheit															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Change in Rail Length in Inches															
100	1/8	1/8	1/8	1/4	1/4	1/4	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8	5/8
200	1/8	1/4	1/4	3/8	1/2	1/2	5/8	5/8	3/4	7/8	7/8	1	1-1/8	1-1/8	1-1/4	1-1/4
300	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8	1-7/8
400	1/4	3/8	1/2	5/8	7/8	1	1-1/8	1-1/4	1-1/2	1-5/8	1-3/4	1-7/8	2-1/8	2-1/4	2-3/8	2-1/2
500	1/4	1/2	5/8	7/8	1	1-1/4	1-3/8	1-5/8	1-7/8	2	2-1/4	2-3/8	2-5/8	2-3/4	3	3-1/8
600	1/4	1/2	3/4	1	1-1/4	1-1/2	1-3/4	1-7/8	2-1/8	2-3/8	2-5/8	2-7/8	3-1/8	3-3/8	3-5/8	3-3/4
700	3/8	5/8	7/8	1-1/8	1-3/8	1-3/4	2	2-1/4	2-1/2	2-3/4	3-1/8	3-3/8	3-5/8	3-7/8	4-1/8	4-3/8
800	3/8	5/8	1	1-1/4	1-5/8	1-7/8	2-1/4	2-1/2	2-7/8	3-1/8	3-1/2	3-3/4	4-1/8	4-3/8	4-3/4	5
900	3/8	3/4	1-1/8	1-1/2	1-7/8	2-1/8	2-1/2	2-7/8	3-1/4	3-5/8	3-7/8	4-1/4	4-5/8	5	5-3/8	5-5/8
1000	1/2	7/8	1-1/4	1-5/8	2	2-3/8	2-3/4	3-1/8	3-5/8	4	4-3/8	4-3/4	5-1/8	5-1/2	5-7/8	6-1/4
1100	1/2	7/8	1-3/8	1-3/4	2-1/4	2-5/8	3-1/8	3-1/2	3-7/8	4-3/8	4-3/4	5-1/4	5-5/8	6-1/8	6-1/2	6-7/8
1200	1/2	1	1-1/2	1-7/8	2-3/8	2-7/8	3-3/8	3-3/4	4-1/4	4-3/4	5-1/4	5-5/8	6-1/8	6-5/8	7-1/8	7-1/2
1300	5/8	1-1/8	1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8	4-5/8	5-1/8	5-5/8	6-1/8	6-5/8	7-1/8	7-5/8	8-1/8
1400	5/8	1-1/8	1-3/4	2-1/4	2-3/4	3-3/8	3-7/8	4-3/8	5	5-1/2	6-1/8	6-5/8	7-1/8	7-3/4	8-1/4	8-3/4
1440	5/8	1-1/8	1-3/4	2-1/4	2-7/8	3-3/8	4	4-1/2	5-1/8	5-5/8	6-1/4	6-3/4	7-3/8	7-7/8	8-1/2	9
1600	5/8	1-1/4	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8	7-1/2	8-1/8	8-3/4	9-3/8	10

DOCUMENT A00900

HOUSATONIC RAILROAD COMPANY PROCEDURES FOR THE INSTALLATION, ADJUSTMENT, MAINTENANCE AND INSPECTION OF CWR AS REQUIRED BY 49 CFR 213.118

THIS PAGE IS INTENTIONALLY LEFT BLANK

Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR as Required by 49 CFR 213.118

Effective April 5, 2021

Amendment Table

Chapter & Section	Amendment	Date
6 - 6.7	Removed Fracture Report Guidelines	01/04/2021
1 - 1.1	Changed Desired Rail Neutral Temperature to 95°F	01/04/2021
3 - 3.2.1	Added Provisions for Adjusting/Destressing CWR Already in Track	01/07/2021
Appendix B: Section 1 & 2	Added Rail Break Thermal Adjustment Charts	01/04/2021
Appendix C	Added Spike Pattern Diagrams	01/04/2021
Appendix D	Added Reference Mark Guidelines	01/05/2021
Appendix	Removed Sample Fracture Report	01/04/2021

Specifications and Training Guidelines for the Installation, Inspection, and Maintenance of CWR.

Chapter 1 CWR Installation Procedures
1.1 Neutral Temperature
1.2 Temperature Differential
1.3 Installing CWR
1.4 Adjusting CWR to obtain proper Adjusted Rail Temperature
1.5 Curve/Patch CWR

Chapter 2 Rail Anchoring Requirements When Installing CWR
2.1 Standard Box Pattern
2.2 Solid Box Pattern
2.3 Bridge Pattern
2.4 Legacy Patterns
2.5 Anchor Pattern after Repair

Chapter 3 Preventive Maintenance on Existing CWR Track
3.1 Maintaining Desired Rail Neutral Temperature Range
3.2 De-Stressing Rail
    3.2.1 Destressing Previously Laid CWR (Already in Track)
3.3 Tie Renewal
3.4 Ballast Section
3.5 Track Surface and Alignment

Chapter 4 Monitoring Curve Movement Following Surfacing and Lining
4.1 Staking of Curves
4.2 Inspecting for Curve Movement

Chapter 5 Placing Temporary Speed Restrictions Account Work
5.1 General Requirements
5.2 Responsibility for Placing Speed Restrictions
5.3 Speed Restriction Length
5.4 Speed Restrictions for Track Work

Chapter 6 Rail Joint Inspections
6.1 Class of Track
6.2 Frequency of Inspections
6.3 Identification of Joints
6.4 Switches, turnouts, track crossings, lift rail assemblies or other transition devices on moveable bridges
6.5 Rail Joint Conditions
6.6 Embedded Joints
6.7 Inspection Records

Chapter 7 Extreme Weather inspections
7.1 Hot Weather Inspections
7.2 Cold Weather Inspections

Chapter 8 Training

Chapter 9 Recordkeeping
9.1 Report of CWR Installations
9.2 Report Maintenance Work in CWR

Appendix
Appendix A: Change in Rail Length Due to Change in Temperature
Appendix B: Rail Break Thermal Adjustment Charts
    Section 1: 136-lb. Every-Other Tie Anchored
    Section 2: 136-lb. Every Tie Anchored
Appendix C: Standard Spiking Patterns
Appendix D: Housatonic Railroad Procedure for the Use of Reference Marks
Appendix E: Housatonic Railroad Thermal Log for Rail Expansion in CWR
Appendix F: Housatonic Railroad Joint Bar Inspection Report

Specifications and Training Guidelines for the Installation, Inspection, and Maintenance of CWR.

This document details Housatonic Railroad's (HRRC) policy on installing, adjusting, maintaining and inspecting Continuous Welded Rail (CWR) track. Each chapter details how HRRC applies its standards and procedures to comply with FRA standards.

Chapter 1 CWR Installation Procedures

Rail lengths welded together that exceed 400 feet are considered CWR. Rail installed as CWR remains CWR, regardless of whether a joint or plug is installed into the rail at a later time. Temperature variations affect rail length. Rail expands (lengthens) when heated and contracts (shortens) when cooled.

1.1 Desired Rail Neutral Temperature

Rail neutral temperature (RNT) is the temperature at which rail is neither in tension nor compression. Designated rail laying temperatures have been established based on geographic and average yearly ambient temperature to provide a specific Desired Rail Neutral Temperature (DRNT) to prevent track buckling. Rail installation temperatures may be slightly higher or lower than the DRNT, but are to be within the designated rail installation range. The Housatonic Railroad's DRNT is 95 degrees F. The designated rail neutral temperature safe range is from 75 to 115 degrees F (+/-20°F from DRNT). This temperature and range were selected to suit the average ambient temperatures of the Housatonic Railroad's operating location of Western Massachusetts and Connecticut.

1.2 Temperature Differential

The difference between the desired rail neutral temperature and the actual rail temperature taken at the time of installation is called the temperature differential. CWR laying and adjusting procedures have been established to compensate for this temperature differential.

1.3 Installing CWR

Most commonly thought of as laying rail out-of-face; however, distances as short as a few hundred feet might be installed.

- The rail should be in a stress-free state when laid in the bed
- If fastened down at this time, the Rail Neutral Temperature (RNT) is established, and equal to the Rail Temperature (RT).
- If the RT is lower than the desired RNT (DRNT), the temperature differential is calculated and the required expansion is determined based on the temperature differential and rail length.
- The rail is then uniformly expanded. The actual length and expansion are then used to determine the new RNT.

Follow these general requirements when installing CWR:

- Refer to the desired rail neutral temperature outlined in Section 1.1
- Take the rail temperature and calculate the expansion required before making adjustments.
- Record the rail laying temperature, location and date on your railroads' approved forms. These records may be retained in an electronic format as per 49 CFR § 213.241.
- Use rail heaters or rail expanders (if necessary) to adjust the rail to the correct length when the actual rail temperature is less than the designated rail laying temperature.
- If the rail temperature exceeds the designated rail installation safe range of DRNT +/- 20 degrees F (75 to 115 degrees F), then the installation must stop until the rail temperature returns within range, or provisions for later readjustment must be made before the arrival of cold weather.
- Heat the rail evenly and uniformly so that the rail expansion occurs evenly. The proper expansion must be achieved at each reference station throughout its length.
- Take the temperature at the location where the anchors or clips are being applied to restrain the rail.
- If rail is laid at a temperature more than 40° F below the designated rail laying temperature, rail must be adjusted or a speed restriction of 25 mph must be placed.
- When tight rail conditions exist, be governed by Chapter 7.

This information applies to rail laid out of face and curve patching in welded rail. When ambient temperatures exceed 95° F, all out of face activities should be suspended on CWR unless an emergency exists.

- For rail replacement projects, ties may be adzed with l/8-inch cant (+/- 1/8") measured at the outside edges of the tie plate during out-of-face and curve patch operations and welded rail laid to 56 1/2 inch gage. Ties on open deck bridges will not be adzed without the approval of the Chief Engineer. For new construction projects, ties will not be adzed.
- All joints should be welded as soon as practical. If it is not possible to weld a joint concurrent with the installation, then follow the provisions for rail joint requirements and timelines in CWR set in Section 2.2.
- Transition rails are used to eliminate the need for bolted or field welded compromise joints at permanent compromise locations. They are designed to be full rail height on the end that matches the new rail specified for the project; and a varying rail height on the end that ties into the existing rail. When using transition rails:
    - Determine the rail height at the compromise point for the existing rail.
    - Identify that same rail height on the transition rail.
    - Mark and cut the transition rail to match the existing rail height.

- Great effort must be made to lay and anchor welded rail at a DRNT of 95 degrees F, per Section 1.1. In the event that this is not possible, welded rail may be laid inside of a safe range of DRNT +/- 20 degrees F (75 to 115 degrees F) without requiring later readjustment, however this may only be used as a last resort. The proper desired rail neutral temperature of 95 degrees F will be used to calculate the actual rail expansion needed. (See Appendix A.)
- Welded rail that has not been properly adjusted will be protected by a temporary speed restriction when the ambient temperature is expected to exceed (DRNT-20) or when the rail temperature is 60° F greater than the rail laying temperature, whichever occurs first.
- The standard rail anchor patterns are detailed in Chapter 2. Care must be taken to ensure that all welded rail is anchored to standard. At locations where the standard pattern does not restrain rail movement due to tonnage, grade, curvature, or other local conditions, the Chief Engineer may require the application of additional anchors.
- CWR laid across bridges will refer to section 2.3
- The standard track spiking patterns are detailed in Appendix C.

1.4 ADJUSTING CONTINUOUS WELDED RAIL

Adjustment Procedure

Complete the form, Record of Rail Laying Temperature for CWR, as the day Progresses. Each string of welded rail will be numbered at both ends near the initial and final weld by the Railroad Supervisor. Enter this number in the space, "String Number", as each string is laid.

Using a rail thermometer, determine the average cold rail temperature of each rail immediately prior to adjustment by taking three measurements along the string. Measure temperature on the shady side of the web.

1. Digital thermometers read instantly and temperature measurements can be made quickly. Ensure that non-contact infrared thermometers are held close enough to the rail that is being measured to ensure that only the temperature of the rail is being measured and not the surrounding materials.
2. Railroad Supervisors will normally be equipped with the standard dial rail thermometer. To obtain an accurate reading leave the thermometer in place until temperature reading becomes steady, normally about five minutes.
3. Measure length of the rail and enter in the space "Length".
4. Enter the desired rail neutral temperature in the space “Desired Temp”.
5. The average cold rail temperature is shown in the space “Cold Temp”.
6. Compute the difference in temperature by subtracting “Cold Temp from Desired Rail Neutral Temperature”. If the cold rail temperature is below desired rail neutral temperature, see next Paragraph to determine the expansion required. If the cold rail temperature is greater than the desired rail neutral temperature, no adjustment needed.

7. Use chart, Change in Rail Length due to Change in Temperature, by locating the row corresponding to rail length and column corresponding to the temperature difference computed in the paragraph above. Read the expansion length in inches at the intersection of the rail length row and temperature length column. Enter in the “Calculated Total" box.
8. The ¼, ½, ¾ & End Point will be entered in the appropriate boxes.

For strings 720' or longer - reference mark the rail base and the tie plates at the quarter points of the strings. For strings less than 720' long – reference mark at the center point of the string. The rail should be measured and reference marked at the same time the cold rail temperature is determined. For example, if you have the following conditions:

1) String length - 1440 feet - Make reference marks on the base of the rail and a secure tie plate at the 360', the 720’, and the 1080' quarter points.
2) String length - 500 feet - Make reference marks on the base of the rail and secure a tie plate at the 250' center point.

These reference marks will be used to measure the expansion during adjustment. Adjustment must be as uniform as possible throughout entire string. (See Example 1 in Appendix A)

If rail is installed in a continuous operation not completely in plates to produce a gap at the end, ensure that the required expansion is achieved for each quarter portion calculated for that length of rail.

Rail heaters or rail expanders will be used to obtain the required expansion.

The Railroad Supervisor in charge of the rail laying project will ensure that the rail heater is operated uniformly and continuously. Vibrate the rail to aid in the rail expansion; do not strike the rail with hammers or other devices.

If the required expansion cannot be obtained with rail heaters, do not bump the rail. Use rail expanders or cut the rail into shorter strings. Employ the procedures outline in section 1.6 if necessary.

1) If the complete expansion as determined in Appendix A has not been obtained, place a wooden shim in the joint. The length of the wooden shim will be the amount of required expansion less the measured amount that the rail has expanded since laying.
2) The wooden shim will remain in place until the next rail is laid and anchored for 250 feet. At this time the wooden shim is removed, then the first rail is expanded uniformly to fill the gap and the joint is made.
3) Record the amount of expansion in the "Actual Expansion" box. Then compute the thermal adjustment based on the actual expansion from the chart in Appendix A, Change in Rail Length due to Change in Temperature, and record this temperature in “Cold Temp” space. Add the "Cold Temp" and value from the

chart in Appendix A to determine the adjusted temperature. This must be equal to or greater than the desired rail neutral temperature specified in section 1.1.

Railroad Supervisor - Production Team will give the completed Record of Laying Temperature for Continuous Welded Rail to the Chief Engineer after the rail has been laid. The Chief Engineer will retain a copy of those records at HRRC headquarters.

The Railroad Supervisor - Production Team must ensure that rail is properly adjusted and all documentation completed before the team leaves the rail laying area.

1.5 CURVE/PATCH WELDED RAIL

1) A string of welded rail used for curve/patch must be adjusted to the desired rail neutral temperature specified in Section 1.1.
2) The length of rail removed will be measured, the cold rail temperature of the replacement rail measured and the amount of expansion determined in the same manner as for laying rail out of face.
3) The rail ends will be misaligned (such that they can run by one another unobstructed) until proper adjustment is obtained.
4) Resistance to expansion may be experienced on sharp curves. If this occurs, it is permissible to anchor one rail length in the center of the curve, bypass the rail ends at each end of the string and then expand and vibrate the rail from the center to each end.
5) Part 4 above will effectively reduce the length of the rail in half. New references will need to be established to ensure uniform expansion.

Chapter 2 Rail Anchoring Requirements

Where the use of positive restraint fasteners are employed rail anchors may be omitted. Anchors may not be applied where they will interfere with signal or other track appliances, where they are inaccessible for adjustment or inspection or on rail opposite a joint. Anchor patterns may be varied as reasonable to avoid placing anchors against deteriorated ties.

Installation

The following anchoring requirements apply to CWR installation on all main track and sidings. These anchoring requirements also apply to all tracks other than main tracks or sidings.

2.1. Standard Box Pattern

When installing CWR, box anchor every other tie except as outlined in Section 2.2.

2.2 Solid Box Pattern

When installing CWR, box anchor every sound (effective) tie at specific locations listed below to provide additional restraint against rail movement.

Condition	Action
Turnouts Rail crossings At grade crossings Open deck bridges Joints where CWR abuts jointed rail	*Anchor every tie for 200’ in each direction
Bolted joint installed during CWR installation when using heater, rail stretcher or sufficient ambient temperature	Weld joint within 60 days, **OR** Install joint with 6 bolts, **OR** *Anchor every tie for 200’ in each direction

*200’ is approximately equal to 120 ties.

2.3 Bridge Pattern

When installing CWR, follow these bridge anchoring requirements:

- Ballast desk bridges should be anchored with the same pattern as in section 2.1.
- Open deck bridges should not be anchored without written permission from the Chief Engineer of HRRC. Records of such written permission will be maintained

in the Engineer's office and furnished to all affected employees and other individuals (track inspectors, bridge gangs, etc.) upon going into effect.

- When granted written permission from the Chief Engineer of the HRRC, open deck bridges will be anchored according to the following guidelines:

Length of Continuous Open Deck Portion (ft)	**Individual Span Length (ft)**	**Rail Anchor Requirements**
100 ft or less	All spans	Box anchor every third or fourth tie, and only if said ties are fastened to the bridge span. NOTE: Open deck bridges over roads are only to be anchored in accordance with the written permission of the Chief Engineer of the HRRC.
Greater than 100 ft	100 ft or less	
	Greater than 100 ft	

Maintenance or Rail Repair

2.4 Legacy Patterns

On CWR installations completed before September 21,1998, existing anchoring may remain if rail is restrained to prevent track buckles, but rail must be adjusted (by increasing or decreasing the length of rail or by lining on curves) or anchors added to rail if restraint is not sufficient.

2.5 Anchor Pattern after Repair

When repairs result in a joint being added to CWR, the anchor pattern shall match the existing pattern in track. At least every other tie will be box anchored for a distance of 200 feet in each direction unless anchoring is otherwise provided. When repairs are made to a stripped joint or failed joint bar, the adjustment or addition of anchors will be as prescribed in the following table.

Condition	Action
Bolted joint in CWR experiencing service failure (stripped joint) or failed bars(s) with gap* present *Gap exists if it cannot be closed by drift pin	Weld joint, **OR** Remediate joint conditions (per Chapter 6.5), and replace bolts (new, in-kind or stronger), and weld joint within 30 days, **OR** Replace failed bar(s), install 2 additional bolts and adjust anchors, **OR** Replace failed bars, bolts (if broken or missing) and anchor every tie for 200’ in both directions **OR** Add rail

Chapter 3 Preventive Maintenance on Existing CWR Track

Performing track buckling maintenance reduces the risk of buckles. When tight rail conditions exist, be governed by Chapter 7.1.

3.1 Maintaining Desired Rail Neutral Temperature Range

A record of rail neutral temperature will be maintained where rail has pulled apart, broken or been cut for defect removal. Record the length of the rail end gap and rail temperature in addition to the other required information on the proper form for determining rail neutral temperature.

Rail that has pulled apart, broken, or been cut for defect removal must be readjusted to be within HRRC's desired rail neutral temperature safe range, which is 95 degrees +/- 20 degrees F, or 75 to 115 degrees F. If the rail has not been readjusted to at least DRNT-20° (75 degrees F) before rail temperatures exceed the limits described in the table on page 14 speed restriction of 25 mph or less will be placed, or a speed restriction of 40 mph will be placed with a required daily inspection made during the heat of the day.

After February 2010, known rail neutral temperature locations not adjusted to within the DRNT -20° safety range must be adjusted within 365 days of installation.

If rail is added for any reason, measure and record the amount of rail added so that adjustments can be made, if necessary. Where rail has been added to re-establish the desired RNT, this requirement need not apply. This measurement will be made by the use of reference marks. The use of reference marks includes:

- Marking the locations where rail is to be cut
- Marking the rail outside the limits of the joint bars (plus 3 ft)
- Rail break or cut temperature (°F)
- Rail temperature (°F) at which to readjust or apply slow order (see table on page 14 for guidelines)
- Measure the distance between the reference marks and mark it on the rail or otherwise record it.
- Install the rail and re-measure the distance between reference marks
- Record the difference and document the location
  (see Appendix D for depiction and detailed explanation)

Rail Break or Cut Temperature (degrees F)	**Rail Temperature (degrees F) at Which to Readjust or Apply Slow Order**
60	135
50	130
40	125
30	120
20	115
10	110
0	105
-10	100
-20	95
-30	90
-40	85

When welding rail ends together, the required weld gap or rail consumption must be taken into consideration when determining the amount of rail adjustment. The amount of adjustment required can be determined using the charts and examples in Appendix B.

3.2 De-Stressing Rail

Definition: Destressing is the operation of removing (or sometimes adding) rail in CWR to make the longitudinal thermal stress (force) to be zero at a prescribed temperature.

- HRRC's desired rail neutral temperature is 95°F

Rail can be de-stressed by cutting rail out or by re-aligning a curve. The latter is only allowable when the curve has been staked at a known RNT. When cutting rail out, at a minimum the following general procedure must be used:

1) Use a designated safe procedure to cut rail if it's possible that the rail is under compression and may move unexpectedly. Cut the rail to be de-stressed.
2) Remove or reposition anchors or clips for a minimum of 200 feet in both directions from the cut or up to a restriction that prevents rail movement (i.e., bridge, switch).
3) Wait until the rails stop moving. The rail ends may need to be trimmed more than one time to allow for expansion.
4) Take the rail temperature away from cut.
5) Use Table in Appendix A to compare the rail temperature with the desired rail neutral temperature for HRRC. This is known as the temperature differential.
6) The temperature differential must be within limits in 3.1 and be recorded per 9.2.
7) Weld the joint or apply joint bars.
8) Replace the rail anchors or clips.

More specific CWR destressing guidelines and procedures are as follows:

3.2.1 Destressing Previously Laid CWR (Rail Already in Track)

General Guidelines for Destressing One or More Strings of CWR In Track Up to 1600' In Length.

(1) This may be used for:

(i) Rail that was laid at colder temperatures sufficiently below a target DRNT of 95°F ("sufficiently below" is defined as below the minimum DRNT-20 value of 75 degrees F specified in Section 1.1); or

(ii) Rail laid at "hot" temperatures, which exhibits excessive rail movement; or

(iii) Locations where recent track maintenance (lining, surfacing, lifting, etc.) has lowered RNT below DRNT -20°F or 75°F; or

(iv) Locations where the HRRC deems it necessary.

(2) The following applies when destressing:

(i) The means, methods, and equipment used when destressing rail shall be approved by the HRRC Chief Engineer. This information is summarized in the Procedure section, beginning on page 18 and ending on page 19.

(ii) Destressing should be scheduled and completed when the ambient temperature provides sufficient heat so that the rail temperature is as near as possible to the target DRNT of 95°F; unless approved by the HRRC Chief Engineer.

(iii) No more than 1,600' of rail may be destressed at any given time (1,600' strings). This is a continuous 1600' string and/or a 1600' string with a cut or joint in the middle (800'+/- each side of cut and/or joint).

(3) The following preparatory work shall be performed:

(i) Make reference match marks around the existing joint or rail cut location:

- On the base of rail and tie plates on unanchored ties within 10' +/- of the joint and/or cut in the rail; or
- On the left side of the elastic fastener tie plate or the side opposite the drive on elastic fastener or clip within 10'+/- of the joint and/or cut in the rail; and

(ii) When destressing one or more strings, mark the quarter points of the string to be destressed.

(iii) When out-of-face destressing, set offset stakes at the far end of the rail to be destressed to measure any rail panel “pull” back at the end of the CWR string where the rail is cut and/or a joint is located.

(iv) Rail panel “pull back” is often associated with wood tie track anchored on every tie with elastic fasteners or in areas with weak crib ballast.

(v) Rail panel “pull back” movements (inches) shall be measured after:

- The rail has been correctly expanded at the quarter points and at the end by using the ambient temperature, a rail heater and/or a. hydraulic rail puller, and;
- The CWR string has been anchored and/or clipped.

(vi) Rail panel “pull back” measured is the same as ADDING RAIL and the CWR shall have to be unclipped and expanded again to eliminate any pull back when it is finally anchored and clipped before it is finally jointed and/or welded.

(vii) Measured rail end movements away from the joint or cut at the end of the CWR string at the match marks is the same as ADDING RAIL. The CWR shall have to be unclipped and expanded again to eliminate any rail end movement away from the joint and/or cut before the CWR is finally jointed and/or welded.

(viii) To improve RNT, the total required expansion for any string, shall consist of the following:

- The calculated expansion required from the temperature "differential" (Appendix A), and;
- Any measured "rail panel pull back", and;
- Any measured rail end movements away from the joint and/or cut.

(ix) If in compression, the rail shall be cut with a torch and placed in a position that will permit the rail ends to bypass each other, so as to permit the rail to expand freely.

(x) If in compression, the rail shall be unanchored or unclipped from the cut or joint at the end of the string to be expanded back to the beginning of the string.

(xi) If the base of rail is caught in the elastic rail fastener plates, the rail shall be raised from the tie plates or tie pads. Place base of rail on risers (spikes and/or rollers) to allow the rail to expand freely; risers shall be placed every 12th to 15th tie (especially in areas of elastic fastener plates). There may be a need to add additional risers at closer intervals on curves.

(xii) If risers are required, all rail anchors, clips and insulators must be removed and risers placed to ensure the base of the rail is free to move relative to the tie plate and/or tie seat (i.e., stress free).

(xiii) If power vibrators are used, it may not be necessary to place the rail on risers in areas of cut spikes and conventional tie plates.

(xiv) Ensure that vibrated rail is totally free to expand/contract longitudinally (i.e., stress free).

Adjusting CWR Lengths Already in Track: Method #1

This method is generally used by HRRC MOW forces to repair a service failure such as a pull-apart, broken rail, or broken weld and to remove a defective rail and/or add a plug rail by making a cut in CWR. This destressing method is used when the rail temperature is within the designated rail installation safe range of DRNT +/- 20-, or 75-degrees F to 115-degrees F.

NOTE: The minimum plug rail length to be used on the HRRC in any of these instances is 19'-6"

Method #1 Procedure:

(1) When destressing lengths by this method, artificial heating via rail heaters is not necessary. The section of track (both rails) to be destressed/adjusted is cut; the anchors and any other restraints are removed for the minimum distance in each direction (195' in each direction) until the rail stops expanding (tap the rail along its length to assure that the rail is moving freely through the plates). The maximum length to be adjusted by this method is 800' on either side of the joint and/or cut, which is 1600' total. Approximately 50% of the area to be destressed should be on either side of the joint and/or cut.

(2) In this case, the rail on either side of the joint and/or cut is expanded towards the rail cut and/or joint location.

(3) The base of the rail and plate should be marked at or within 10' of either side of the joint or cut and then at 50' stations or the quarter points for the full length of the rail to be expanded.

(4) In these instances, the minimum amount of rail to be de-anchored is equal to the length of the rail to be de-stressed on either side of the joint. For example, if 380' total is to be destressed with a joint in the middle (195' of rail on either side of the joint), then 195' of rail on either side of the joint must be de-anchored to allow the length in question to expand freely.

(5) The movement at these stations should be recorded when the joint is removed and/or the rail is cut and recorded.

(6) After all thermal forces have been released and the movement has stopped, the rails can then be rejoined and the anchors reinstalled. This restores both rails to a RNT equal to the rail temperature at the time of the rails being rejoined.

Adjusting Numerous CWR Strings Out-of-Face Already in Track: Method #2

(1) This procedure applies to destressing CWR when a length of rail(s) is deemed to be sufficiently below (or above) the target DRNT of 95°F to warrant RNT

readjustment. “Sufficiently below” is defined as an RNT below the DRNT-20 limit of 75 degrees F, which is described in Section 1.1.

(2) The preferred way to expand rail is to heat the rail naturally or with a rail heater. A rail puller may be used when expanding rail to help achieve the required expansion and/or hold the expanded rail in place while installing anchors and/or clips.

(3) The rail to be destressed is usually expanded from the starting point to the end of the string being destressed in one continuous direction.

(4) The maximum length of rail to be destressed at any time is 1600’.

Procedure

(i) Once a string to be destressed is identified, the end of the string at an existing joint, or a location where the rail is cut, shall have the rail ends misaligned to allow unobstructed movement of the rail string. Then, as the rail is heated, the rail is expanded in the direction towards the joint and/or cut.

(ii) Before expanding the rail string, anchors, and/or clips shall be removed starting at the far end of the string at the joint and/or rail cut back to the beginning of the rail string.

(iii) Measure the existing rail temperature and subtract from the target DRNT of 95°F to determine the temperature differential to be used. See Appendix A to calculate the total expansion required. The expansion required depends upon the rail temperature differential and total length of the CWR string. The required amount of expansion shall be marked at the one-quarter points on the base of the rail and plates.

(iv) Mark the quarter points on the base of the rail and tie plates of rail strings to be expanded.

(v) Expanding rail continuously in one direction allows MOW crews to mark and expand rail at the quarter points and then re-clip rail in a continuous motion from the point of beginning to the end of the string at the joint and/or cut in the CWR.

(vi) Heat should be uniformly applied along the string to be destressed until the required expansion has been obtained at the quarter points to include the end of the string at the joint and/or cut rail.

(vii) When using a rail heater, if any quarter point does not have the required expansion, either before or after anchoring/clipping, the string shall have to be reheated. The rail heater will back over the portion that needs to be reheated

without applying heat. Then, the heater shall work towards the end of the string at the joint or rail cut applying heat until the required expansion is obtained.

(viii) Re-clip and/or re-anchor the rail as soon as expansion at the quarter points has been achieved. Clip and/or anchor using the standard anchor patterns given in Chapter 2.

(ix) The CWR shall not be considered destressed until the required expansion at all the quarter points have been realized. When destressing strings of CWR, rail expansion, and NOT rail temperature, determines if a string of CWR has been destressed.

(x) A rail puller can be used to hold the required expansion and/or to help get the required expansion. At least 20 ties on the next string to be destressed should be solid box anchored and/or clipped to provide sufficient holding power for the rail puller to hold or pull the string being expanded.

NOTE: Deviation from the destressing methods in Section 3.2 is allowed with the written permission of the HRRC Chief Engineer. Records of such written permission will be maintained in the Engineer's office and furnished to all affected employees and individuals (track inspectors, track foremen, affected contractors, etc.) upon going into effect.

3.3 Tie Renewal

1. Any tie & tie renewal program must conform to the standards of HRRC.
2. Defective or deteriorated ties should be replaced prior to CWR renewal or installation.
3. When renewing ties in CWR track, two or more passes with the tie gang may be required. No more than 3 consecutive ties will be removed per pass. A maximum of 12 ties or less per 39-foot segment may be renewed per pass.
4. New ties will be spiked to conform to HRRC Standard Spiking Pattern. (Appendix C)
5. The disturbed ballast section must be restored as soon as practical.
6. Anchoring patterns must be restored as soon as practical. (See section 2)

3.4 Ballast Section

HRRC employs a standard ballast section conforming to AREA Standards. A minimum of 12" of ballast at tie ends with a 2:1 slope.

3.5 Track Surface and Alignment

CWR Track should be kept in a state of good repair. Any major deviation corrections should be performed prior to CWR renewal or installation.

Chapter 4 Monitoring Curve Movement Following Track Surfacing and Lining

4.1 Staking of Curves

Before surfacing and lining a mainline curve, stake curve if it is 3 degrees or more and the rail temperature is more than 50° F below the desired rail neutral temperature (or is forecasted to be in the next 24 hours).

To stake a curve prior to surfacing and lining, place at least 3 reference points uniformly spaced around the curve. These reference points shall be no more than 200 feet apart. Refer to your railroad's engineering standards for guidance when staking curves that are miles in length.

4.2 Inspecting for Movement

Inspect for curve movement periodically after the work especially during periods of large temperature changes. Where curve has been staked per Section 4.1 and curve has shifted inward more than a maximum of 3 inches, the curve must be lined out prior to ambient temperatures above or forecasted above the DRNT-20**.** If curve is not lined out or de-stressed, a speed restriction of 40 mph or less must be placed. When tight rail conditions exist, be governed by Chapter 7.1.

Chapter 5 Placing Temporary Speed Restrictions Due to work

Place a temporary speed restriction anytime the roadbed or ballast section is disturbed as required in Section 5.4, except where the maximum authorized speed of the track is equal to or less than the required restriction or when mechanical dynamic stabilization is used.

5.1 General Requirements

Speed restrictions ensure safe train operations until the affected track stabilizes. Restrictions need to stay in place to allow the ballast to consolidate, rail compressive forces to equalize, and the sub grade to compact. Take more restrictive measures when conditions warrant.

5.2 Responsibility for Placing Speed Restrictions

During the work or before returning the track to service, the railroad supervisor in charge must ensure that:

- Gage, surface and alignment have been established.
- Crib and shoulder ballast is in place or lateral constraint is otherwise provided.
- The rail is anchored per Sections 2 or 3.

5.3 Speed Restriction Length

To minimize running rail and other dynamic forces, trains must have time to brake and adjust slack before entering the disturbed track. For heavy grades, sharp curves or substandard track conditions, extend speed restrictions farther from the work limits, if needed.

5.4 Speed Restrictions for Track Work

When the following track work has been performed, place a speed restriction that complies with the following guidelines.

When rail temperature is above or forecasted above 95° F within the next 24 hours

Activity	Maximum Speed	Minimum Duration
Out-of-face installation of ties Undercutting Laying track/switch panels Constructing track Out-of-face surfacing and lining	30 mph or lower for freight 40 mph or lower for passenger	8 freight trains or l6 passenger trains **OR** an equivalent combination* (0.1 MGT)
Spot Maintenance • Installing ties (no more than 5 ties in 39 ft. and no more than 3 consecutive ties) • Surfacing/lining (maximum length of 19'6")	30 mph or lower for freight 40 mph or lower for passenger	1 train
Mechanically-stabilized track performed after any of the activities listed above	30 mph or lower for freight 40 mph or lower for passenger	1 train

- 2 passenger trains are equivalent to 1 freight train

When the temperature is within the DRNT-20 within the next 24 hours

Activity	Maximum Speed	Minimum Duration
Out-of-face installation of ties Out-of-face surfacing and lining Undercutting Laying track & switch panels Constructing track Exception: Spot maintenance does not require a speed restriction	30 mph or lower for freight 40 mph or lower for passenger	8 freight trains or l6 passenger trains **OR** an equivalent combination* (0.1 MGT)
Mechanically-stabilized track performed after any of the activities listed above	40 mph or lower for passenger	1 train

When ambient temperature is less than 50° F, a speed restriction is not required. An inspection must be conducted before releasing the speed restriction to ensure the track is safe for higher speeds.

Chapter 6 Rail Joint Inspection

CWR Joint means any joint directly connected to CWR.

6.1 Class of Track

All CWR joints within the following classes must be inspected on foot:

- Class 2 on which passenger trains operate, and
- Class 3 and higher

6.2 Frequency of Inspections

CWR joints shall be inspected on foot at the following minimum frequencies:

Minimum Number of Inspection Per Calendar Year**					
	Freight Trains operating over track with an annual tonnage of			Passenger Trains operating over track with an annual tonnage of:	
	less than 40 MGT	40 to 60 MGT	greater than 60 MGT	less than 20 MGT	greater than or equal to 20 MGT
Class 5 & above	2x	3x*	4x*	3x*	3x*
Class 4	2x	3x*	4x*	2x	3x*
Class 3	1x	2x	2x	2x	2x
Class 2	0	0	0	1x	1x
Class 1	0	0	0	0	0
Excepted Track	0	0	0	n/a	n/a

4x: Four times per calendar year, with one inspection in each of the following periods: January to March, April to June, July to September, and October to December; and with consecutive inspections separated by at least 60 calendar days.

3x: Three times per calendar year, with one inspection in each of the following periods: January to April, May to August, and September to December; and with consecutive inspections separated by at least 90 calendar days

2x: Twice per calendar year, with one inspection in each of the following periods: January to June and July to December; and with consecutive inspections separated by at least 120 calendar days.

lx: Once per calendar year, with consecutive inspections separated by at least 180 calendar days.

*Where extreme weather conditions prevent a track owner from conducting an inspection of a particular territory within the required interval, the track owner may extend the interval by up to 30 calendar days from the last day that the extreme weather condition prevented the required inspection.

**Where a track owner operates both freight and passenger trains over a given segment of track, and there are two different possible inspection interval requirements, the more frequent inspection interval applies.

6.3 Identification of Joints

Definitions
CWR joints are any joint within CWR.

Periodic Inspections
Periodic CWR joint bar inspections should occur as required in section 6.2. CWR joint bar inspection on track classifications not covered by this section may, at the discretion of the Chief Engineer of HRRC, also occur on an annual basis. The inspection should occur in the months prior to cold weather. At the discretion of the Chief Engineer of HRRC, the time frame for inspections may be altered to be more frequent than the minimum requirements of 49 CFR 213.119(i). Periodic CWR joint bar inspections are to be conducted on foot.

Locating and Identifying CWR Joints
CWR joints may be identified by, but not limited to, any of the following methods;

1. Nearest milepost location (i.e. BL Line MP 58.25 both rails)
2. Nearest Time Table location (i.e. 83 ft. north of Smith St. east rail)
3. By Global Positioning System (GPS)
4. Painted or Striped Joints (NOTE: this method is not to be used as a standalone method. It may be used in conjunction with one or more of the aforementioned methods in order to make visual identification of joints easier.)

Special CWR Joint Inspections
Due to certain field conditions, a special inspection may be required. This inspection should be conducted in the same manner as the periodic annual inspection. Special inspections may be conducted for, but not limited to, the following:

1. joints that were recently "repaired"
2. extreme and sudden temperature changes
3. periodic and routine track surfacing and lining
4. reclassification of track to higher class standards

Each CWR joint requiring action as outlined in section 6.5 shall be identified in the field as specified above.

6.4 Switches, Track Crossings, Lift Rail Assemblies or Other Transition Devices on Moveable Bridges

Joints within or adjacent to switches, track crossings, lift rail assemblies or other transition devices on moveable bridges are exempt from the periodic joint inspection requirements provided they are inspected monthly during the required monthly walking inspection of these devices.

Therefore, inspect these locations on a minimum monthly basis and include in the inspection and report the following:

At switches:

- All joints from and including the insulated joints at the signals governing movement entering and leaving the control point or interlocking.
- If there are no signals at the switch location, include as a minimum all joints from the point of the switch to the heel of the frog.

At cross-over:

- All joints in track between switches.

At track crossings:

- All joints from and including the insulated joints at the signals governing movement entering and leaving the control point or interlocking.
- If there are no signals at the track crossings, include as a minimum all joints that are between or connected to the crossing frogs.

At lift rail assemblies or other transition devices on movable bridges:

- All joints immediately attached to the rail assembly or transition device.

6.5 Rail Joint Conditions

When inspecting CWR joints on foot in track listed in 6.1, inspectors must watch for (but not be limited to) the following rail joint conditions outlined in the table below. When such conditions are found, they must be noted on an inspection report and the appropriate action must be taken as outlined.

Rail Joint Condition	**Action***
Visible cracks in. joint bar	Replace bar
Loose bolts	Tighten bolts
Bent bolts	Replace bolts **OR** Reinspect as per 6.2
Missing bolts**	Replace bolts
Tie(s) not effectively supporting joint	Tamp tie(s) Replace or repair tie(s) **OR** Conduct follow-up inspections every other week until repaired/removed
Broken or missing tie plate(s)	Replace tie plate(s) **OR** Conduct follow-up inspections every other week until repaired/removed
Deteriorated insulated j joint	Replace/repair joint **OR** Conduct follow-up inspections every other week until repaired/removed
Rail end batter (More than 3/8" in depth and more than 6" in length measured with a 24" straight-edge)	Repair by welding joint or removing rail **OR** Conduct follow-up inspections every other week until repaired/removed
Rail end mismatch reaches limits specified by 49 CFR 213.115	Weld or grind
Longitudinal rail movement greater than 2"	Add or adjust rail anchors, tighten bolts, add or remove rail at appropriate time **OR** Conduct follow-up inspections every other week until repaired/removed
Wide rail gap greater than 1.5"	Adjust rail gap and secure joint **OR** Conduct follow-up inspections every other week until repaired/removed

Joint vertical movement (profile) that exceeds 75% of the allowable threshold for the designated class or track	Surface joint **OR** Conduct follow-up inspections every other week until repaired/removed
Joint lateral movement (in a curve or spiral) that reaches ¾"	Correct lateral movement **OR** Conduct follow-up inspections every other week until repaired/removed

*Action may also consist of placing a speed restriction or removing the track from service.
** A minimum of 2 bolts per rail must be in place at each joint.

6.6 Embedded Joints

Permanently Embedded Locations

Where such locations exist, it is not necessary to disassemble or remove the track structure (e.g., remove pavement or crossing pads) to conduct an inspection of CWR joints. Make every effort, to the extent practicable, to inspect the visible portion of joints in these structures.

Temporarily Embedded Locations

Joints may sometimes be temporarily buried (e.g., where ballast or similar material is in the middle of the track and along the track) and therefore unavailable for inspection. Where CWR joints are buried (e.g., by ballast), wait for the completion of the track work before conducting joint bar inspections. Locations that have been buried for an extended period of time must still be inspected.

6.7 Inspection Records

Track subject to inspections under 49 CFR § 213.119, must comply with:

- Track Inspections (49 CFR § 213.233),
- Inspections of switches, turnouts, track crossings, lift rail assemblies or other transition devices on moveable bridges (49 CFR § 213.235), if applicable,
- Periodic and follow-up CWR Joint Inspections (49 CFR § 213.119 (g)).

On-Foot Periodic and Follow-up Inspection Reports

- Document each on-foot periodic and follow-up inspection on the date of the inspection by noting the following information:
- Date
- Limits of the inspection
- Location and nature of CWR joint conditions specified in section 6.5
- Corrective or remedial action
- Name and signature of inspector

Chapter 7 Extreme Weather inspections

For purposes of forecasting or initiating extreme weather inspections and conversions of rail temperature in relation to ambient temperatures, use the following conversions:

- In hot weather, rail temperature is equal to ambient temperature plus 30° F.
- In cold weather, rail temperature is equal to ambient temperature.

7.1 Hot Weather Inspections

On main tracks, hot weather inspections must be performed as directed by the Chief Engineer of HRRC when the temperature is forecast to exceed 95° F. Perform inspections during the heat of the day - primarily between 12 noon and 6 p.m. When tight rail conditions exist, a speed restriction of 25 mph or less must be placed or the track must be removed from service.

Inspectors will inspect for signs of tight rail conditions, including:

- Kinky or wavy rail
- Rail canting or lifting out of tie plates
- Shiny marks on the base of the rail including that the rail is running through anchors and spikes
- Gaps in ballast at the ends of ties
- Churning ballast and ties
- Ties floating in the ballast

When tight rail conditions are present such as above, a speed restriction of 25 mph or less must be placed or track removed from service until repair or adjustment is made.

- Inspectors will pay special attention to the following locations:
- Recently disturbed track
- Track at the bottom of sags
- Locations where heavy braking occurs
- Fixed track structures, such as turnouts and bridges
- Locations where rail has been repaired or welds made
-

7.2 Cold Weather Inspections

On main tracks, cold weather inspections must be performed as directed by the Chief Engineer of HRRC when the rail temperature is forecast to drop 100° F below the rail laying temperature.

Inspectors will inspect for:

- Broken rails
- Pull-apart
- Curve movement
- Wide gap between rail-ends
- Bent bolts
- Cracked or broken joint bars (conventional and insulated)
- Canted rail

Chapter 8 Training

All employees responsible for the inspection, installation, adjustment or maintenance of CWR track must complete training on CWR procedures every calendar year. In addition, they shall be provided a copy of these procedures and all accompanying documents. HRRC will maintain lists of those employees qualified to supervise restorations and inspect track in CWR territory. The qualified employee lists will be made available to the FRA upon request. Training programs will address, but not be limited to, the following:

- CWR installation procedures
- Rail anchoring requirements when installing CWR
- Preventive maintenance on existing CWR track
- Monitoring curve movement following track surfacing and lining
- Placing temporary speed restrictions account track work
- Rail joint inspections
- Insufficient ballast
- Extreme weather inspections
- Recordkeeping
- Action items

Chapter 9 Recordkeeping

9.1 Report of CWR Installations

Rail and length, initial rail temperature, desired RNT, adjusted RNT, location, and date of CWR installations must be recorded on the prescribed form and must be retained for at least one year after installation.

9.2 Report Maintenance Work in CWR

Because track maintenance can disturb the lateral and longitudinal resistance of the track, Records of the following must be kept until corrections or adjustments are made:

- Rail that is added for any reason, including repair of broken or defective rail, pull-apart and welding of rail joints.
- Where curve has been staked and has shifted inward more than a maximum of 3 inches.
- CWR installation or maintenance work that does not conform to these written procedures.
- A record of rail neutral temperature will be maintained where the rail has pulled apart, broken or been cut for defect removal.

Railroad Supervisors must monitor these records to ensure necessary corrections and adjustments are made.

Appendix

Appendix A: Housatonic Railroad Thermal Table

Change in Rail Length Due to Temperature

A = (Tđ - Tā) x L x α
Tđ = Desired Rail Neutral Temperature (95° F for HRRC)
Tā = Actual Rail Temperature (°F)
T = (Tđ – Tā) Change in Temperature (°F)
α = (0.000078) Coefficient of Expansion for Rail Steel (Inches/Foot)
L = Length of Rail (Feet)
A = Adjustment (Inches)

Length (Feet)	Change in Temperature °F											
	5	***10***	***15***	***20***	***25***	***30***	***35***	***40***	***45***	***50***	***55***	***60***
400	1/8	3/8	1/2	5/8	3/4	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8
500	1/4	3/8	5/8	3/4	1	1 1/8	1 3/8	1 1/2	1 3/4	2	2 1/8	2 3/8
600	1/4	1/2	3/4	7/8	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8	2 5/8	2 3/4
660	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 3/8	2 5/8	2 7/8	3 1/8
700	1/4	1/2	7/8	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 1/2	2 3/4	3	3 1/4
720	1/4	1/2	7/8	1 1/8	1 3/8	1 5/8	2	2 1/4	2 1/2	2 3/4	3 1/8	3 3/8
800	3/8	5/8	1	1 1/4	1 1/2	1 7/8	2 1/8	2 1/2	2 3/4	3 1/8	3 3/8	3 3/4
900	3/8	3/4	1	1 3/8	1 3/4	2 1/8	2 1/2	2 3/4	3 1/8	3 1/2	3 7/8	4 1/4
1000	3/8	3/4	1 1/8	1 1/2	2	2 3/8	2 3/4	3 1/8	3 1/2	3 7/8	4 1/4	4 5/8
1080	3/8	7/8	1 1/4	1 5/8	2 1/8	2 1/2	3	3 3/8	3 3/4	4 1/4	4 5/8	5
1100	3/8	7/8	1 1/4	1 3/4	2 1/8	2 5/8	3	3 3/8	3 7/8	4 1/4	4 3/4	5 1/8
1200	1/2	7/8	1 3/8	1 7/8	2 3/8	2 3/4	3 1/4	3 3/4	4 1/4	4 5/8	5 1/8	5 5/8
1300	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 5/8	5 1/8	5 5/8	6 1/8
1320	1/2	1	1 1/2	2	2 5/8	3 1/8	3 5/8	4 1/8	4 5/8	5 1/8	5 5/8	6 1/8
1400	1/2	1 1/8	1 5/8	2 1/8	2 3/4	3 1/4	3 7/8	4 3/8	4 7/8	5 1/2	6	6 1/2
1440	1/2	1 1/8	1 5/8	2 1/4	2 3/4	3 3/8	3 7/8	4 1/2	5	5 5/8	6 1/8	6 3/4
1500	5/8	1 1/8	1 3/4	2 3/8	2 7/8	3 1/2	4 1/8	4 5/8	5 1/4	5 7/8	6 3/8	7
1520	5/8	1 1/8	1 3/4	2 3/8	3	3 1/2	4 1/8	4 3/4	5 3/8	5 7/8	6 1/2	7 1/8
1600	5/8	1 1/4	1 7/8	2 1/2	3 1/8	3 3/4	4 3/8	5	5 5/8	6 1/4	6 7/8	7 1/2

DESIRED RAIL NEUTRAL TEMPERATURE
Tđ = 95°F FOR HRRC

EXAMPLE 1
HOW MANY INCHES MUST A STRING OF WELDED RAIL 1000 FEET LONG LAID AT A RAIL TEMP OF 70°F EXPAND TO BE ADJUSTED FOR Tđ?

T = Tđ – Tā
T = 95°F - 70°F
T = 25°F

GO TO THE TABLE AND READ THE LENGTH GIVEN IN THE 1000 “LENGTH” ROW WHERE IT CROSSES THE COLUMN HEADED BY 25 “CHANGE IN TEMPERATURE” COLUMN.
A = 2 INCHES

UNIFORMLY ADJUSTING THE RAIL IN EXAMPLE 1 (REFER TO SECTION 1.4)

THE ACTUAL ADJUSTMENT IS 2” AND THE KNOWN LENGTH OF THE RAIL IS 1000’. THEREFORE THE FOLLOWING REFERENCES WILL APPLY;

STATION 1 @1/4 LENGTH (250 FEET) = ½”
STATION 2 @1/2 LENGTH (500 FEET) = 1”
STATION 3 @3/4 LENGTH (750 FEET) = 1 ½”
STATION 4 @ END OF 1000 FEET = 2”

Appendix B

The charts and tables contained in Appendix B, Sections 1 and 2 are applicable when CWR is cut or breaks and a gap is formed as a result. Using Appendix B will allow MOW gangs to determine the pre-cut/break RNT, as well as the total rail adjustment necessary to bring the rail in question back to the desired RNT of 95 degrees F. In doing this, the following procedure is to be used:

1. Make your cut (if applicable).
2. Measure the gap formed between the two rail ends due to the break or after the cut is made.
3. Using this gap distance, go to the "Rail Neutral Temperature (RNT) at Pull Apart or Break Chart (Pre-Cut/Break Chart)" and find the corresponding gap size in the table.
4. Measure the rail temperature at the time the cut is made or at the time that the gap due to the break was measured.
5. Move down the corresponding gap size column to find where it intersects with the measured rail temperature row.
6. Once the intersection point is found, note the temperature indicated at this point. This is your pre-cut/pre-break RNT.
7. Subtract this pre-cut/break RNT from the DRNT of 95 degrees F to find the temperature difference.
8. Go to the Thermal Adjustment Chart and find the temperature value that is most near to the temperature difference calculated in step 7. Write down the corresponding change in rail length.
9. Add this change in rail length to the width of the gap formed by the cut or break. This number is the amount of expansion required to bring the rail back to the DRNT of 95 degrees F.
10. Following the guidelines and procedures outlined in Section 3.2.1, perform the adjustment procedure to bring the RNT back up to the DRNT of 95 degrees F. See the examples below the Thermal Adjustment Charts for further guidance on how to use the charts and tables in Appendix B and perform the necessary calculations.

Appendix B: Section 1

HRRC Desired RNT = 95°F

Rail Neutral Temperature (RNT) at Pull Apart or Break Chart (Pre-Cut/Break Chart): Every-Other Tie Anchored

Rail Size 136-lb. A.R.E.M.A.: Every-Other Tie Anchored										
Rail Temp. (°F)	**Gap Size (inches)**									
	0.5	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
95	119	129	137	144	149	155	159	164	168	172
90	114	124	132	139	144	150	154	159	163	167
85	109	119	127	134	139	145	149	154	158	162
80	104	114	122	129	134	140	144	149	153	157
75	99	109	117	124	129	135	139	144	148	152
70	94	104	112	119	124	130	134	139	143	147
65	89	99	107	114	119	125	129	134	138	142
60	84	94	102	109	114	120	124	129	133	137
55	79	89	97	104	109	115	119	124	128	132
50	74	84	92	99	104	110	114	119	123	127
45	69	79	87	94	99	105	109	114	118	122
40	64	74	82	89	94	100	104	109	113	117
35	59	69	77	84	89	95	99	104	108	112
30	54	64	72	79	84	90	94	99	103	107
25	49	59	67	74	79	85	89	94	98	102
20	44	54	62	69	74	80	84	89	93	97
15	39	49	57	64	69	75	79	84	88	92
10	34	44	52	59	64	70	74	79	83	87
5	29	39	47	54	59	65	69	74	78	82
0	24	34	42	49	54	60	64	69	73	77
-5	19	29	37	44	49	55	59	64	68	72
-10	14	24	32	39	44	50	54	59	63	67
-15	9	19	27	34	39	45	49	54	58	62
-20	4	14	22	29	34	40	44	49	53	57

Thermal Adjustment Chart: Every-Other Tie Anchored

Change in Temp. (°F)	Change in Length (inches)
5	5/16”
10	5/8”
15	15/16”
20	1-1/4”
25	1-9/16”
30	1-7/8”
35	2-3/16”
40	2-1/2”
45	2-13/16”
50	3-1/8”
55	3-7/16”
60	3-3/4”
65	4-1/16”
70	4-3/8”

Rail expansion based on a 780’ affected length zone.
(390’, or 10 rail-lengths, on either side of the separation)

Example:

1. If the rail temperature is 25°F and it pulls apart 2”, then it has an RNT = 74°F.

2. HRRC requires an RNT = 95°F.

3. Change in temp. is
   95°F - 74°F = 21°F.

4. Change in length for 21°F = 1-1/8”.

5. Remove or adjust anchors/e-clips on both sides of cut/joint (to allow for rail movement).

6. Heat or pull rail 2” (to close gap) PLUS the 1-1/8” to adjust CWR to RNT = 95°F.

7. Total required rail expansion =
   2” + 1-1/8” = 3-1/8”.

Appendix B: Section 2

HRRC Desired RNT = 95°F

Rail Neutral Temperature (RNT) at Pull Apart or Break Chart (Pre-Cut/Break): Every Tie Anchored

Rail Size 136-lb. A.R.E.M.A.: Every Tie Anchored										
Rail Temp. (°F)	**Gap Size (inches)**									
	0.5	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
95	125	137	147	155	162	168	174	179	184	189
90	120	132	142	150	157	163	169	174	179	184
85	115	127	137	145	152	158	164	169	174	179
80	110	122	132	140	147	153	159	164	169	174
75	105	117	127	135	142	148	154	159	164	169
70	100	112	122	130	137	143	149	154	159	164
65	95	107	117	125	132	138	144	149	154	159
60	90	102	112	120	127	133	139	144	149	154
55	85	97	107	115	122	128	134	139	144	149
50	80	92	102	110	117	123	129	134	139	144
45	75	87	97	105	112	118	124	129	134	139
40	70	82	92	100	107	113	119	124	129	134
35	65	77	87	95	102	108	114	119	124	129
30	60	72	82	90	97	103	109	114	119	124
25	55	67	77	85	92	98	104	109	114	119
20	50	62	72	80	87	93	99	104	109	114
15	45	57	67	75	82	88	94	99	104	109
10	40	52	62	70	77	83	89	94	99	104
5	35	47	57	65	72	78	84	89	94	99
0	30	42	52	60	67	73	79	84	89	94
-5	25	37	47	55	62	68	74	79	84	89
-10	20	32	42	50	57	63	69	74	79	84
-15	15	27	37	45	52	58	64	69	74	79
-20	10	22	32	40	47	53	59	64	69	74

Thermal Adjustment Chart: Every Tie Anchored

Change in Temp. (°F)	Change in Length (inches)
5	5/16”
10	5/8”
15	15/16”
20	1-1/4”
25	1-9/16”
30	1-7/8”
35	2-3/16”
40	2-1/2”
45	2-13/16”
50	3-1/8”
55	3-7/16”
60	3-3/4”
65	4-1/16”
70	4-3/8”

Rail expansion based on a 780’ affected length zone.
(390’, or 10 rail-lengths, on either side of the separation)

Example:

1. If the rail temperature is 25°F and it pulls apart 2”, then it has an RNT = 85°F.

2. HRRC requires an RNT = 95°F.

3. Change in temp. is
   95°F - 85°F = 10°F.

4. Change in length for 10°F = 1/2”.

5. Remove or adjust anchors/e-clips on both sides of cut/joint (to allow for rail movement).

6. Heat or pull rail 2” (to close gap) PLUS the 1/2” to adjust CWR to RNT = 95°F.

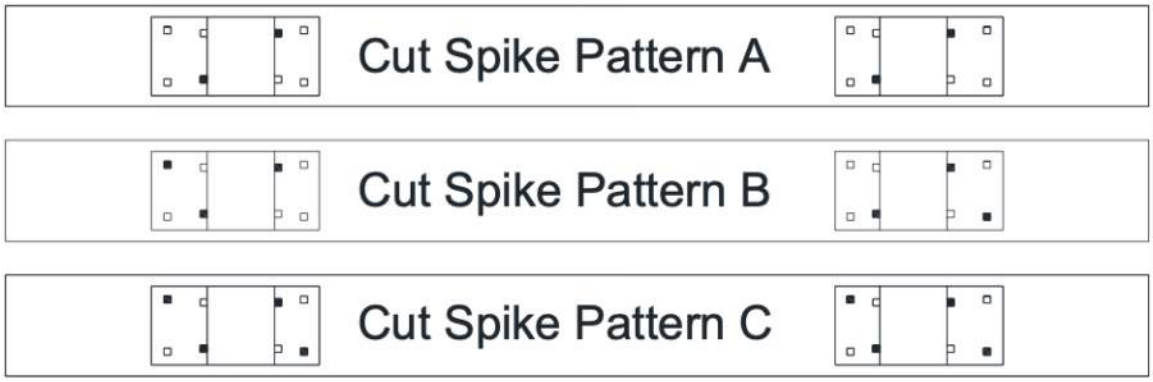
7. Total required rail expansion =
   2” + 1/2” = 2-1/2”.

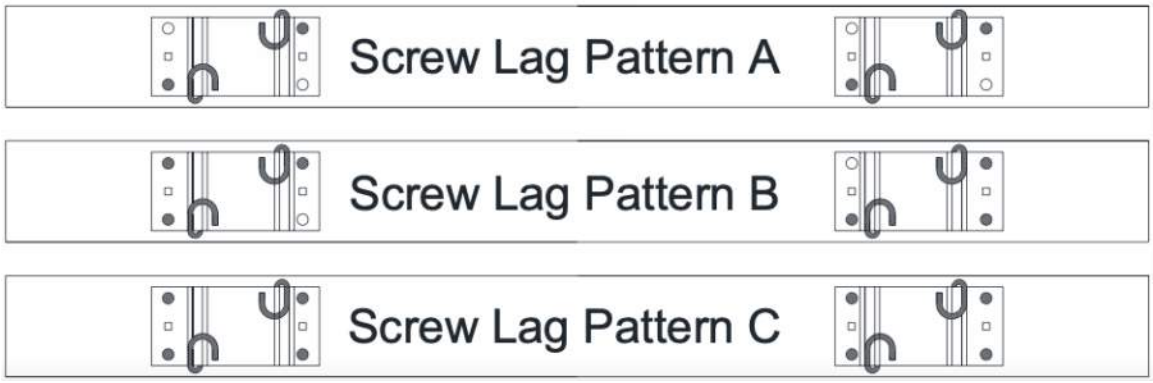
Appendix C

Housatonic Railroad Spiking Patterns				
Class of Track	**Tangent Track**	**Curves 0-3 Degrees**	**Curves 3-6 Degrees**	**Over 6 Degrees**
1	A	A	A	B
2	A	A	B	B
3	A	B	B	C
4	A	B	B	C

Positive Restraint Rail Fasteners may be used in any class of track or alignment.

The Chief Engineer for HRRC may require more restrictive spiking patterns depending on field conditions.





Appendix D

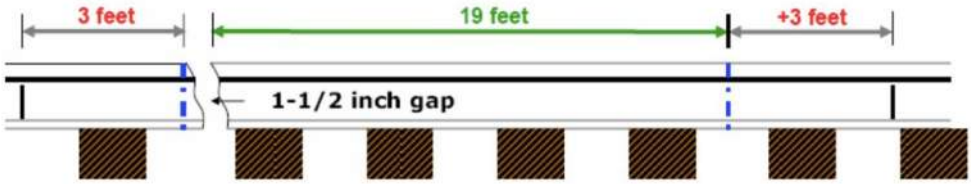
Housatonic Railroad Reference Mark Procedure

1. Start at one end of the break, then measure back 3 feet and make the first mark (see image below).

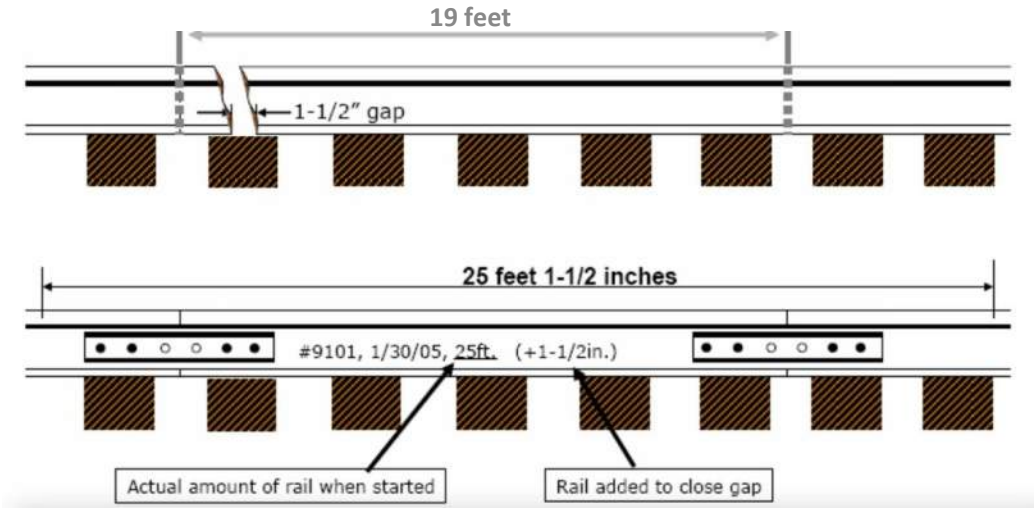
2. From the opposite end of the break, measure back the length of the replacement rail PLUS another three feet (see image below).

3. Add up the amount of rail on either side of the gap.

   Example: 3 ft + 19 ft + 3 ft = 25 ft



4. Select a location between the two reference marks to cut in the new rail (see image below).



5. Measure the total distance between the two reference marks (see image above). Then, take this final length and subtract the length obtained in Step 3. This is the total rail added.

   Example: 25' 1-1/2" – 25' = 1-1/2" of rail added.

6. Before leaving, mark on the field side of the replacement rail the following information:
    - Milepost
    - Rail temperature at time of replacement
    - Date of replacement
    - Distance between reference marks after replacement (Ex: 25’ 1-1/2”)
    - Amount of rail added or removed (+ indicates rail added, – indicates rail removed)
    - See sample below

Milepost Rail Temperature Date	Distance Between Marks Rail Added or Removed

Example:

13.4 NU 57 ° 4/12/2013	6' 8" + 1"

Appendix E

Housatonic Railroad Thermal Log for Rail Expansion in CWR

Date _____

Time _____

Location _____

Track _____

Railroad Supervisor in Charge_____

Weather _____

Ambient Temperature _____

Rail Identification _____

Rail Weight _____

Cold Rail Temperature _____

DRNT: 95°F
DRNT – Cold Rail Temperature_____

EXPANSION	ACTUAL	CALCULATED	ANCHORING TEMPERATURE
¼ POINT			
½ POINT			
¾ POINT			
END OF RAIL			
TOTAL			

REMARKS:_____
_____
_____
_____
_____
_____

Appendix F

Housatonic Railroad Joint Bar Inspection

Date Inspected	Track	Prefix	MP Limits		Inspectors Name	Total Jts Inspected
			From	To		

Joint Bar Conditions Noted					Action Taken					
Date Found	Track	Prefix	MP Location	Rail	Condition Code	Date Repaired	Slow Order	Speed	Inspect in 14 Days	
				N,S, E,W					Date	Date

Rail Joint Codes

01 - Visible cracks in bar
02 – Loose Bolts
03 – Bent Bolts
04 – Missing Bolts
05 – Tie(s) not effectively supporting joint
06 – Broken or missing tie plate(s)
07 – Deteriorated Insulated Joint
08 – Rail end batter> 3/8 in depth and > 6 inches in Length measured w/ 24" straight edge
09 – Rail end mismatch reaches limits specified by 213.115
10 – Longitudinal rail movement > 2 "
11 – Wide rail gap > 1 1/2
12 – Joint vertical movement that exceeds PR1 levels (1 class higher) of the allowable threshold for the designated. class track
13 – Fouled Ballast
14 – Joint lateral movement (in curve) ≥3/4"

DOCUMENT A00901

HOUSATONIC RAILROAD ON TRACK SAFETY MANUAL

THIS PAGE IS INTENTIONALLY LEFT BLANK

Housatonic Railroad

ON TRACK SAFETY MANUAL

EFFECTIVE:

0001 Hours, Tuesday July 1, 2014
(Supersedes October 1, 2004)

FOR THE GOVERNMENT OF EMPLOYEES ONLY

TABLE OF CONTENTS
REGULATIONS GOVERNING ON-TRACK SAFETY

ITEM	RULE	PAGE
Responsibilities of Employees		
Compliance	**RW-1**	**5**
Fouling	**RW-2**	**5**
Before Fouling	**RW-3**	**5**
Good Faith Challenge	**RW-4**	**5**
Safe Passage of Trains	**RW-5**	**5**
Personal Protective Equipment	**RW-6**	**5**
Clearing for Trains	**RW-7**	**5**
Employee in Charge	**RW-8**	**6**
Responsibilities	**RW-9**	**6**
Job Briefing	**RW-10**	**7**
Lone Worker	**RW-11**	**8**
Lone Worker Job Briefing	**RW-12**	**9**
Type of On-Track Protection to be Used		
Type of Track	**RW-13**	**10**
Employees Protected	**RW-14**	**10**
Protection Available	**RW-15**	**10**
Exclusive Use of Track	**RW-16**	**10**
Foul Time	**RW-17**	**11**
Inaccessible Track	**RW-18**	**11**
Individual Train Detection	**RW-19**	**11**
Watchmen/Lookouts **N/A**	**RW-20**	**11**
Train Coordination **N/A**	**RW-21**	**11**
Establishing On-Track Protection		
Exclusive Use of the Track	**RW-22**	**11**
Foul Time	**RW-23**	**19**
Individual Train Detection	**RW-24**	**20**
Watchmen **N/A**	**RW-25**	**21**
Performing Work and Clearing Track		
Operating Self-Propelled Equipment	**RW-26**	**22**
Clearing Tracks	**RW-27**	**23**
Challenge Resolution		
Resolving On-Track Safety Challenge	**RW-28**	**25**
Definitions		
Definitions		**32**
Forms		
Statement of On-Track Safety		**36**
Good Faith Challenge Form		**37**

TABLE OF CONTENTS
REGULATIONS GOVERNING BRIDGE WORKER SAFETY

ITEM	RULE	PAGE
Responsibilities of Employees		
Compliance	**RW-40**	**28**
Conditions Requiring Use of Fall Arrest	**RW-41**	**28**
Conditions Not Requiring	**RW-42**	**28**
Procedures Prior To Use	**RW-43**	**28**
Components Of Fall Arrest System	**RW-44**	**29**
Components Of Safety Net System	**RW-45**	**30**
Inspection Of Safety Nets	**RW46**	**31**
Working Over Water Or Adjacent To	**RW-47**	**31**
Use Of River Craft	**RW-48**	**31**
Use Of Scaffolding	**RW-49**	**31**
Definitions		
Definitions		**32**
Forms		
Statement of On-Track Safety		**36**
Good Faith Challenge Form		**37**

REGULATIONS GOVERNING ON-TRACK SAFETY

The regulations herein are effective July 1, 2001. They must be observed by all Housatonic employees and contractor employees working on or within 4 feet of the outside rail of any Housatonic Railroad track.

The intention of these regulations is to guard against employees being struck by trains or on-track equipment while performing their duties.

This book contains all rules and procedures that apply to on-track safety, including the responsibility of Roadway Workers and procedures for providing protection from trains and on-track equipment.

All Roadway Workers must be qualified on the Operating Rules and when required by their duties, must be qualified on the Physical Characteristics of the territory they are required to work. Roadway Workers will be responsible to maintain all qualifications required.

Any employee providing on-track protection and each Lone Worker, as defined herein, must have a copy of this manual in his/her possession at all times.

Responsibilities of Employees

ROADWAY WORKERS

RW-1. Compliance
Each roadway worker is responsible for complying with the regulations governing On-Track Safety.

RW-2. Fouling
No roadway worker will foul tracks except when necessary in the performance of duty, and only then, in accordance with these rules.

RW-3. Before Fouling
Before fouling a track, ascertain that on-track safety is being provided.

RW-4. Good Faith Challenge
If you are given a directive that would violate an on-track safety procedure, you may make a good faith challenge to that directive. Inform the employee in charge of on-track safety that the on-track safety protection to be applied does not comply with the regulations governing On-Track Safety.

Remain in the clear of tracks until the conflict is resolved, as shown in rule RW-28.

RW-5. Safe Passage of Trains
No work may be attempted that would interfere with the safe passage of trains.

RW-6. Personal Protective Equipment
Roadway workers must wear a high visibility vest, or other approved garment, hard hat and safety glasses, when on or about the track.

RW-7. Clearing for Trains
On receiving warning or knowing of the approach of a train, all employees must clear tracks at least 15 seconds before the train reaches the point of work, discontinue all activity, and remain clear until safe to resume work.

EMPLOYEE IN CHARGE

RW-8. Employee in Charge
Every Roadway Work Group whose duty requires fouling a track shall have one roadway worker designated to provide on-track safety for all members of the group.

When two or more Work Groups are assembled to work as a single group, one foreman must be designated to take charge of the work and be responsible for the protection of the employees. Each foreman involved will be advised which one of them is to be Employee in Charge. In an emergency or until one foreman has been designated, the foreman in whose territory the work is being performed will take charge, but if he is not present, the foremen will agree as to which one of them will be in charge. The Employee in Charge will advise each of the other foremen what his duties will be with respect to the safety of their employees.

The designated employee shall be qualified on the NORAC Operating Rules, Regulations Governing On-Track Safety, and the physical characteristics of the territory where the work will be performed.

RW-9. Responsibilities
The Employee in Charge of on-track protection is responsible for a safe operation and must exercise precaution to protect the employees in his/her charge. The Employee in Charge must.

a) Conduct job briefings with each employee that include the on-track safety protection that will be provided and the safety procedures that will be followed.

b) Get an acknowledgment from each roadway worker that the job briefing was understood.

c) If the on-track protection changes during the work period, inform each employee before the change becomes effective, except in an emergency. If the employee cannot be notified in advance because of an emergency, have the employee clear the track immediately, and stay clear until on-track protection is established.

d) Notify all employees before the Working Limits are released for the operation of trains. Do not release the Working Limits until all affected employees have either left the track or have been given on-track protection.

RW-10. Job Briefing

All Roadway Workers whose duties require the coordination between two or more workers must perform a job briefing prior to starting their job. The Roadway Worker must acknowledge that they have a clear understanding of the task, how it is to be accomplished and the on-track protection procedure to be used.

Job Briefings should be conducted face to face. When not practical or possible to do so, radio or telephone can be used. Discussion between employees must include, but is not limited to, the following:

1. The specific job to be performed for the day. Example: Installing ties at new interlocking under construction.

2. What type of protection the Employee in Charge intends to use. Example: Depending on the nature of the work, the affected track will be taken out of service, obstructed, or Foul Time will be requested.

3. Responsibilities of each employee. Example: Which foreman will be in charge of the Work Group.

4. Any known hazards or situations that could jeopardize personal safety. Example: The adjacent track is in service and trains will be passing work site at Normal Speed.

5. How equipment is to be operated, and which communication method will be used. Example: Who will give the crane operator hand signals.

6. Any requirements that will affect their job, such as orders to clear the track by a certain time.

7. All known unusual conditions or situations that may affect their job assignment.

8. If necessary to work under traffic, where the Predetermined Place of Safety(PPOS) location will be to clear the track. Employees must **not** clear the track by occupying another track unless that track is out of service.

Job Briefing should be updated regularly. When there is more than one foreman on the jobsite only one foreman can be in charge of the worksite. The foremen in charge must keep all other foreman up-to-date and must have a clear understanding as to how the job is to be conducted.

LONE WORKER

RW-11. Lone Worker
Each Lone Worker will communicate at the beginning of each duty period with a supervisor or another designated employee in order to receive a job briefing. The Lone Worker will advise such person of the Lone Worker's planned itinerary and the procedures that the Lone Worker intends to use for on-track safety.

When communication channels are disabled, the Lone Worker may begin the work and conduct the job briefing as soon as communications are restored.

RW-12. Job Briefing for Lone Worker

All Roadway Workers whose duties require them to work alone and who are not part of any other work group must contact their supervisor before the start of their work and conduct a job briefing. The Roadway Workers must acknowledge that they have a clear understanding of the task and the on-track protection procedure to be used.

Job Briefings should include how the worker intends to protect him/herself against moving track equipment or trains.

Discussion between Lone Worker and his/her supervisor must include, but is not limited to, the following:

1. All specific jobs to be performed for the day. Example: Inspecting track between two specific locations.

2. Responsibilities of the Lone Worker. Example: What portions of the job will require "Individual Train Detection" and when the track would need to be taken out of service.

3. Any known hazards or situations that could jeopardize personal safety. Example: The adjacent track is in service and trains will be passing the Lone Worker at Normal Speed.

4. How communication will be established. Example: Will the Lone Worker be monitoring the radio and on which frequency.

5. Any requirements that will affect the job, such as orders to clear the track by a certain time if the track is to be taken out of service.

6. All known unusual conditions or situations that may affect the job assignment.

7. If necessary to work under traffic, where will the PPOS location be to clear the track. Employees must **not** clear the track by occupying another track unless that track is out of service.

Job Briefing should be updated regularly. When it is not possible to contact the supervisor another employee must be designated to conduct an updated job briefing. If no other M of W employee is available to conduct a job briefing, the Dispatcher must be contacted and a job briefing will be conducted with the Dispatcher.

TYPE OF ON-TRACK PROTECTION TO BE USED

RW-13. Type of Track
The Employee in Charge of on-track protection will determine if the track to be protected is:

a) Controlled Track.
b) Non-controlled Track.
c) Interlocking Limits.

RW-14. Employees Protected
The Employee in Charge of on-track protection will determine if the employee(s) to be protected are a Roadway Worker Group or a Lone Worker.

RW-15. Protection Available
The Employee in Charge of on-track protection will determine what types of protection are available based upon the type of track and the employees that need protection.

One of the following means of protection must be selected:

a) Exclusive use of track
b) Foul time
c) Inaccessible track
d) Individual train detection

RW-16. Exclusive Use of Track
Exclusive use of track establishes Working Limits on Controlled Track by one of two methods:

a) The Dispatcher or Block Operator withholds or restricts authority to move into the Working Limits as established by Form D Line 4, or Line 5.,

RW-17. Foul Time
Foul Time establishes Working Limits on controlled track Through exclusive track occupancy by:

a) The Dispatcher or Block Operator giving an employee verbal permission to foul a specific segment of controlled track during a specific time period.

Foul Time remains in effect until the employee to whom the Foul Time was issued reports clear of the track.

NOTE: Foul Time cannot be used if the work involves on-track equipment, or if the work will make the track structure unsafe for Normal Speed.

RW-18. Inaccessible Track
Inaccessible track establishes Working Limits on Non-controlled Track by using switches, derails, and/or M of W Watchmen to prevent access to the Working Limits.

RW-19. Individual Train Detection
Individual Train Detection (ITD) may be used under strictly defined circumstances by trained and qualified Lone Workers to provide on-track protection on certain tracks outside Working Limits.

Note: Lone Workers have the right to use on-track protection other than ITD if they feel it is necessary to perform their work safely.

RW-20. Watchmen/Lookouts

(Does not apply to HRRC)

RW-21. Train Coordination

(Does not apply to HRRC)

ESTABLISHING THE ON-TRACK PROTECTION

RW-22 Exclusive Use of Track
The following rules give procedures for establishing exclusive use of track.

(NORAC Rule 132)

Protection When Fouling Working on a Track; Protection in Unforeseen Conditions.

Trains must be fully protected against any known condition that may interfere with their safe passage.

If work on or adjacent to a track will create a condition interfering with the safe passage of trains, that work must not be attempted without permission of the employee in charge of the track.

On tracks where ABS, DCS, or Interlocking rules are in effect, the Dispatcher (or Operator when authorized by the Dispatcher) must assure that protection against trains in both directions has been provided as follows:

1. If the work involves on-track equipment or will disturb the track structure so that it would be unsafe for Normal Speed, Form D line 4 or Form D line 5 must be issued.

2. If the work will not disturb the track structure, the Dispatcher may verbally authorize Foul Time in accordance with NORAC Rule 140.

Form D line 4, Form D line 5, and Foul Time may be issued only to employees who are qualified on the operating rules and the physical characteristics of the territory involved.

If an event occurs or conditions are found that may interfere with the safe passage of trains and no protection has been provided, employees must immediately attempt to stop trains by radio communication to trains and the Dispatcher. They must provide flag protection in both directions as prescribed by NORAC Rule 130, paragraph (b), “Flag Protection Against Trains on Adjacent Tracks”. Flag Protection must be maintained until the unsafe condition has been corrected, or until employees are assured by the Dispatcher or Operator that other protection has been provided.

(NORAC Rule 133)

Removing a Track from Service

Whenever Form D line 4 is issued to remove a track from service, the following procedures will apply:

a. Action Required Prior to Issuance

The Dispatcher must not issue the Form D Line 4 authority until:

1. The affected track is clear of other movements that are not part of the work group

AND

2. Controlled signals leading to the affected track are in Stop position,

AND

3. Blocking devices are applied to the controls of switches and signals leading to the affected track.

These signals must not be displayed for movement leading to the out-of-service track, except as provided for in NORAC Rule 134, paragraph (a), “Movement in the Direction of the Out-of –Service Track”.

b. Addressees

Form D must be issued to both:

1. The employee requesting use of track,

AND

2. The Operators controlling entrance to the track.

c. Establishing Out-of-Service Limits

Each end of the out-of-service limits must be defined by one of the following physical features:

1. A whole mile post.

2. A station or other physical characteristic location.

3. A track barricade or flagman at a designated location.

(NORAC Rule 133, cont'd.)

d. Operation Within Out-of-Service Limits

The employee named in Form D Line 4 is in charge of the out-of-service limits. ABS, CSS, DCS, and Interlocking rules do not apply within the out-of-service limits. All movements must operate at Restricted Speed. Interlocking switches within the out-of-service limits must not be operated without permission of the employee in charge.

EXCEPTION: In territory where non-signalled DCS rules apply in both directions, the employee in charge of the out-of-service limits may authorize trains to operate within the out-of-service limits at Normal Speed not exceeding 30 MPH, when the following conditions have been met:

1. The track to be used must be clear and safe for the speed to be authorized.
2. All affected switches must be secured in normal position.
3. All affected Roadway Workers must be notified.
4. Permission must be given in the following manner: *"Extra 453 may proceed North through my out-of-service limits at Normal Speed (not exceeding 30 MPH) from A to B"* This permission must be repeated and confirmed before it is acted upon.
5. No following movements may be permitted behind the train given this authority.

The train must not reverse direction without the permission of the employee in charge. If permission is received, the movement must be made at Restricted Speed.

e. Additional Equipment Entering or Leaving Out-of-Service Limits.

1. Additional equipment may enter the out-of-service limits after:

(a) The person in charge of the additional equipment has received permission from the employee in charge of the out-of-service limits. The employee in charge of the out-of-service limits must show or read his copy of the Form D Line 4 to the person in charge of the additional equipment unless the limits are published by Bulletin Order.

(b) If movement to the out-of-service limits will involve passing a Stop Signal, the Dispatcher or Operator may then authorize movement in accordance with Rule 241.

(NORAC Rule 133, cont'd.)

g. Returning the Track to Service

When the track is to be returned to service, the employee in charge of the out-of-service track must take two actions:

1. He must notify the Dispatcher or Operator of any restrictions necessary for the safe passage of trains.

AND

2. He must ascertain that all track cars and trains are clear of the track, and notify the Dispatcher or Operator that they are clear.

   EXCEPTION: With the Dispatcher's permission, the track may be returned to service while it is still occupied by equipment. Before the track is returned to service, the employee in charge of the track must ensure that the equipment remaining on the track receives proper authority to occupy the track after it is returned to service. If the track is governed by Rule 261, permission must include direction of movement.

(NORAC Rule 135)

Protection by Stop Signs When an In-Service Track is Obstructed for Maintenance

Whenever Form D line 5 is to be issued in accordance with item 1 of Rule 132, "Protection When Fouling or Working on a Track," the following procedures will apply. The "Working Limits" refers to the area designated by Form D line 5 or Bulletin Order, which must be identified by a whole milepost, station, or other physical characteristic location.

a. Addressees

Form D Line 5 must be issued to both:

1. The employee requesting to obstruct the track,

AND

2. Trains approaching the obstructed track.

EXCEPTION: When the Working Limits is published by Bulletin Order, issuance of Form D to approaching trains is not required.

b. Required use of Signs

The approach to the Working Limits must be indicated by an Approach Sign. The Approach Sign indication will not apply when permission is received to proceed past the stop sign.

The Working Limits must be indicated by a Stop Sign and a Working Limits Resume Speed Sign. A Working Limits Speed Limit Sign may be substituted for the Stop Sign when the track is not obstructed.

c. Action Required Prior to Issuance

The Dispatcher must not issue Form D line 5 authority until:

The affected track is clear of movements that are not part of the work group.

AND

The Employee in Charge has advised that all signs associated with the working limits have been properly placed.

(NORAC Rule 135, cont'd.)

d. Movements within Working Limits

A train must not enter the Working Limits until permission has been received from the employee in charge, unless a Working Limits Speed Limit Signs is displayed. The Employee in Charge must not authorize a train to enter the Working Limits or display a Working Limits Speed Limit Sign until he has been assured that the track through the Working Limits is not obstructed, and all Roadway Workers have been notified. Trains must not exceed 30 MPH through the Working Limits, unless directed by the Employee in Charge to operate at a higher or lower speed.

EXCEPTION: Trains and track cars that will be performing maintenance within the Working Limits:

1. May be admitted by the Employee in Charge while the Working Limits is still obstructed.

2. Must operate at Restricted Speed (ABS, DCS and CSS rules do not apply to such movements).

3. Must not leave the Working Limits without proper authority.

e. Interlocking Switches within Restricted Area

Dispatchers or Operators controlling interlocking switches within the Working Limits must line such switches for movements within the Working Limits and must apply blocking devices to the controls of those switches. These blocking devices must not be removed without permission of the Employee in Charge of the Working Limits. This requirement does not relieve employees operating within the Working Limits from complying with interlocking signal indications.

Before displaying a signal for a train to divert into the Working Limits, the Dispatcher must confirm with the Engineer that the train has permission to enter the Working Limits.

f. Trains in the Working Limits when Bulletin Order Item Becomes Effective.

Any train that is in the Working Limits when Bulletin Order becomes effective may continue at Normal Speed through the Working Limits. The Dispatcher must not issue Form D Line 5 until the limits are clear of movements that are not part of the Work Group.

Table 1. Minimum stopping distances From Approach Signs to Stop Signs on level or ascending grades.

Normal Speed (MPH)	**Maximum Stopping Distance (feet)**	
	Passenger	**Freight**
80	6,200	-------
70	4,700	-------
60	3,450	14,500
50	2,700	11,100
40	2,000	8,700
30	1,400	5,900
20	900	3,800
10	500	1,900

Table 2. Minimum stopping distances from Approach Signs to Stop Signs on descending grades. The approach distance from Table 1 should be increased as follows:

Grades	Increase	Grades	Increase
0 -.09%	None	1.01 % -1.10%	50%
.10% -.30%	10%	1.11% - 1.30%	60%
.31% - .50%	20%	1.31% - 1.40%	70%
.51% - .80%	30%	1.41% - 1.60%	80%
.81% - 1.00%	40%	1.61% 0 1.70%	90%

RW-23. Foul Time

The following rule gives the procedures for establishing Foul Time. Also refer to NORAC Rule 132, Protection When Fouling or Working On a Track, Protection In Unforeseen Conditions.

(NORAC Rule 140)

Foul Time may be issued only by the Dispatcher, or Operator when authorized by the Dispatcher.

a. Action Required Prior to Issuance

Before issuing or authorizing Foul Time, the Dispatcher must determine that no trains have been authorized to occupy the track segment to be fouled. In signaled territory, the Dispatcher must ensure that Stop Signals have been displayed and blocking devices applied to controls of switches and signals leading to the affected track. When trains are to be held at a TBS where blocking devices cannot be applied, the Dispatcher must issue Form D line 13 instructing the Operator to hold trains clear of the affected track.

b. Permission to Foul

Permission to foul the track must include the following information:

1. Title and name of employee receiving foul time.
2. Track designation
3. Track limits (between/at)
4. Time limits

The receiving employee must repeat this permission and the Dispatcher or Operator must then confirm it before the Foul Time becomes effective.

c. Releasing Foul Time

Once protection has been provided, it must be maintained until the employee who was granted the Foul Time has released the foul time. The release must include the employee's title and name, and the track designation and limits being released. This information must be repeated by the Dispatcher or Operator, and confirmed by the employee releasing the foul time before blocking devices are removed.

(NORAC Rule 141)

Inaccessible Track

Roadway Workers may establish working limits on a track not controlled by the Dispatcher or Operator, by making the track inaccessible at each possible point of entry through one of the following means:

1. A switch or derail aligned to prevent access to the Working Limits and secured with an effective securing device, and properly tagged. The effective securing device and tag may be removed only by direction of the employee in charge of the Working Limits.

2. A remotely controlled switch aligned to prevent access to the Working Limits and secured with a blocking device by the employee who controls the switch. Blocking device protection must not be considered in effect until is has been confirmed by the employee controlling the switch. Protection must be maintained until the employee who requested the protection has reported clear.

3. A disconnected rail.

4. A flagman assigned to hold trains and equipment clear of the Working Limits.

Movements within Working Limits may be made only with permission of the employee in charge.

RW-24 Individual Train Detection

The following rules give procedures for using Individual Train Detection (ITD). If you are a Lone Worker and cannot comply with all the provisions of Individual Train Detection, you must establish another form of on-track protection before you foul any track.

Individual Train Protection
(Watching For Trains Yourself)

If you are a Lone Worker who fouls a track while performing routine inspection or minor correction, you may watch for trains yourself only if all of the following eight conditions are met:

1. You are trained and qualified to use Individual Train Detection (ITD).

2. You are not within an Interlocking.

3. You are able to visually detect the approach of a train moving the maximum speed authorized for that track and

move to a previously determined place of safety at least 15 seconds before the train reaches you.

Note: The place of safety may not be another track unless Working Limits are established on that track.

4. There are not power-operated tools or roadway maintenance machines in use within your range of hearing.

5. Your ability to see and hear approaching trains and other on-track equipment is not impaired by background noise, lights, fog, precipitation, passing or standing trains, or any other physical conditions.

6. You may not occupy a position or engage in any activity that would interfere with your ability to maintain a vigilant lookout for, and detect the approach of, a train moving in either direction.

7. You must participate in a job briefing with your supervisor or other designated employee, such as the Dispatcher or Block Operator, at the beginning of your tour of duty. This briefing must include:

    a) Your Planned itinerary,

AND

    b) The on-track protection you plan to use.

EXCEPTION: If you are not able to communicate with the designated employee due to a communications failure, you may begin the work and conduct the job briefing as soon as communications are restored.

8. You have completed a Statement of On-Track Safety. Only one statement can be in effect at a time.

RW-25 Watchmen

(Does not apply to HRRC)

PERFORMING THE WORK AND CLEARING THE TRACK

The following rules must be followed while operating roadway maintenance machines and when clearing the tracks.

RW-26 Operating Self-propelled Equipment
Follow these precautions when operating self-propelled equipment:

1. The employee must be qualified or must be a trainee under the supervision of a qualified employee.

2. Keep the Operator's Manual available on the equipment to determine safe operating procedures.

3. Communicate with any employee(s) who are near the equipment regarding:

   a) Normal equipment operating procedures.

   b) Location of employees working around or observing the equipment.

   c) Operator's blind spots.

   d) Signals warning that the equipment will move.

4. Do not get closer than 15 feet to employees working on the track in front of or behind the equipment unless:

   a) The operation requires employees to be closer,

AND

   b) You have communicated with the affected employees.

5. Keep at least 30 feet from standing or working equipment to avoid collisions. Increase the distance between machines when:

   a) The equipment is working on territory where grades or curves limit the sight distance,

OR

   b) The rail is wet, icy, or slippery.

EXCEPTION: When the operation requires, the 30 foot distance between equipment may be reduced after arrangements have been made with all affected employees to ensure that no employees are between the equipment.

6. Consider the following factors when determining a working speed for the equipment:

   a) Location of employees required to be on the track in the area.

   b) Operator's visibility.

   c) Braking distance.

   d) Speed required to do the job.

   e) Physical characteristics of the track.

   f) Environmental conditions.

7. Do not foul the track with any part of the equipment unless:

   a) The adjacent track is a controlled track and exclusive use or Foul Time has been established on the track.
   b) The adjacent track is a non-controlled track and the track has been made inaccessible.

8. Test the brakes immediately after starting to travel.

9. When employees are getting on, getting off, or between self-propelled equipment, disengage the clutch or gears and set the brakes to hold.

10. Do not allow anyone to distract you or interfere with your duties. If this happens, stop all movement.

RW-27 Clearing Tracks

The following rules give procedures for clearing tracks.

(NORAC Rule 808)

Clearing a Track Specified on Form D Line 2

When a track car clears the track specified on Form D line 2, the Form D authorizing the use of the track is fulfilled, and a new Form D must be issued for any further movement. The Foreman or Track Car Driver must report clear to the Dispatcher or Operator.

Safety Precautions For Clearing All Tracks

Follow these safety precautions when clearing tracks:

1. When you are notified or become aware of the approach of a train, stop all work. Clear the tracks at least 15 seconds before the train reaches you.

2. Move to the location established by the Employee in Charge during the job briefing.

Note: You may not clear onto another track unless Working Limits have been established on that track.

3. Stop all equipment and vehicles on the right of way while the train is passing.

4. Do not leave tools, objects, material, or equipment where they could be struck by the passing train.

5. Face the direction from which the train is approaching. Watch for projecting, dragging, or falling objects.

6. Inspect all passing trains. If you detect a dangerous condition, use any available means to warn the crewmembers on the passing train to stop. If the train does not stop at once, notify the Dispatcher.

7. Stay clear until you are notified that it is safe to resume work.

Clearing Controlled Tracks

Follow this procedure to clear a controlled track, which is any Track shown in the Timetable as being under the control of a Dispatcher, Block Operator, or Yard Master.

1. Clear all tracks, keeping at least 30 feet away from passing trains and equipment, if possible. Do not clear onto another in service track.

2. If you are operating equipment and you are within the gauge of the track, stay on your machine. If you are not within the gauge of the track, dismount the equipment and clear the track.

Clearing Non-Controlled Industrial and Yard Tracks

Follow these procedures when working on and clearing non-controlled track (industrial, Yard, or any other track not controlled by the Dispatcher, Block Operator or Yard Master):

1. If a train is approaching on an adjacent track, stop work and stand in the center of the track where you are working.

2. If you are a Lone Worker using ITD you must be governed by the following:

   a) The place of safety cannot be on a track that is not shown on your Statement of On-track Safety, unless Working Limits are established on that track.
   b) A maximum of three adjacent tracks may be shown on one Statement of On-track Safety.
   c) You must always be prepared to clear all tracks if necessary.

CHALLENGE RESOLUTION

HRRC Roadway Workers have the absolute right to challenge, in good faith, any directive that would violate any Regulation Governing On-Track Safety. The Roadway Worker will remain clear of the track until a challenge is resolved.

RW-28. Resolving an On-track Safety Challenge

When a Roadway Worker has concerns about any directive that would violate the Regulations Governing On-track Safety the following procedures will apply:

1. The Roadway Worker will discuss the on-track safety procedures at the work location with the Employee in Charge. The worker and the Employee in Charge will try to clarify any misunderstanding and will resolve any differences of opinion about the on-track safety procedures.

2. If the worker and the Employee in Charge are unable to resolve the conflict, the employee may challenge the on-track safety procedures. To issue such a challenge, the worker must:

   a) Do so in good faith. The worker must have an honest concern that the procedures in place do not comply with these on-track safety regulations.

   b) Be able to explain his/her concern about the proposed on-track safety procedures being applied.

3. If the worker decides to challenge the on-track safety procedures, he/she must:

   a) Notify the Employee in Charge.

   b) Notify any other Roadway Workers of his/her concern.

   c) Remain clear of the track.

   d) The worker will explain the reason(s) for their concern on a “Roadway Worker Challenge Form”.

   e) The worker will give the “Roadway Worker Challenge Form” to the Employee in Charge.

4. The Employee in Charge will review the Challenge Form and determine whether the worker’s statement of on-track safety procedures at the work location is accurate and the On-track Safety procedures comply with the Regulations Governing On-track Safety.

5. If the Employee in Charge determines that the worker's concerns are valid, the Employee in Charge changes the procedures so that they comply with the regulations. If the worker considers the challenge resolved, the Employee in Charge forwards the challenge form to the Division Engineer's office and the workers return to work.

6. If the Employee in Charge determines that the worker's concerns are not valid the Employee in Charge notifies the worker and documents the determination on the Challenge Form. If the worker considers the challenge to be resolved, the Employee in Charge forwards the Challenge Form to the Division Engineer's office and the worker returns to work.

7. If the worker does not consider the challenge to be resolved, the Employee in Charge will contact his /her supervisor for a resolution.

8. The Supervisor reviews the Challenge Form and determines whether the proposed on-track safety procedures at the work location comply with the regulations. The Supervisor will contact the employees named on the form to make this determination.

9. If the Supervisor determines that the challenge was valid, the Supervisor will arrange for the procedures to comply with the regulations. Once the procedures are in compliance, the worker(s) returns to work. If the Supervisor determines that the challenge was not valid, the Supervisor explains to the worker why the challenge was not valid. The challenge is considered resolved and the worker(s) return to work.

10. A copy of the completed challenge form will be forwarded to the Division Engineer's (or designee) office. For the purpose of this section, the title "Division Engineer" may also include Engineers of Track, Structures, and Signal Construction. The original copy of the completed challenge form must be sent to the Director of Rules and Safety (or designee).

TYPES OF PROTECTION	CONTROLLED TRACK		NON-CONTROLLED TRACK		INTERLOCKING	
	GANG	LONE	GANG	LONE	GANG	LONE
EXCLUSIVE USE OF TRACK	X	X			X	X
FOUL TIME	X	X			X	X
INACCESSIBLE TRACK			X	X		
INDIVIDUAL TRAIN DETECTION		X		X		

Responsibilities of Employees

BRIDGE WORKER SAFETY

RW-40. Compliance
Each roadway worker is responsible for complying with the regulations governing Bridge Worker Safety.

RW-41. Conditions Requiring Use of Fall Arrest Systems
When bridge workers work twelve feet or more above the ground or water surface, they shall be provided and shall use a personal fall arrest system or safety net system.

RW-42. Conditions That Do Not Require Use of Fall Arrest Systems
(1) If the installation of the fall arrest system poses a greater risk than the work to be performed, OR
(2) If the inspection of railroad bridges are conducted in full compliance with the following conditions:
(i) The railroad has a written program in place that requires training in, adherence to, and use of safe procedures associated with climbing techniques and procedures to be used;
(ii) Bridge workers have been trained and qualified according to that program to perform bridge inspections, have been previously and voluntarily designated to perform inspections under the provision of that program, and have accepted the designation;
(iii) Bridge workers are familiar with the appropriate climbing techniques associated with all bridge structures they are responsible for inspecting;
(iv) Bridge workers are engaged solely in moving on or about the bridge or observing, measuring and recording the dimensions and condition of the bridge and its components;
(v) Bridge workers are provided all equipment necessary to meet the needs of safety, including any specialized alternative systems required.
(3) Where bridge workers are working on a railroad bridge equipped with walkways and railings of sufficient height, width, and strength to prevent a fall, so long as bridge workers do not work beyond the railings, over the side of the bridge, on ladders or other elevation devices, or where gaps or holes exist through which a body could fall.
(4) This section shall not apply where bridge workers are performing repairs or inspections of a minor nature that are completed by working exclusively between the outside rails, including but not limited to, routine welding, spiking, anchoring, spot surfacing, and joint bolt replacement

RW-43. Procedures Prior to Use of Fall Arrest Systems
Prior to use and after any component or system is changed, bridge workers shall be trained in the application limits of the

equipment, proper hook-up, anchoring and tie-off techniques, methods of use, and proper methods of equipment inspection and storage.

RW-44. Components of a Fall Arrest System

All components of a personal fall arrest system shall conform to the following standards:

(1) Lanyards and vertical lifelines that tie off one bridge worker shall have a minimum breaking strength of 5,000 pounds.

(2) Self-retracting lifelines and lanyards that automatically limit free fall distance to two feet or less shall have components capable of sustaining a minimum static tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.

(3) Self-retracting lifelines and lanyards that do not limit free fall distance to two feet or less, ripstitch, and tearing and deformed lanyards shall be capable of withstanding 5,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.

(4) Horizontal lifelines shall be designed, installed, and used under the supervision of a competent person, as part of a complete personal fall arrest system that maintains a safety factor of at least two.

(5) Lifelines shall not be made of natural fiber rope.

(6) Body belts shall not be used as components of personal fall arrest systems.

(7) The personal fall arrest system shall limit the maximum arresting force on a bridge worker to 1,800 pounds when used with a body harness.

(8) The personal fall arrest system shall bring a bridge worker to a complete stop and limit maximum deceleration distance a bridge worker travels to 3.5 feet.

(9) The personal fall arrest system shall have sufficient strength to withstand twice the potential impact energy of a bridge worker free falling a distance of six feet, or the free fall distance permitted by the system, whichever is less.

(10) The personal fall arrest system shall be arranged so that a bridge worker cannot free fall more than six feet and cannot contact the ground or any lower horizontal surface of the bridge.

(11) Personal fall arrest systems shall be worn with the attachment point of the body harness located in the center of the wearer's back
near shoulder level, or above the wearer's head.

(12) When vertical lifelines are used, each bridge worker shall be provided with a separate lifeline.

(13) Devices used to connect to a horizontal lifeline that may become a vertical lifeline shall be capable of locking in either direction.

(14) Dee-rings and snap-hooks shall be capable of sustaining a minimum tensile load of 3,600 pounds without cracking, breaking, or taking permanent deformation.

(15) Dee-rings and snap-hooks shall be capable of sustaining a minimum tensile load of 5,000 pounds.

(16) Snap-hooks shall not be connected to each other.

(17) Snap-hooks shall be dimensionally compatible with the member to which they are connected to prevent unintentional disengagement, or shall be a locking snap-hook designed to prevent unintentional disengagement.

(18) Unless of a locking type, snap-hooks shall not be engaged:

(i) Directly, next to a webbing, rope, or wire rope;
(ii) To each other;
(iii) To a dee-ring to which another snap-hook or other connector is attached;
(iv) To a horizontal lifeline; or
(v) To any object that is incompatibly shaped or dimensioned in relation to the snap-hook so that unintentional disengagement could occur.

RW-45. Components of a Safety Net System

Use of safety net systems shall conform to the following standards and practices:

(1) Safety nets shall be installed as close as practicable under the walking/working surface on which bridge workers are working, but shall not be installed more than 30 feet below such surface.

(2) If the distance from the working surface to the net exceeds 30 feet, bridge workers shall be protected by personal fall arrest systems.

(3) The safety net shall be installed such that any fall from the working surface to the net is unobstructed.

(4) Except as provided in this section, safety nets and net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at six-month intervals if left in one place. The drop-test shall consist of a 400-pound bag of sand 30 inches, plus or minus two inches, in diameter dropped into the net from the highest (but not less than 3\1/2\ feet) working surface on which bridge workers are to be protected.

(i) When the railroad or railroad contractor demonstrates that a drop-test is not feasible and, as a result, the test is not performed, the railroad or railroad contractor, or designated competent person, shall certify that the net and its installation are in compliance with the provisions of this section by preparing a certification record prior to use of the net.

(ii) The certification shall include an identification of the net, the date it was determined that the net was in compliance with this section, and the signature of the person making this determination. Such person's signature shall certify that the net and its installation are
in compliance with this section. The most recent certification for each net installation shall be available at the jobsite where the subject net is located.

(5) Safety nets and their installations shall be capable of

absorbing an impact force equal to that produced by the drop test specified in this section.

(6) The safety net shall be installed such that there is no contact with surfaces or structures below the net when subjected to an impact force equal to the drop test specified in this section.

(7) Safety nets shall extend outward from the outermost projection of the work surface as follows:

(i) When the vertical distance from the working level to the horizontal plane of the net is 5 feet or less, the minimum required horizontal distance of the outer edge of the net beyond the edge of the working surface is 8 feet.

(ii) When the vertical distance from the working level to the horizontal plane of the net is 5 feet, but less than 10 feet, the minimum required horizontal distance of the outer edge of the net beyond the edge of the working surface is 10 feet.

(iii) When the vertical distance from the working level to the horizontal plane of the net is more than 10 feet, the minimum required horizontal distance of the outer edge of the net beyond the edge of the working surface is 13 feet.

RW-46. Inspection of Safety Nets

Safety nets shall be inspected after any occurrence that could affect the integrity of the safety net system.

RW47. Working Over or Adjacent to Water

Bridge workers working over or adjacent to water with a depth of four feet or more, or where the danger of drowning exists, shall be provided and shall use life vests, or buoyant work vests with life preservers within ready access. This Rule does not apply to bridge workers using personal fall arrest systems or safety nets that comply with rule RW-44.

RW48. Use of River Craft

Where life vests are required, at least one lifesaving skiff, inflatable boat, or equivalent device shall be immediately available. If it is determined by a competent person that environmental conditions, including weather, water speed, and terrain, merit additional protection, the skiff or boat shall be manned.

RW49. Use of Scaffolding

Each scaffold and scaffold component, including footings and anchorage, shall be capable of supporting, without failure, its own weight and at least four times the maximum intended load applied or transmitted to that scaffold or scaffold component.

DEFINITIONS

Adjacent Tracks – Two or more track centers spaced less than 25 feet apart.

Anchorage – A secure point of attachment for lifelines, lanyards or deceleration devices that is independent of the means of supporting or suspending the employee.

Body Belt – A strap that can be secured around the waist or body and attached to a lanyard, lifeline, or deceleration device.

Blocking Device – A lever, plug, ring, or other method of control that restricts the operation of a switch or signal.

Control Operator – The railroad employee in charge of a remotely controlled switch or derail, an interlocking, a controlled point, or a segment of Controlled Track.

Controlled Track – Track upon which all movements must be authorized by a Train Dispatcher or Control Operator.

Deceleration Device – Any mechanism, including, but not limited to, rope grabs, ripstich lanyards, specially woven lanyards, and automatic self-retracting lifelines/lanyards that serve to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy on a person during fall arrest.

Derail – A track safety device designed to guide a car off the rails at a selected spot as a means of protection against collisions or other accidents.

Effective Securing Device – A device used to prevent the operation of a manually operated switch or derail that is:

Vandal resistant,
Tamper resistant, and
Designed to be applied, secured, uniquely tagged, and removed only by the class, craft, or group of employees for whom protection is being provided.

Exclusive Track Occupancy - A method of establishing Working Limits on Controlled Track in which movement authority is withheld or restricted by the Train Dispatcher or Control Operator or where one or more approaches to the Working Limits are protected by flagmen.

Flagman – An employee designated to direct or restrict the movement of trains at a point on track to provide on-track protection for Roadway Workers, while engaged solely in performing that function.

Form D – See Movement Permit Form D.

Foul Time – A method of establishing Working Limits through exclusive use of the track in which notification is given and recorded by the Train Dispatcher or Control Operator to an employee that no trains will operate within a specific segment of Controlled Track during a specific time period, and the required blocking devices have been placed on the control machine to protect the track fouled. Foul Time shall remain in effect until the employee to whom the Foul Time was issued has reported clear of the track.

Fouling a Track – The location of an individual or equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment, or, in any case, within 4 feet of the field side of the running rail.

Inaccessible Track – A method of establishing Working Limits on Non-controlled Track by preventing access to the Working Limits.

Individual Train Detection (ITD) – A procedure that may be used under strictly defined circumstances by trained and qualified Lone Workers to provide on-track protection on certain tracks outside Working Limits.

Interlocking Limits – The tracks between the opposing home signals of an interlocking.

Lanyard – A flexible line of rope, wire rope, or strap that is used to secure a body harness to a deceleration device, lifeline, or anchorage.

Lone Worker – An individual employee who is not being afforded on-track protection by another employee, is not a member of a Roadway Work Group, and is not engaged in a common task with another Roadway Worker.

Movement Permit Form D – A form containing written authorization(s), restriction(s), or instruction(s), issued by the Dispatcher to specified individuals.

Non-Controlled Track – Track upon which trains are permitted by rules or special instructions to move without receiving authorization from a Train Dispatcher or Control Operator.

On-Track Roadway Maintenance Machine – A self propelled, rail mounted, non-highway, maintenance machine whose light weight in excess of 7,500 pounds, and whose purpose is not for the inspection of railroad track.

On-Track Roadway Maintenance Machine, new – A machine ordered after 12/26/03 and completed after 9/27/04.

On-Track Safety – The state of freedom from the danger of being struck by a moving railroad train or other equipment, provided by operating and safety rules that govern track occupancy by personnel, trains, and on-track equipment.

Personal Fall Arrest System – A system used to arrest a fall of a person from a working level.

Personal Place of Safety – A predetermined location where a Roadway Worker or group will occupy when it is necessary to clear a work location.

Pilot – An employee assigned to a train or track car when the Engineer, Conductor, or Track Car Driver is not qualified on the physical characteristics or the operating rules of the territory to be traversed.

Qualified Employee – An employee who has successfully completed all required training for, has demonstrated proficiency in, and has been authorized to perform the duties of, a particular position or function.

Railroad Bridge Worker – An employee of, or employee of a contractor of, a railroad responsible for the construction, inspection, or maintenance of a bridge whose assigned duties, if performed on the bridge, include inspection, testing, maintenance, repair, construction, or reconstruction of the track, bridge structural members, operating mechanisms and water traffic control systems, or signal, communication, or train control systems integral to that bridge.

Restricted Speed – A designation that requires the Operator to be prepared to stop within one-half the range of vision short of other trains or railroad equipment occupying or fouling the track, obstructions, switches not properly lined for movement, derails set in the derailing position, or any signal requiring a stop. Operator must be on the lookout for broken rail and misaligned track. Speed must not exceed 20 MPH outside interlocking limits, or 15 MPH within interlocking limits. This speed applies to the entire movement unless otherwise specified in the rule or instruction that requires Restricted Speed.

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

Roadway Maintenance Work Train - A train which is being operated within Working Limits in conjunction with roadway maintenance, construction, or repairs, under the direction of a designated employee in charge.

Roadway Work Group – Two or more employees working together on a common task.

Roadway Worker – An employee of HRRC, or employee of a contractor of HRRC, whose duties include inspection, construction, maintenance, or repair of track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities, or roadway maintenance machinery on or near track with the potential of fouling a track, and an employee of HRRC or of a contractor of HRRC who is responsible for on-track protection.

Three-Step Protection – A procedure used by an engineer to protect employees before they foul equipment. Three-step protection has three components:

- Apply the brake.
- Center the reverser.
- Put the generator field in the OFF or OPEN position.

Track Barricade – A designated sign or obstruction fastened to a track that prevents access to the track.

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

Warning Tag – Tag used to indicate that equipment is out of service and should not be operated.

Watchman (Train Approach Warning) – A method of establishing on-track protection by warning employees of the approach of trains in ample time for them to move to or remain at a place of safety in accordance with the Watchman Rules.

Working Limits – A segment of track within definite limits, established by NORAC rules, upon which trains and engines may move only as authorized by the Employee in Charge having control of the track within the Working Limits. Working Limits may be established through Exclusive Use of Track, Foul Time, or Inaccessible Track.

STATEMENT OF ON-TRACK SAFETY

Lone Workers who use individual train detection to establish on-track safety must complete this "Statement of On-track Safety" for each assignment. The statement shall be available for inspection by a railroad official or Federal Railroad Administration representative whenever the Lone Worker is using individual train detection. (49 CFR 214.335(f)).

Railroad Name:	**Housatonic Railroad**		
Lone Worker Name:			
Date:		Time:	
Job Location:			
Indicate track Limits the Lone Worker will be working:			
SAMPLE FORM			
Date and time the Lone Worker will be using individual train detection at this location:			
Date:			
Start Time:			
End Time:			
Maximum authorized speed for trains at this location: MPH			
Sight distance at this location along the tracks where trains will be visible:			
Feet		Yards	
Lone Worker Signature:			

GOOD FAITH CHALLENGE FORM

The employee making challenge shall complete this form, sign and date it, and give it to his Supervisor who shall document this determination, sign and forward form to his immediate Supervisor.

Name:	**Housatonic Railroad**		
Job Position:			
Job Location:	SAMPLE FORM		
Supervisors Name		Title:	
Date and Time of Occurrence:			
Work Location:			
Nearest City/Town:			
On-Track Safety Procedure applied (or lacking) at working Location:			
Railroad Safety or Operating Rule not being complied with:			
Reason for this Challenge:			
Other Employees with information regarding this situation:			
Signature:		Date	
Determination by Supervisor:			
Supervisor Signature:		Date	

DOCUMENT A00902

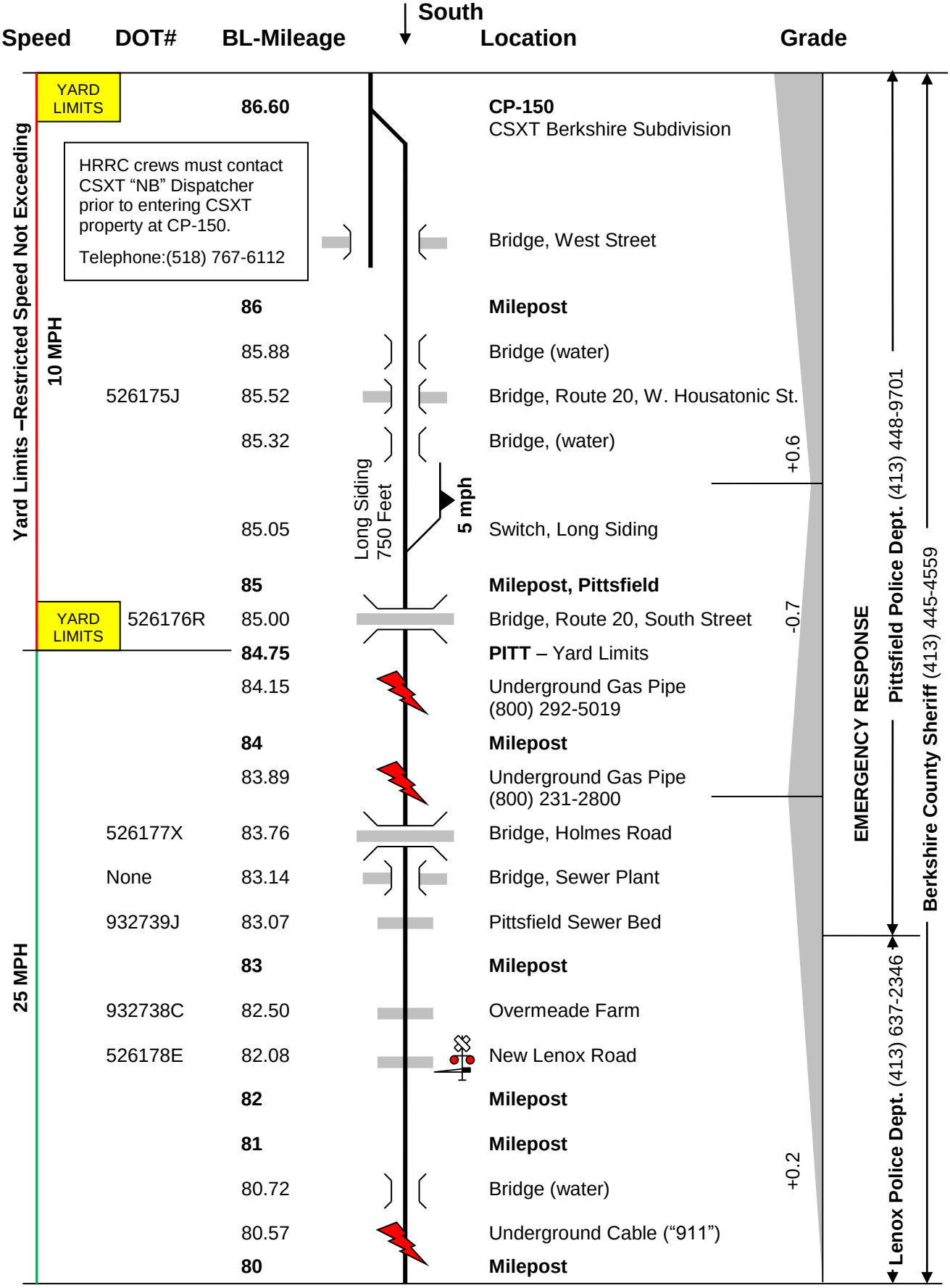
HOUSATONIC RAILROAD TIMETABLE

THIS PAGE IS INTENTIONALLY LEFT BLANK

HOUSATONIC RAILROAD

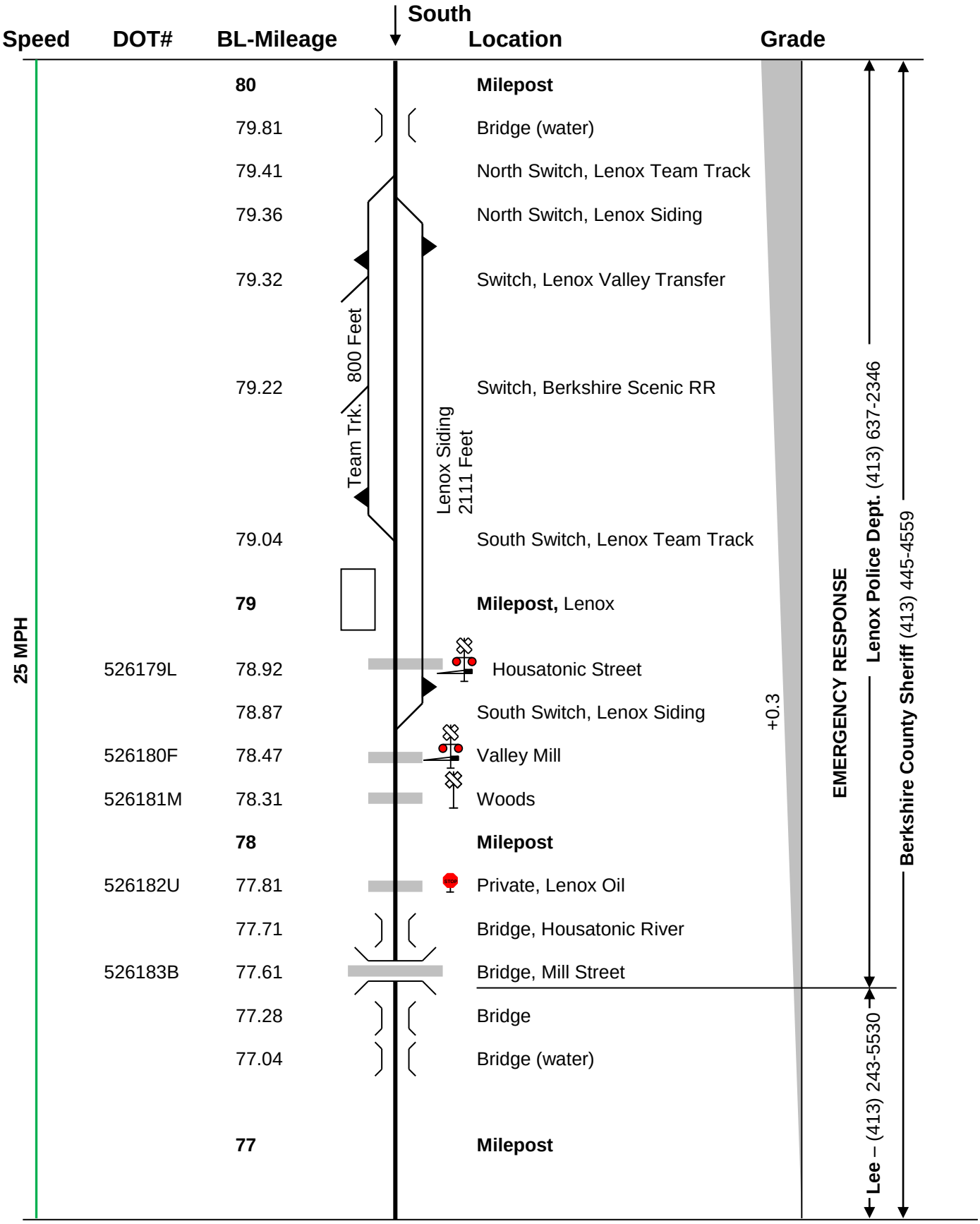
Berkshire Line – CP-150, BL-86.60 to BL-80

South ↓



HOUSATONIC RAILROAD

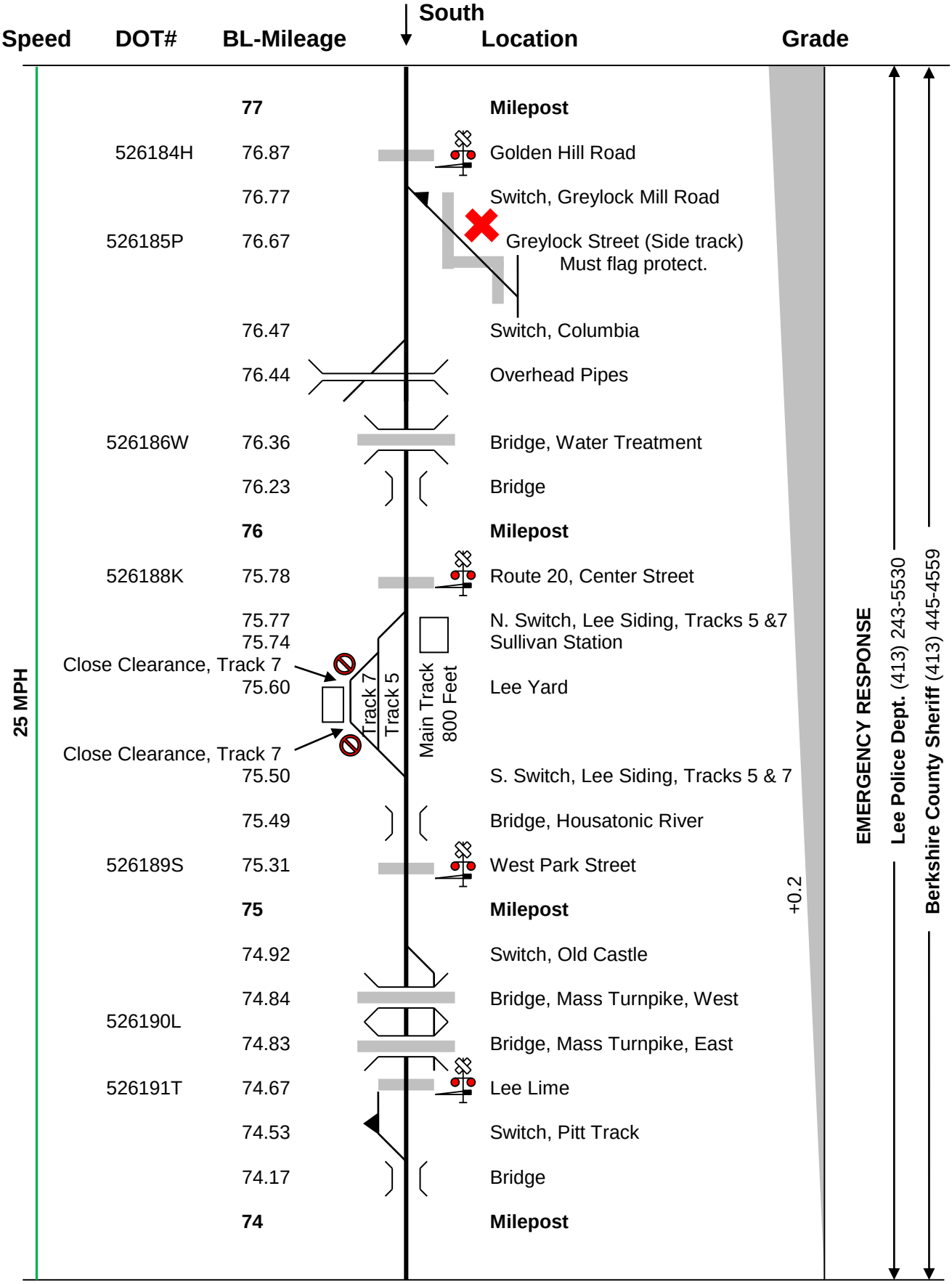
Berkshire Line – BL-80 to BL-77



HOUSATONIC RAILROAD

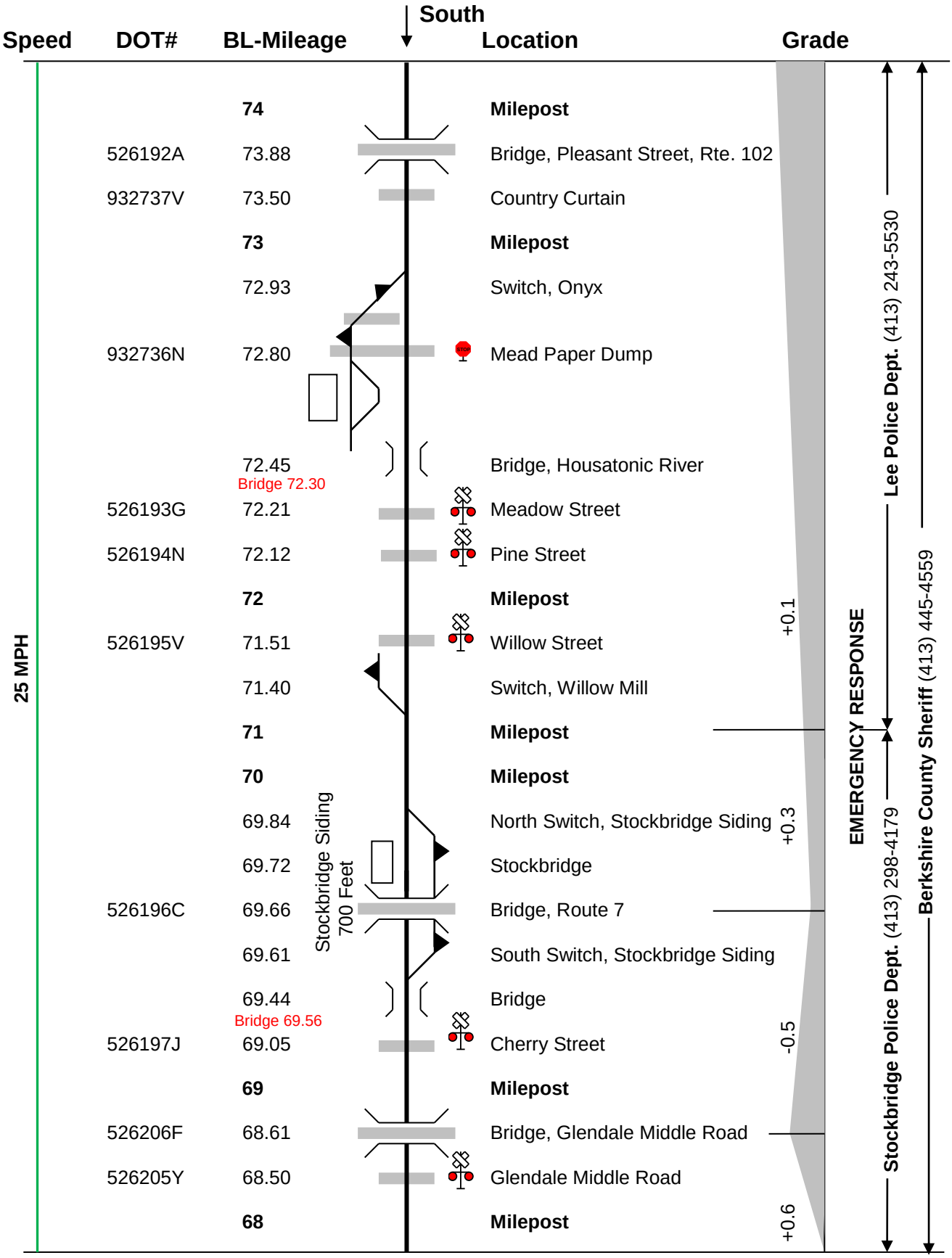
Berkshire Line – BL-77 to BL-74

South



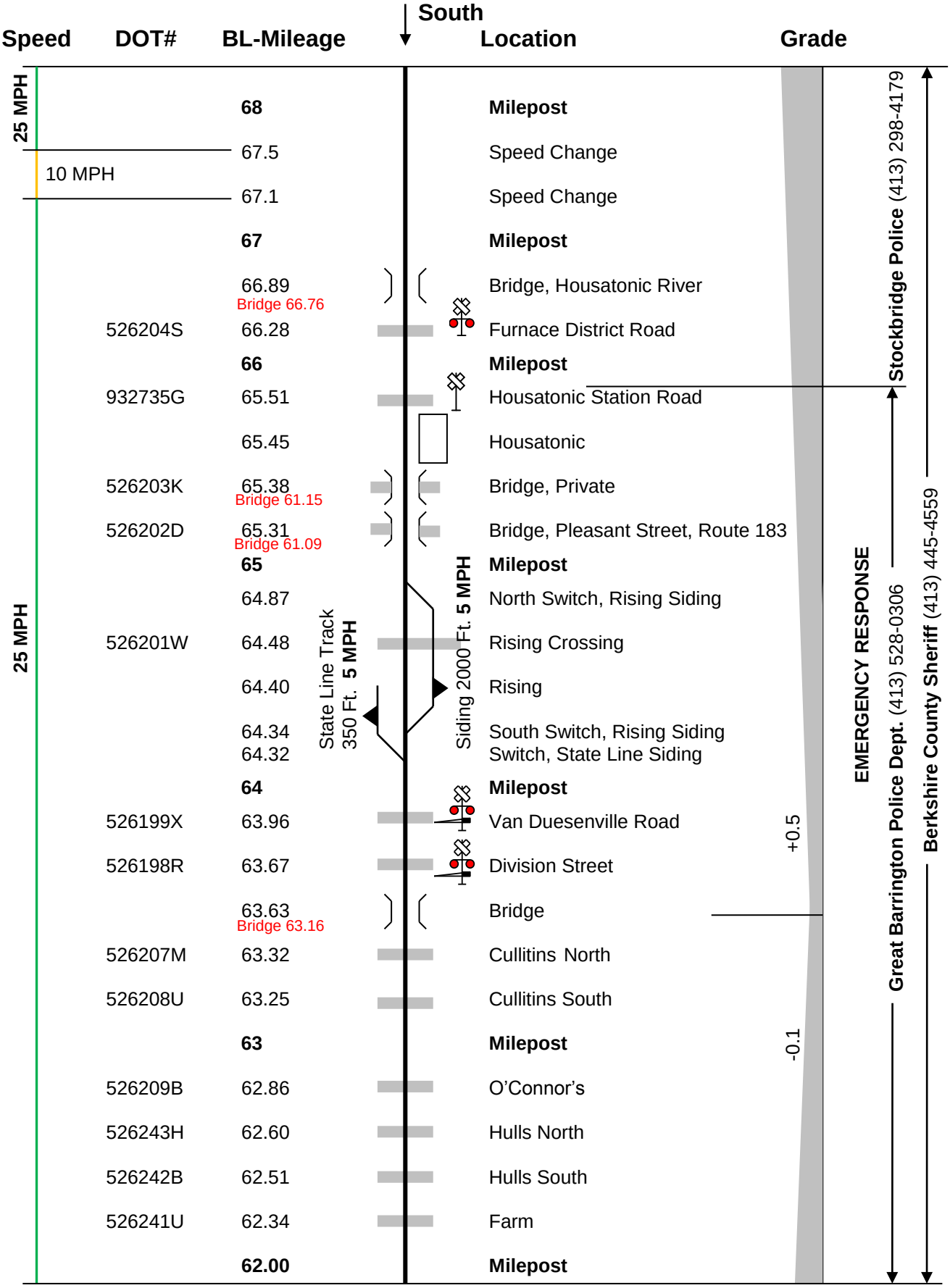
HOUSATONIC RAILROAD

Berkshire Line – BL-74 to BL-68



HOUSATONIC RAILROAD

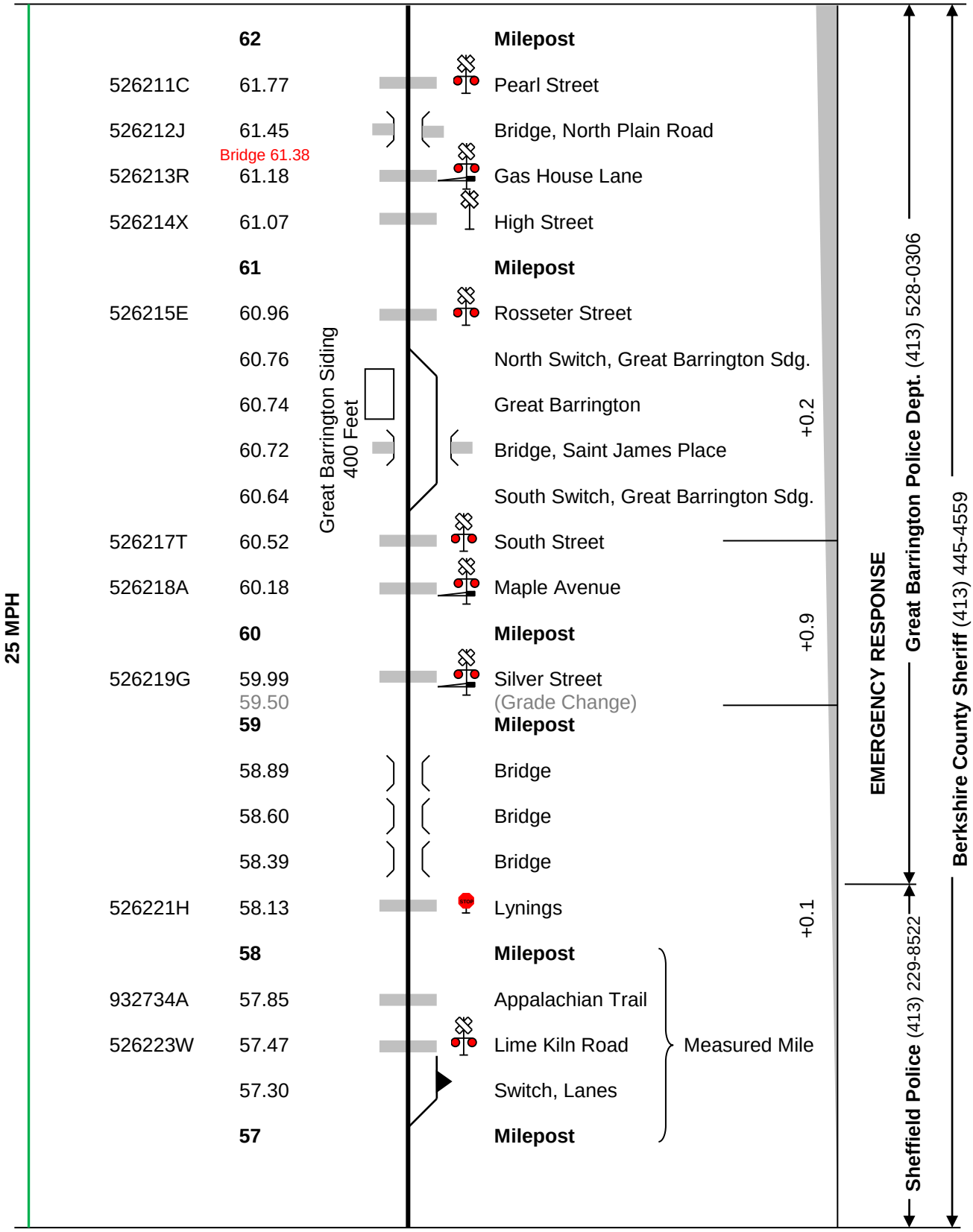
Berkshire Line – BL-68 to BL-62



HOUSATONIC RAILROAD

Berkshire Line – BL-62 to BL-57

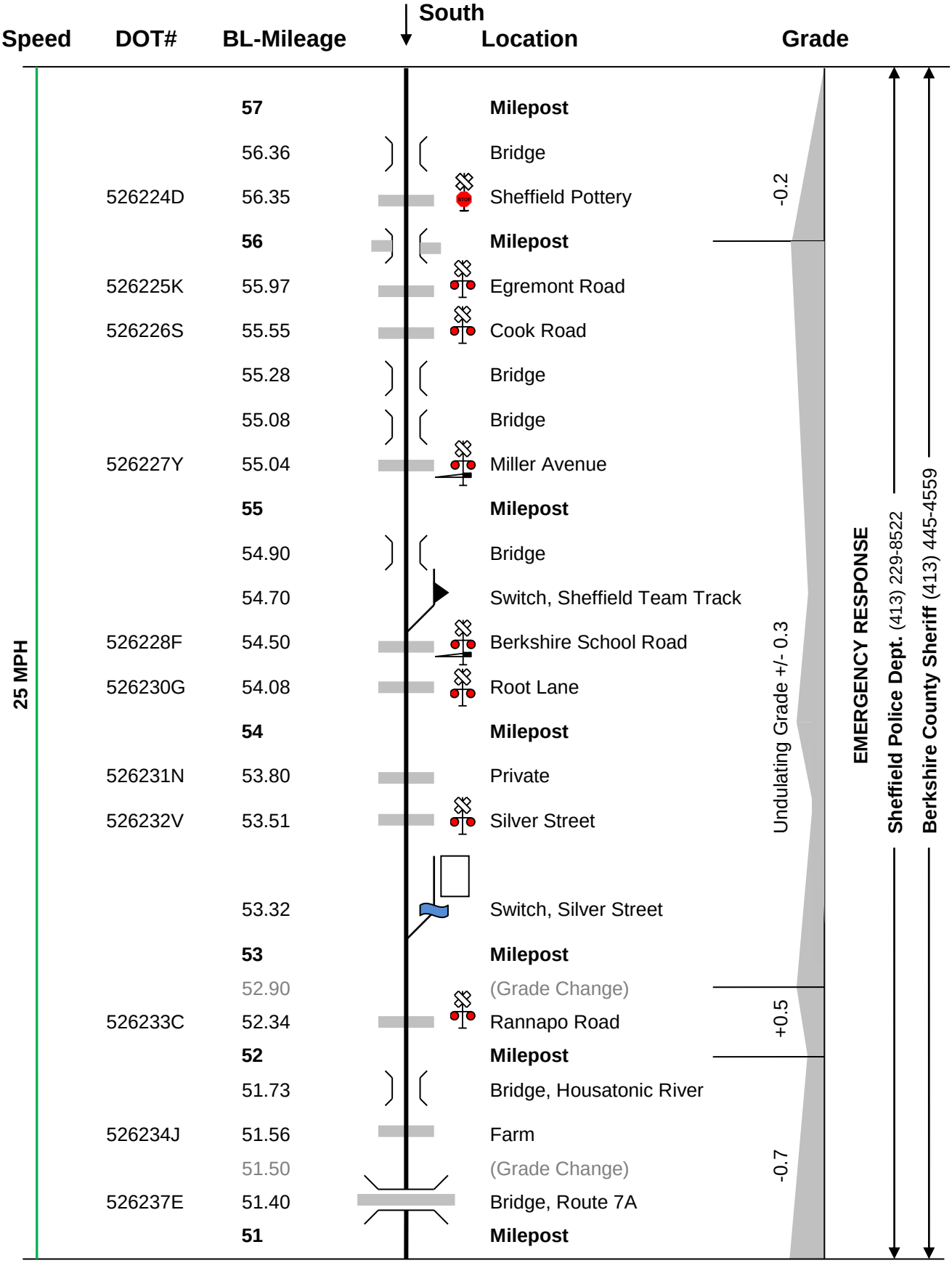
South



HOUSATONIC RAILROAD

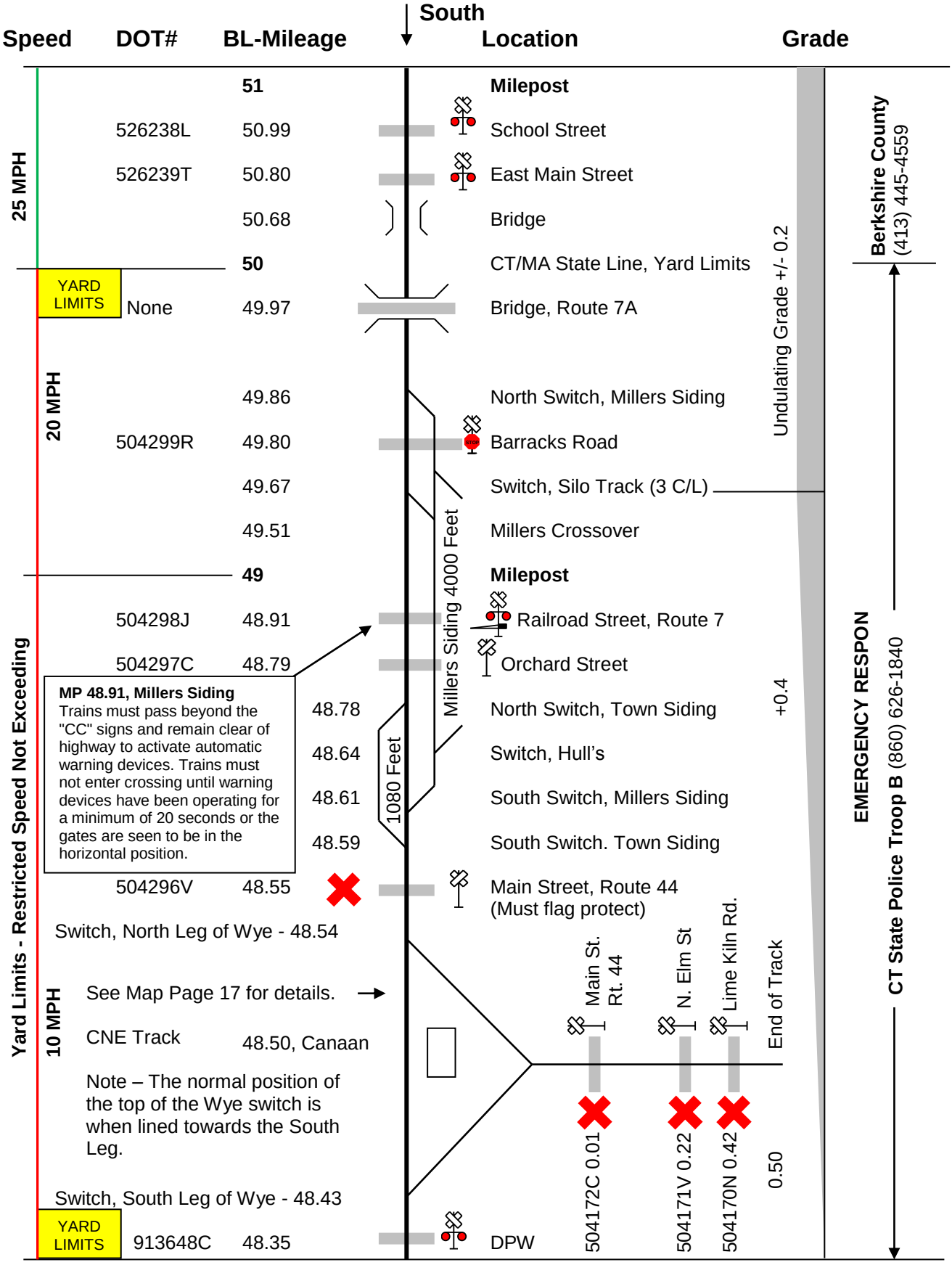
Berkshire Line – BL-57 to BL-51

South



HOUSATONIC RAILROAD

Berkshire Line – BL-51 to BL-48.35



DOCUMENT A00903

GEOTECHNICAL REPORTS

THIS PAGE IS INTENTIONALLY LEFT BLANK

GEOTECHNICAL REPORT FOR BR. 77.14

GEI Consultants

Consulting
Engineers and
Scientists

March 5, 2018
Project 1703257

VIA EMAIL: June.Wu@hdrinc.com

Ms. June Wu, P.E.
HDR Engineering, Inc.
99 High Street, Suite 2300
Boston, Massachusetts 02110

Dear Ms. Wu:

Re: Geotechnical Recommendations for Bridge Replacement
Berkshire Line Bridge - Mile Post 74.23
Lee, Massachusetts

This letter presents the results of our subsurface exploration and our geotechnical recommendations for the bridge replacement of the MassDOT Berkshire Line Bridge at Mile Post 74.23 in Lee, Massachusetts.

We performed the following scope of work:

- Performed two borings near the middle of Willow Brook.
- Analyzed the subsurface conditions and developed basic soil properties and recommendations for replacement of the existing bridge with a box culvert.
- Prepared this letter report presenting the results of our subsurface exploration and our recommendations.

We performed this work under the Subconsultant Agreement between HDR Engineering, Inc and GEI Consultants, Inc., dated August 1, 2017. Our scope of work was based on our revised proposal dated October 23, 2017.

Site and Project Description

MassDOT Berkshire Line Railroad Bridge at Mile Post 74.23 crosses Willow Brook about 1,400 feet west of the intersection of Marble Street and Pleasant Street in Lee, Massachusetts as shown in Fig. 1. The existing structure consists of six timber beams supported on stone masonry abutments.

The north and south abutments consist of stone masonry abutments with timber beam seats and combination stone masonry and timber backwalls. We understand that the existing south abutment is experiencing distress and that the bridge substructure and superstructure may be replaced with a precast concrete box structure.

GEI Consultants, Inc.
400 Unicorn Park Drive, Woburn, MA 01801
781.721.4000 fax: 781.721.4073

Elevations in this report are in feet and reference the top of existing train rail, arbitrarily taken as El. 100 at the midspan of the existing bridge.

Exploration Program

New England Boring Company (NEBC), of Derry, New Hampshire, drilled two borings (B201 and B202) between January 16, 2018 and January 18, 2018. The borings were drilled using a Mobile B-52 high-rail truck-mounted drill rig and advanced using wash-rotary techniques with casing. B201 was performed near the centerline of the tracks approximately 5 feet south of the face of the north abutment and boring B202 was performed near the centerline of the tracks approximately 6.5 feet south of the face of the north abutment, as shown in Fig. 2. A GEI engineer observed and coordinated the drilling program and logged the soil samples.

Standard Penetration Tests (SPTs) were performed in general accordance with ASTM D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. A 140-pound safety hammer with a drop height of 30 inches was used to drive a split-spoon sampler 24 inches to collect samples at about 5-foot intervals. Recovered split-spoon soil samples were classified in the field by GEI. Individual sample descriptions are provided in the boring log in Appendix A.

Subsurface Conditions

The soil layers encountered in the boring are described below, in order of increasing depth, and shown in Fig. 3. Subsurface conditions are known only at boring locations B201 and B202 to the depths indicated on the logs. Conditions elsewhere may differ significantly from those described below.

- Sand and Gravel – Four feet of sand and gravel was encountered at the mudline. This soil layer ranged from narrowly graded gravel with silt and sand to silty sand with gravel. The SPT N-values ranged from 50 to over 100 blows per foot (bpf) indicating a very dense soil. The shallow SPT-N values may be artificially high due to the soil at the mudline being partially frozen.

- Silty Sand – Approximately 9 feet of tan silty sand was encountered below the sand and gravel layer in B201. This soil layer consisted primarily of fine to coarse sand with 10 to 30 percent non-plastic silt. The SPT N-values ranged from 22 to 46 blows per foot (bpf) indicating a medium dense to dense soil. B202 was terminated in this layer.

- Glacial Till – Approximately 42 feet of glacial till was encountered below the silty sand in B201. This soil layer primarily consisted of a silty sand with gravel and clayey sand with gravel. The glacial till contained multiple boulders throughout the layer. The SPT N-Values ranged from 88 to over 100 bpf indicating a very dense soil. B201 was terminated in this layer approximately 62 feet below the top of rail.

Water Conditions

Water was measured at El. 94.7 which was 5.3 feet below the top of the rail. At the time of the subsurface explorations, there was approximately two feet of water (mostly frozen) in Willow Brook.

Recommendations

We expect that the existing abutments bear on the silty sand layer. We recommend that the proposed box culvert also bear on the silty sand layer. Based on the SPT N-values at and below the anticipated bearing elevation, we recommend a net allowable bearing pressure of 2 tons per square foot for the proposed culvert.

We recommend that the proposed culvert be placed on a minimum 12-inch-thick bedding layer of compacted 1.5-inch crushed stone conforming to MassDOT M2.01.1 extending at least 12 inches beyond the outside limits of the box in all directions. We recommend that the bottom of the crushed stone be founded 4 feet below the surrounding stream bed elevation for frost protection. We recommend placing a woven geotextile meeting the requirements of MassDOT M9.50.0 (AASHTO M 288 Class 1) between the subgrade and the 1.5-inch crushed stone. The geotextile should be wrapped up on all the edges and extend a minimum of 3 feet below the culvert to confine the stone.

We recommend that the precast box culvert be designed in accordance with AREMA Manual for Railway Engineering requirements. We recommend computing minimum and maximum lateral earth pressures with lateral earth pressure coefficients of 0.33 and 1.0, respectively in accordance with AREMA (2016) Section 16.4.2. We recommend using a lateral earth pressure coefficient for live load surcharge of 0.33 in accordance with AREMA (2016) Section 16.4.3. We recommend using a moist unit weight of 120 pcf for the backfill around the proposed box culvert.

We expect that the existing embankment fill behind the abutments will be acceptable for reuse as backfill. However, since it was not tested as part of our scope of work, we recommend that the contractor perform grain size analyses and Modified Proctor density tests (ASTM 1557) on representative samples of the existing embankment fill soils prior to excavation to determine compaction requirements for backfilling. We recommend that the backfill around the proposed box culvert be placed in maximum 12-inch-loose lifts and compacted to at least 95% of its Modified Proctor maximum dry density.

Construction Considerations

We understand the Berkshire Line railroad can be taken out of service for the duration of the construction at Bridge MP 74.23. We expect the construction can be performed using an open cut. The types of equipment that can be used will be limited due to the existing overhead wires. All excavations should be performed in the dry and in accordance with OSHA requirements. Excavation support designs should be prepared and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

Based on our observations, we expect a temporary water barrier on each side of the work area such as sheet piles, Portadam, or sand-filled supersacks with a pumped bypass can be used to control water flowing in Willow Brook.

Groundwater will be encountered during the excavation. The specifications should require the contractor to maintain the groundwater level below the bottom of the excavation at all times. We recommend that the excavation subgrade be sloped slightly to a sump. Sumps should be located outside the limits of the stone bedding, and should extend at least 2 feet below the bottom of the excavation. Deeper sumps may be required to draw down the groundwater to maintain stability of the subgrades during subgrade preparation and placement of the crushed stone below the culvert. The sumps should consist of perforated pipes wrapped in filter fabric and surrounded by

crushed stone. The contractor should submit a dewatering plan prior to the start of excavation. Permits will be required for the proposed work.

We recommend that the final subgrade be excavated with a smooth-bladed bucket. Loose or disturbed soil should be removed. All organic or deleterious material should be excavated. The geotextile (described above) should be placed over the undisturbed subgrade immediately after it has been exposed and approved by the resident engineer. Crushed stone should be placed in maximum 9-inch-loose lifts and compacted with multiple passes to form an unyielding surface at each lift.

Limitations

This letter was prepared for the use of HDR Engineering, Inc., exclusively. Our recommendations are based on the project information provided to us at the time of this report and may require modification if there are any changes in the nature, design, or location of the proposed structure. We cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design. We also recommend that GEI visit the site to observe to following: excavation for box culvert, preparation of the foundation subgrade, placement of the geotextile separation layer, and placement of the crushed stone layer.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We, therefore, recommend that GEI be engaged to make site visits during construction to: a) check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and b) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

If you have any questions, please feel free to contact James Christensen at 781-721-4126 or Mike Yako at 781-721-4043.

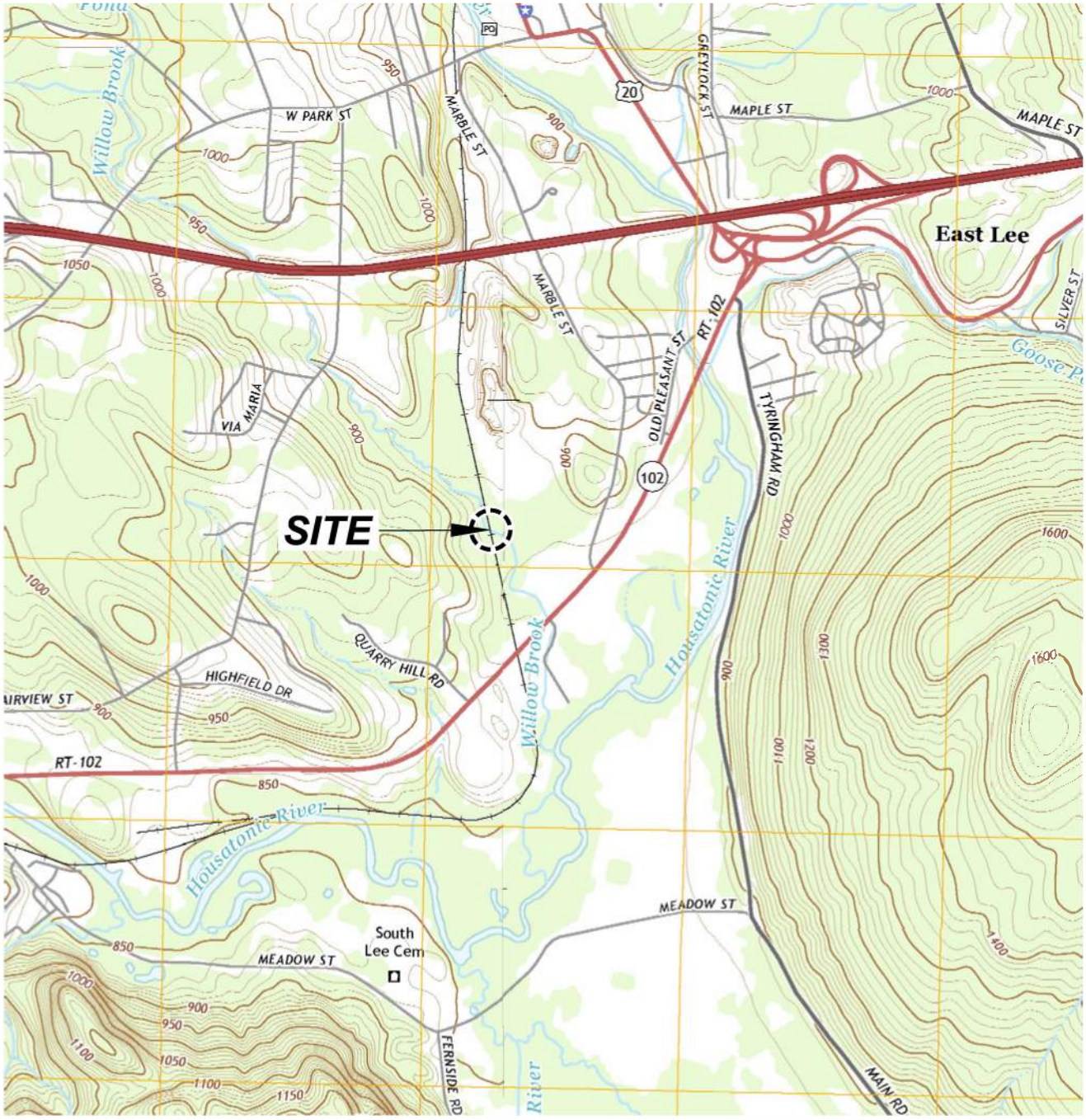
Sincerely,

GEI CONSULTANTS, INC.

James L. Christensen, P.E.
Project Manager

Michael A. Yako, P.E.
Vice President

Attachments
- Fig. 1 – Site Location Map
- Fig. 2 – Boring Location Plan
- Appendix A – Boring Logs
- Appendix B – Laboratory Test Data



0 1000 2000 4000 6000

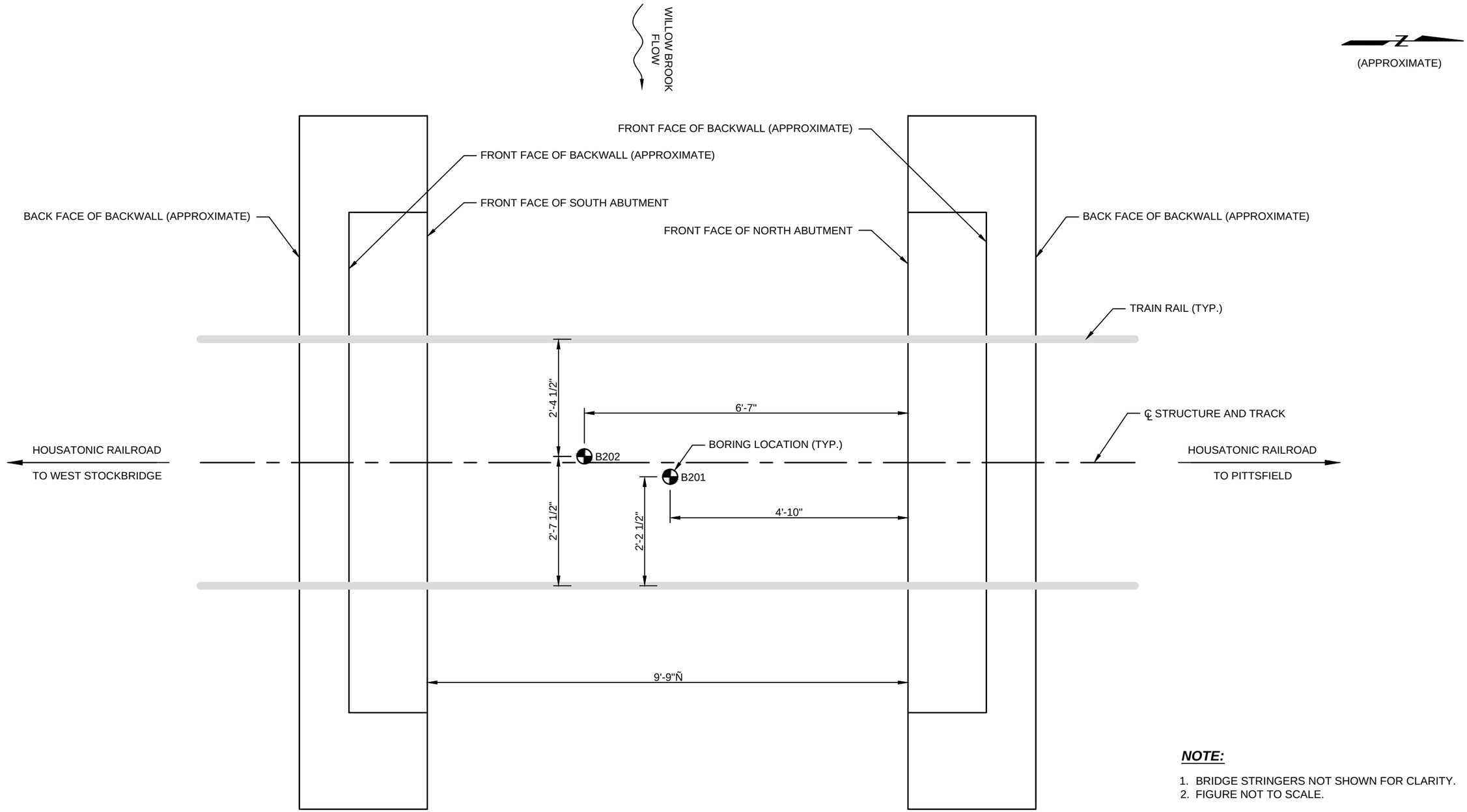
SCALE, FEET

This Image from U.S.G.S. Topographic 7.5 Minute Series
Stockbridge and East Lee, MA Quadrangles, 2015.
Datum is North American Vertical Datum of 1988 (NAVD88).
Contour Interval is 20 Feet.

QUADRANGLE LOCATION

MassDOT Berkshire Line Bridge MP 74.23 Lee, Massachusetts	GEI Consultants	SITE LOCATION MAP
HDR Engineering, Inc. Boston, Massachusetts	Project 1703257	March 2018 Fig.1

B:\Working\HDR\1703257 HDR-MASSDOT RR BRIDGES\00_CAD\Figures\{Report}\1703257-02



NOTE:

1. BRIDGE STRINGERS NOT SHOWN FOR CLARITY.
2. FIGURE NOT TO SCALE.

MassDOT Berkshire Line Bridge MP 74.23 Lee, Massachusetts	GEI Consultants	BORING LOCATION PLAN
HDR Engineering, Inc. Boston, Massachusetts	Project 1703257	March 2018 Fig. 2

---- B:\Working\HDR\1703257 HDR-MASSDOT RR BRIDGES\00_CAD\Figures\Br. 74.23 Subsurface Program\Berkshire Line Bridge MP 74.23.dwg - 3/5/2018

Appendix A

Boring Logs

BORING INFORMATION

LOCATION: 4-feet 7-inches south of N. Abut
GROUND SURFACE EL. (ft): 93
VERTICAL DATUM: See Notes
TOTAL DEPTH (ft): 55.0
LOGGED BY: D. Litton
DATE START/END: 1/16/2018 - 1/18/2018
DRILLING COMPANY: New England Boring
DRILLER NAME: Pete Michard
RIG TYPE: High Rail B-52

BORING

B201

DRILLING INFORMATION

HAMMER TYPE: Safety Hammer - rope and cathead
AUGER I.D./O.D.: NA / NA
DRILLING METHOD: Driven casing and washed with rotary tooling.
WATER LEVEL DEPTHS (ft): See Notes
CASING I.D./O.D.: 3 inch / 3.5 inch
DRILL ROD O.D.: 2.675 inch
CORE BARREL TYPE: NX
CORE BARREL I.D./O.D. NA / NA

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
90	0	S1	0 to 2	24/11	25-66-39-37		SAND AND GRAVEL	S1: SILTY SAND WITH GRAVEL (SM); 70.4% fine to coarse sand, 16.7% fine gravel, 12.9% non-plastic silt from grain size analysis . Very dense. Tan.
		S2	2 to 4	24/19	10-30-20-17			S2: SILTY SAND WITH GRAVEL(SM); 57% fine to coarse sand, 26.6% fine gravel, 16.4% non-plastic silt. Medium dense. Tan.
		S3	4 to 5	12/7	14-17	Hole partially collapsed prior to split spoon	SILTY SAND	S3: SILTY SAND (SM); 71% fine to coarse sand, 29% non-plastic silt. Very dense. Tan
85	5	S4	5 to 7	24/22	15-22-24-20			S4: SILTY SAND (SM); 80.9% fine to medium sand, 19.1% non-plastic silt. Dense. Tan.
	10	S5	10 to 12	24/12	6-12-10-11			S5: SILTY SAND (SM); ~60% fine to medium sand, ~30% low-plasticity silt, ~10% fine gravel. Medium dense.
80		C1	13 to 18	60/11		Core times (min/ft): 8, 3, 2, 3, 5	GLACIAL TILL	C1: 4" boulder, white, hard. 7" of till recovered.
75	15	S6	18 to 20	24/19	41-45-68-73			S6: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~30% non-plastic silt, ~20% fine to coarse subangular gravel. Very dense. Tan to grey.
70	20							

NOTES: Vertical Datum: Top of rail at midspan of bridge taken as El. 100.
Approximately 2-feet of water in Willow Brook at time of drilling.

PROJECT NAME: MassDOT Berkshire Line, Bridge MP 74.23
CITY/STATE: Lee, Massachusetts
GEI PROJECT NUMBER: 1703257

GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HOUSATONIC BR 74.23.GPJ 3/5/18

LOCATION: 4-feet 7-inches south of N. Abut
GROUND SURFACE EL. (ft): 93 **DATE START/END:** 1/16/2018 - 1/18/2018
VERTICAL DATUM: See Notes **DRILLING COMPANY:** New England Boring

BORING B201

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	C2	25 to 26	12/10		Core times (min/ft): 3		C2: 12 inch core. 6" boulder, hard, white. 4" of till recovered.
65		S7	28 to 30	24/14	44-57-78-65			S7: CLAYEY SAND WITH GRAVEL (SC); ~40% low-plasticity fines, ~35% fine to coarse sand, ~25% fine to coarse gravel up to 1". Very dense. Brown.
	30							
60		S8	33 to 35	24/20	30-43-51-73			S8: CLAYEY SAND (SC); ~55% fine to medium sand, ~40% low-plasticity fines, ~5% fine gravel. Very dense. Grey.
	35							
55		S9	38 to 40	24/18	48-36-57-63		GLACIAL TILL	S9: CLAYEY SAND WITH GRAVEL (SC); ~45% fine to medium sand, ~40% low-plasticity fines, ~15% fine gravel. Very dense. Grey.
	40							
50		S10	43 to 45	24/19	33-37-51-105			S10: CLAYEY SAND (SC); ~50% fine to medium sand, ~40% low-plasticity fines, ~10% fine gravel. Very dense. Grey.
	45							
45		S11	48 to 48.1	1/1	100/1"			S11: SILTY GRAVEL WITH SAND (GM); ~55% fine to coarse gravel, ~25% non-plastic silt, ~20% fine to coarse sand. Very dense. Tan with black gravel.
	50	C3	50 to 55	60/30		Core times (min/ft): 2, 3, 4, NM, NM		C3: 20" boulder into till. White, hard, fracture at 12" ~30 deg. 10" of till recovered. Multiple boulder and cobble fragments in till recovered.
40								
	55							Bottom of boring at 55 feet. Borehole backfilled with cuttings.

NOTES: Vertical Datum: Top of rail at midspan of bridge taken as El. 100. Approximately 2-feet of water in Willow Brook at time of drilling.

PROJECT NAME: MassDOT Berkshire Line, Bridge MP 74.23
CITY/STATE: Lee, Massachusetts
GEI PROJECT NUMBER: 1703257

GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HOUSATONIC BR 74.23.GPJ 3/5/18

BORING INFORMATION

LOCATION: 6-feet 7-inches south of n. abut backwall
GROUND SURFACE EL. (ft): 93
VERTICAL DATUM: See Notes
TOTAL DEPTH (ft): 6.0
LOGGED BY: D. Litton
DATE START/END: 1/23/2018 - 1/25/2018
DRILLING COMPANY: New England Boring
DRILLER NAME: Pete Michard
RIG TYPE: High Rail B-52

BORING

B202

DRILLING INFORMATION

HAMMER TYPE: Safety Hammer - rope and cathead
AUGER I.D./O.D.: NA / NA
DRILLING METHOD: Driven casing and washed with rotary tooling.
WATER LEVEL DEPTHS (ft): See Notes
CASING I.D./O.D.: 3 inch / 3.5 inch
DRILL ROD O.D.: 2.675 inch
CORE BARREL TYPE: NA
CORE BARREL I.D./O.D. NA / NA

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
90	0	S1	0 to 2	24/14	8-21-35-26	Splitspoon extender used	SAND AND GRAVEL	S1: NARROWLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); ~50% fine to coarse gravel, ~40% fine to coarse sand, ~10% non-plastic fines. Very dense. Tan.
		S2	2 to 4	24/16	41-24-26-26			S2: WIDELY GRADED SAND WITH GRAVEL (SW); ~60% fine to coarse sand, ~35% fine to coarse gravel, ~5% non-plastic fines. Very dense. Tan
	5	S3	4 to 6	24/8	16-12-40-35		SILTY SAND	S3: NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% fine sand, ~10% non-plastic fines. Very dense, Tan.
85								Bottom of boring at 6 feet. Borehole backfilled with cuttings.
	10							
80								
	15							
75								
	20							
70								

NOTES: Vertical Datum: Top of rail at midspan of bridge taken as El. 100. Approximately 2-feet of water in Willow Brook at time of drilling.

PROJECT NAME: MassDOT Berkshire Line, Bridge MP 74.23
CITY/STATE: Lee, Massachusetts
GEI PROJECT NUMBER: 1703257

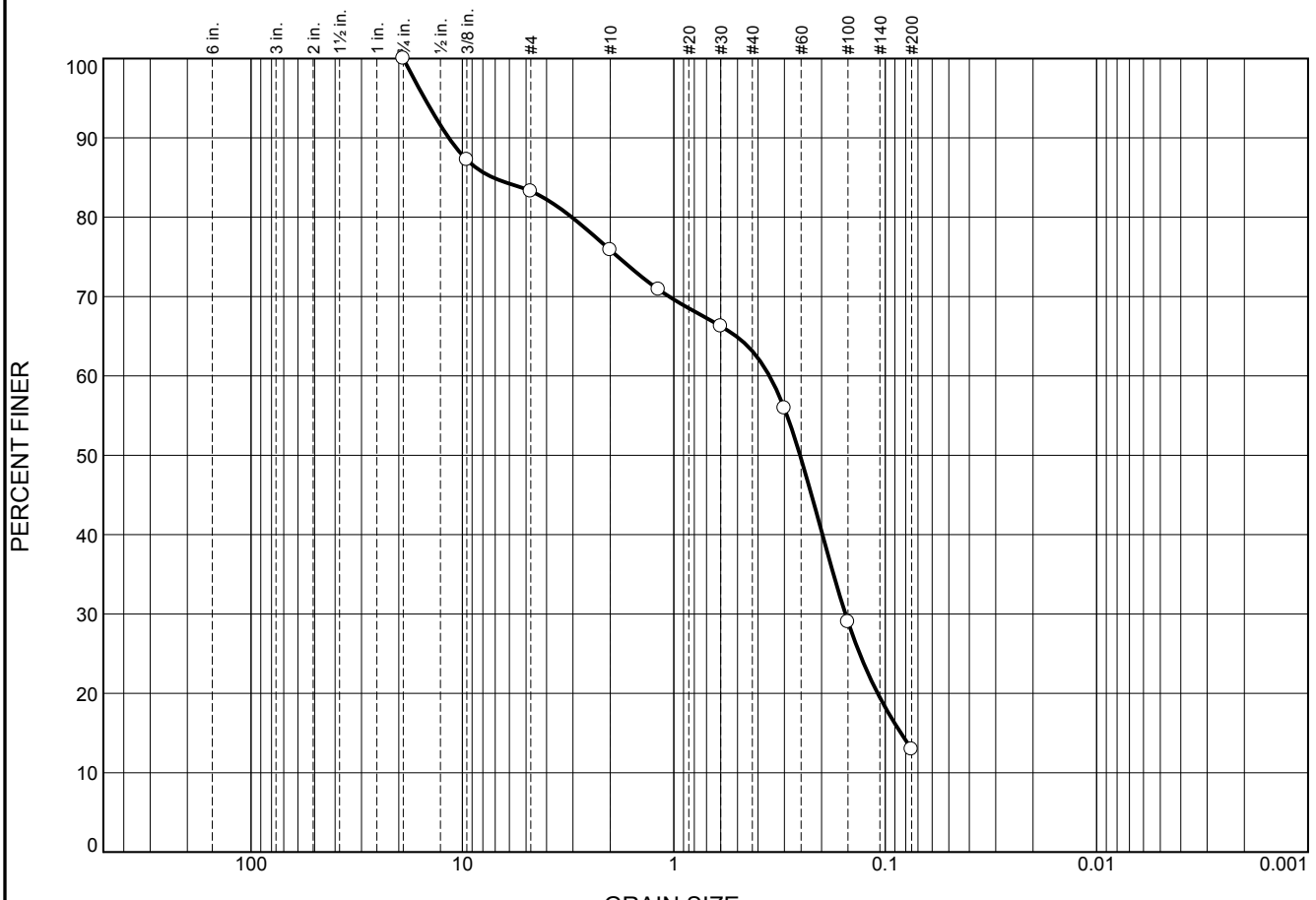
GEI Consultants

GEI WOBURN STD 1-LOCATION-LAYER NAME HOUSATONIC BR 74.23.GPJ 3/5/18

Appendix B

Laboratory Test Data

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	16.7	7.4	12.8	50.2	12.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○	NV		7.1639	0.3527	0.2528	0.1543	0.0843			

Material Description	USCS	AASHTO
○ Silty SAND with Gravel	SM	-

Project No. 1703257 **Client:** HDR Engineering Inc.

Project: MassDOT Berkshire Line
Bridge MP 74.23

○ **Source of Sample:** B201 **Depth:** 0-2 ft **Sample Number:** S1

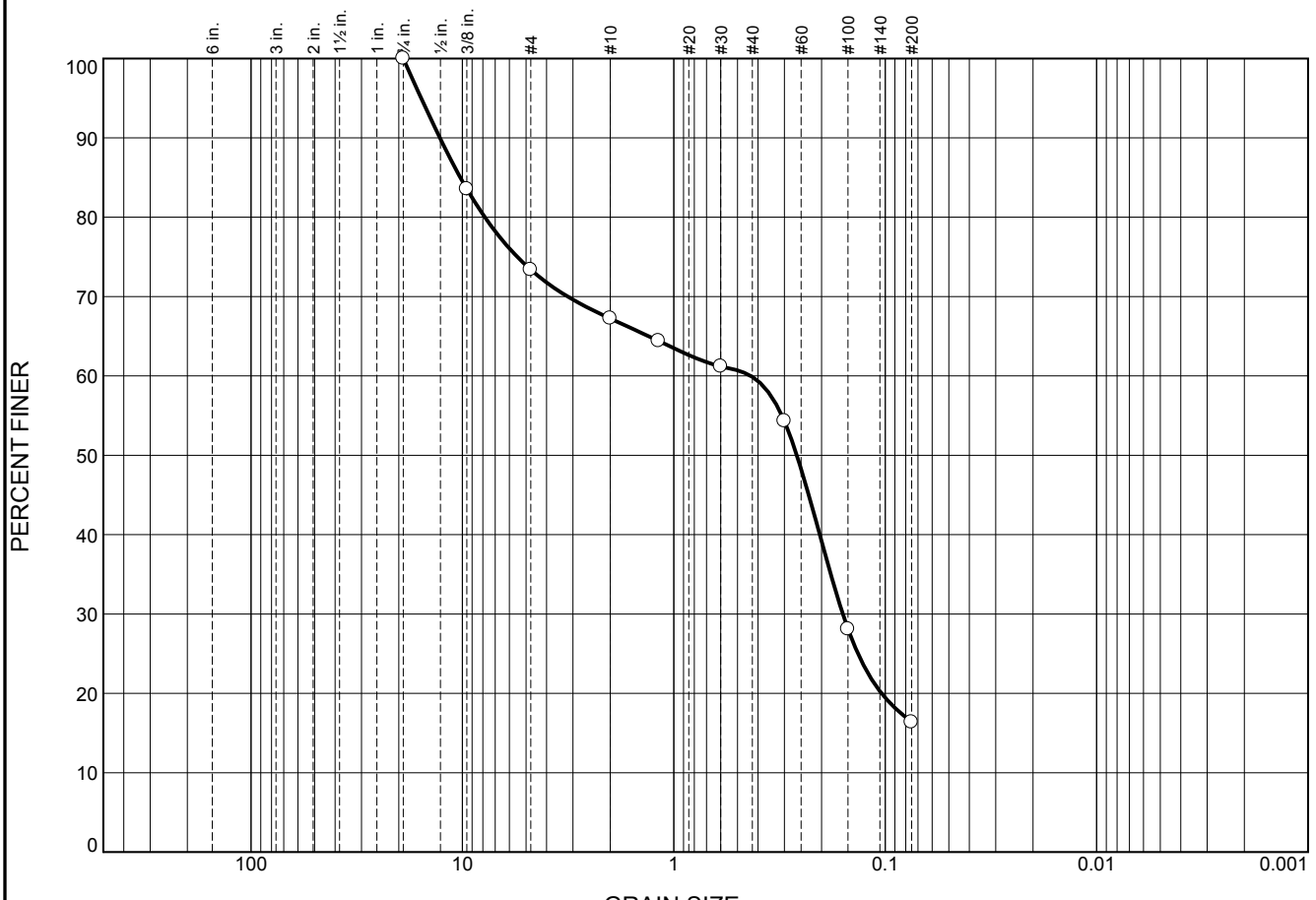
Remarks:
○As Rec'd WC = 13.3%

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

Figure B1

Tested By: AH **Checked By:** EF

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	26.6	6.2	7.3	43.5	16.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○	-	-	10.2296	0.4325	0.2619	0.1588				

Material Description	USCS	AASHTO
○ Silty SAND with Gravel	SM	-

Project No. 1703257 **Client:** HDR Engineering Inc.

Project: MassDOT Berkshire Line
Bridge MP 74.23

○ **Source of Sample:** B201 **Depth:** 2-4 ft **Sample Number:** S2

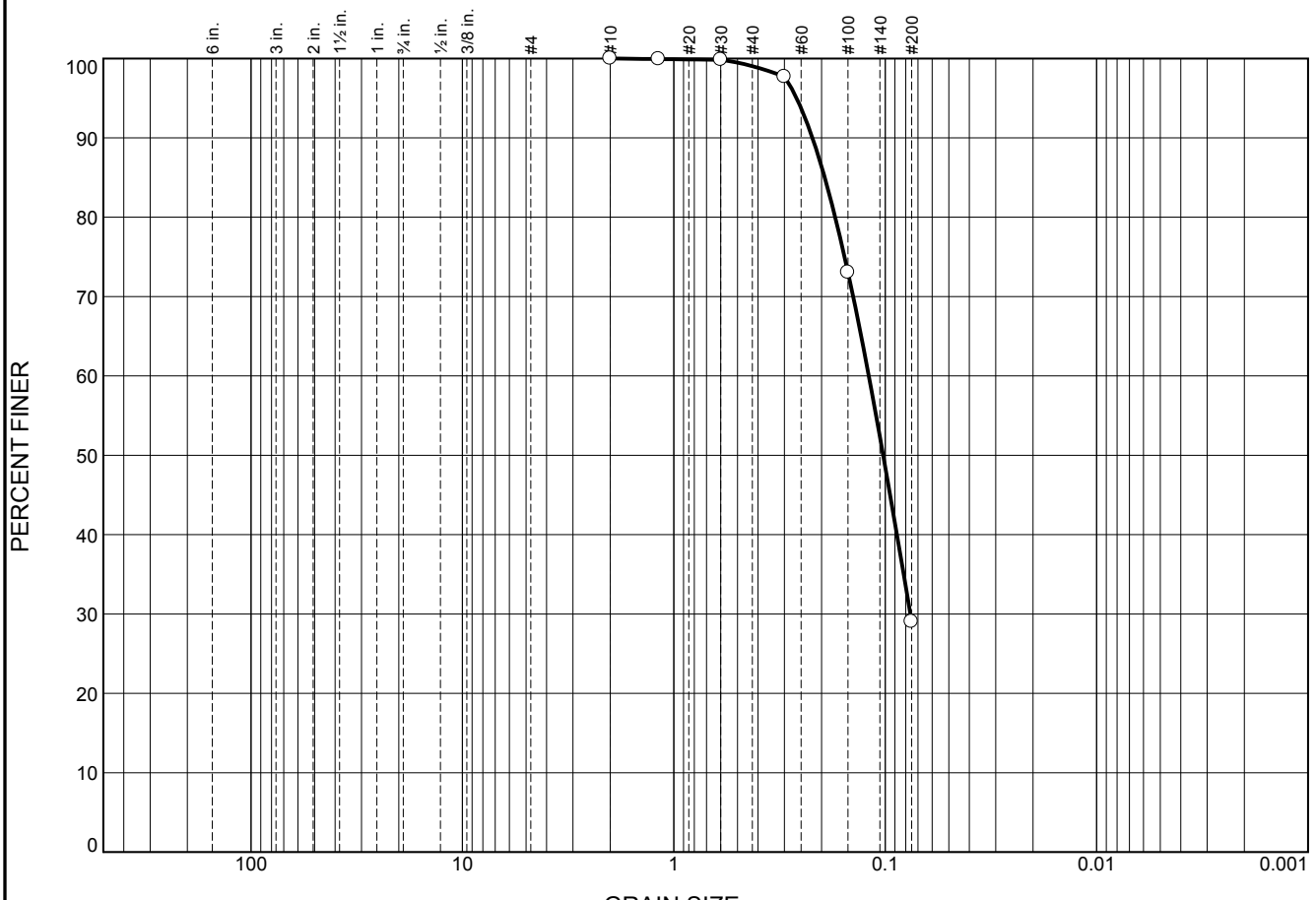
Remarks:
○As Rec'd WC = 15.1%

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

Figure B2

Tested By: AH **Checked By:** EF

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.0	70.0	29.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	-	-	0.1933	0.1196	0.1022	0.0761				

Material Description	USCS	AASHTO
○ Silty SAND	SM	-

Project No. 1703257 **Client:** HDR Engineering Inc.

Project: MassDOT Berkshire Line
Bridge MP 74.23

○ **Source of Sample:** B201 **Depth:** 4-5 ft **Sample Number:** S3

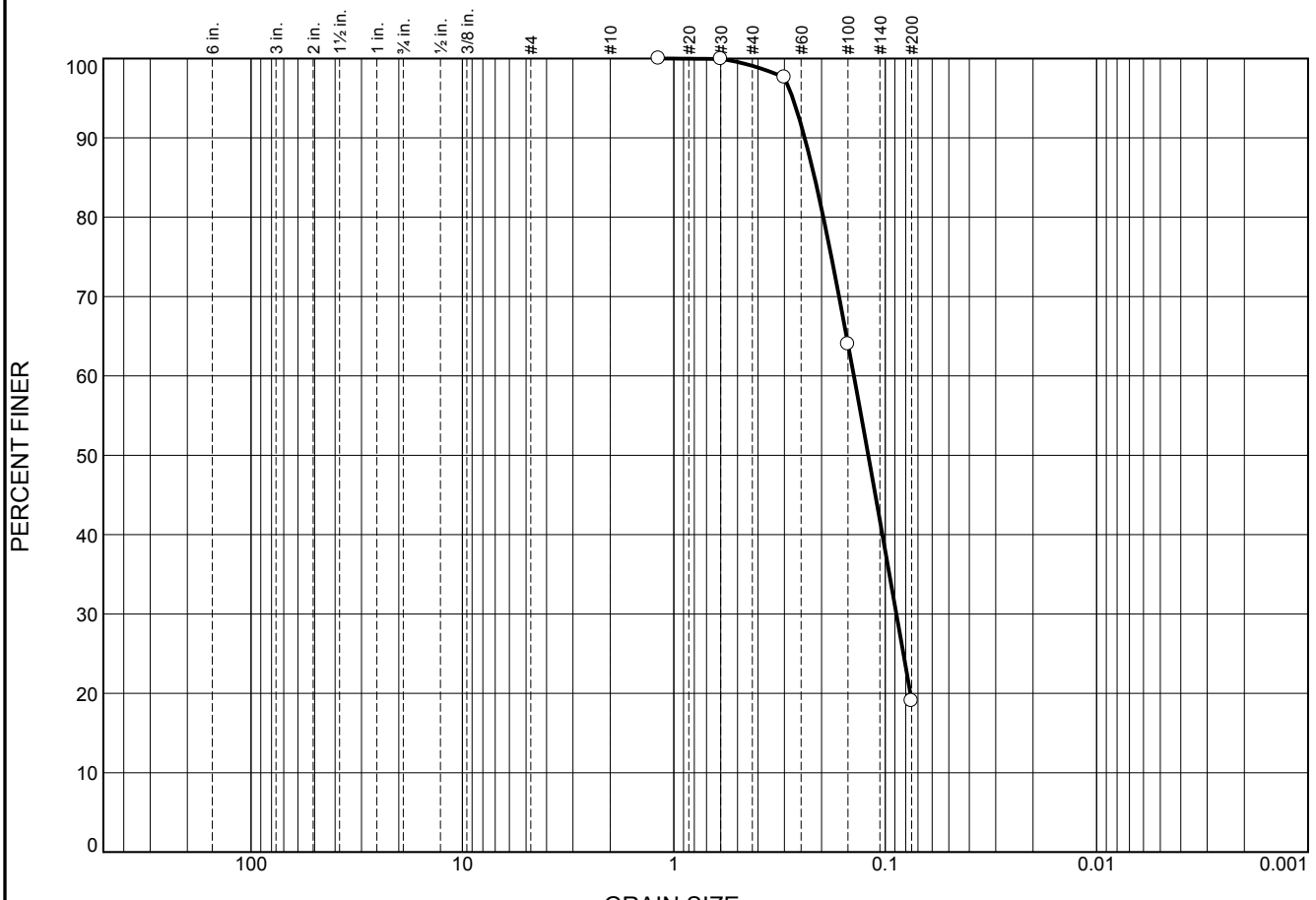
Remarks:
○As Rec'd WC = 21.8

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

Figure B3

Tested By: AH **Checked By:** EF

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.9	80.0	19.1	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○	-	-	0.2159	0.1407	0.1203	0.0885				

Material Description	USCS	AASHTO
○ Silty SAND	SM	-

Project No. 1703257 **Client:** HDR Engineering Inc.

Project: MassDOT Berkshire Line
Bridge MP 74.23

○ **Source of Sample:** B201 **Depth:** 5-7 ft **Sample Number:** S4

Remarks:
○As Rec'd WC = 22.3%

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801

Figure B4

Tested By: AH **Checked By:** EF

Geotechnical Recommendations for Selected Bridge and Track Improvements Along the Berkshire Line Railroad

Lee and Lenox, MA

Massachusetts Department of Transportation
Rail & Transit Division
10 Park Plaza Boston, MA 02116

February 28, 2025

February 28, 2025

Scott Conti
Project Manager
Rail & Transit Division
Massachusetts Department of Transportation
10 Park Plaza Boston, MA 02116

Re: Geotechnical Engineering Report
Selected Bridge and Track Improvements Along the Berkshire Line Railroad
Massachusetts Department of Transportation

Dear Mr. Conti,

The geotechnical field investigation study for the Berkshire Line Improvements in Lee and Lenox, Massachusetts has been completed, and the results of the findings are provided within this Geotechnical Engineering Report. HDR and its sub consultants performed the field investigation and laboratory testing for the determination of subsurface material properties to be used in the geotechnical recommendations presented herein.

Please feel free to contact our office(s) at your convenience should you have any questions or comments or require additional information.

Sincerely,
HDR Engineering, Inc.

Ryan Lavorati, P.E.
Geotechnical Engineer

Max Rolandi, PhD, P.E.
Geotechnical Section Manager

hdrinc.com
99 High Street, Suite 2300, Boston, Massachusetts 02110-2378
T 617.357.7731 **M** 978.844.7464

Table of Contents

1 Geotechnical Scope of Work 1
1.1 Background Information 1
1.2 Elevation Datum 1
1.3 Existing Conditions 1
1.3.1 Bridge 76.23 2
1.3.2 Bridge 77.28 2
1.3.3 Milepost 73 Corridor 2
1.3.4 Milepost 78 Corridor 2
1.4 Proposed Construction 3
1.4.1 Bridge 76.23 3
1.4.2 Bridge 77.28 3
1.4.3 Milepost 73 Corridor and Milepost 78 Corridor 3
2 Geology and Existing Geotechnical Information 4
2.1 Bridge 76.23 4
2.2 Bridge 77.28 4
2.3 Milepost 73 Corridor 4
2.4 Milepost 78 Corridor 5
3 Subsurface Exploration 6
3.1 General 6
3.2 Subsurface Exploration Program 6
3.2.1 Subsurface Exploration Program 6
3.2.2 Drilling Oversight 7
3.3 Geotechnical Laboratory Testing 7
4 Subsurface Conditions 9
4.1 Bridge 76.23 9
4.1.1 Soils 9
4.1.2 Bedrock 9
4.1.3 Groundwater 10
4.2 Bridge 77.28 10
4.2.1 Soils 10
4.2.2 Bedrock 10
4.2.3 Groundwater 10
4.3 Milepost 73 Corridor 10
4.3.1 Soils 10
4.3.2 Groundwater 11

4.4 Milepost 78 Corridor 11
4.4.1 Soils 11
4.4.2 Groundwater 11
5 Geotechnical Evaluation and Recommendations 13
5.1 Geotechnical Implications of Site Subsurface Conditions 13
5.2 Bridge 76.23 13
5.2.1 Bridge Seat and Backwall Structure on Drilled Micropiles 13
5.2.2 Bridge Abutments with Tieback Anchors 16
5.3 Bridge 77.28 16
5.3.1 Bridge Abutments with Tieback Anchors 16
5.4 Seismic Design Parameters 17
5.4.1 Seismic Site Class 17
5.4.2 Spectral Response Accelerations 17
6 Geotechnical Construction Considerations 18
6.1 Site Excavations 18
6.1.1 General 18
6.1.2 Excavation Slopes and Support of Excavation 18
6.1.3 Dewatering 18
6.2 Backfill Compaction and Backfill Gradations 18
6.3 Reuse of On-Site Soils 20
6.4 Micropile Installation and Testing 20
6.5 Tieback Anchors Installation and Testing 21
7 Limitations 22

LIST OF FIGURES

FIGURE 1A: Boring Location Plan – Bridge 76.23

FIGURE 1B: Boring Location Plan – Bridge 77.28

FIGURE 1C: Boring Location Plan – Milepost 73 Corridor

FIGURE 1D: Boring Location Plan – Milepost 78 Corridor - South

FIGURE 1E: Boring Location Plan – Milepost 78 Corridor - North

LIST OF APPENDICES

APPENDIX A – SUBSURFACE EXPLORATION PROGRAM

A.1 Test Boring Logs
A.2 Abutment Probe Sketches

APPENDIX B – LABORATORY TEST RESULTS

B.1 Geotechnical Laboratory Test Results on Soil Samples
B.2 Geotechnical Laboratory Test Results on Bedrock Samples

APPENDIX C – CALCULATION PACKAGES

C.1 Drilled Micropiles
C.2 Tieback Anchors
C.3 Seismic Site Class

1 Geotechnical Scope of Work

HDR Engineering, Inc. (HDR) geotechnical scope of work for this project included coordinating and performing a subsurface exploration program, consisting of test borings, abutment probes and geotechnical laboratory testing, performing geotechnical evaluations and preparing this Geotechnical Report (report). This report summarizes HDR's design recommendations and construction considerations for selected bridges and track improvements that are proposed along the Massachusetts Department of Transportation (MassDOT) Berkshire Railroad Line in Lee and Lenox, Massachusetts.

The structures included in the geotechnical scope of work and their approximate locations are listed in **Table 1.1**.

TABLE 1.1 – Summary of Site Coordinates

Site ID	Latitude	Longitude
Bridge 76.23	42.3139°	-73.2465°
Bridge 77.28	42.3276°	-73.2420°
Milepost 73 Corridor	42.2775°	-73.2575°
Milepost 78 Corridor	42.3454°	-73.2459°

This report has been prepared in accordance with the provision of the American Railway Engineering and Maintenance-of-Way Association Manual of Railway Engineering (AREMA MRE).

1.1 Background Information

Our understanding of the proposed project at each site is based on the following documents:

- A 100% Design drawing set prepared by HDR, titled MassDOT Berkshire Line Civil Improvement – Civil Package and dated February 18, 2025
- Report on Track Substructure Conditions of MassDOT's Berkshire Line prepared by HyGround / Loram dated February 1, 2019
- Correspondence and communication with the HDR Structural and Rail Design Teams

1.2 Elevation Datum

Unless otherwise specified, in this report, latitude and longitude are referenced to the North American Datum of 1983 (NAD83) horizontal datum. Elevations (El.) are expressed in feet and are referenced to the North American Vertical Datum of 1988 (NAVD88) vertical datum.

1.3 Existing Conditions

The MassDOT Berkshire Railroad Line runs along the Housatonic River Valley from the Massachusetts-Connecticut border to Pittsfield. MassDOT is responsible for maintaining a state of good repair along the corridor, which is currently used only as a freight rail line.

1.3.1 Bridge 76.23

The existing bridge at milepost 76.23, carries the railroad track over an access road to Columbia Mills. A buried gravity sewer line runs below this bridge flowing west to east toward Columbia Street. A stormwater catch basin exists directly below the bridge span and drains southwest into the Housatonic River. The existing bridge superstructure consists of eight I-beams supporting an open deck. The bridge span measures approximately 18.4 feet in length measured along the centerline of the track. The existing abutment walls measure approximately 25 feet in width. The bridge is skewed approximately 44 degrees measured from the perpendicular to the abutment walls. Existing grades range from 894 ft below the bridge to 905 ft at the top of rail above the bridge. The bridge clearance, measured at the abutments, is approximately 7.3 feet. The two abutments are stone block masonry and show signs of deterioration along the face and stone block rotation/misalignment.

1.3.2 Bridge 77.28

The existing bridge at mile post 77.28, carries the railroad track is over Mt. Washington Brook, just upstream of where the brook runs into the Housatonic River. The existing bridge superstructure consists of two steel girders supporting an open deck. The bridge span measures approximately 23.1 feet. The bridge clearance from the mudline of approximately 12 feet. The existing stone masonry abutment walls measure approximately 12 feet in width. The northeast and southeast stone masonry wingwalls are rotated 60 degrees with respect to the abutment walls. The northwest and southwest stone masonry wingwalls are a continuation of the existing abutment walls but taper down a height of approximately 6 feet. The south abutment wall and wingwalls show some deformation and misalignment of the stone blocks and are in need of repair. At the time of this report, a survey was not available for this bridge.

1.3.3 Milepost 73 Corridor

The stretch of track identified in this report as the milepost 73 corridor (MP73) has been a noted area of track instability by railroad workers, owners, and consultants. This portion exists in a rare east-west rail orientation between the Housatonic River to the south and industrial properties along Pleasant Street (MA Route 102) to the north in Lee, Massachusetts. The railroad is generally on a raised embankment through wet lowland areas. We understand that the rails experience settlement over time at several locations along MP76.

1.3.4 Milepost 78 Corridor

The section of track identified in this report as the milepost 78 corridor (MP78) is a noted area of track drainage and repeatedly fouled ballast. This portion of the railroad is oriented approximately north-south between the Housatonic River to the east and Crystal Street to the west in the village of Lenox Dale in Lenox, Massachusetts. A run of the river dam exists in the Housatonic River adjacent to this stretch. Surrounding grades generally slope down from west to east except for a portion on the north end where the railroad is on a causeway along the edge of the Housatonic River. We understand that the rails experience deformation due to a pumping response of possible unsuitable soils present along MP78.

1.4 Proposed Construction

1.4.1 Bridge 76.23

The proposed construction at Bridge 76.23 includes installation of reinforced concrete breastwalls at the abutment walls, tieback anchors going through the existing stone masonry walls and the breastwalls, precast concrete bridge seats and backwalls/pile cap founded on drilled micropiles, and a new bridge superstructure complete with ballasted trackbed. The new bridge structure will be skewed 30 degrees from the perpendicular to the existing abutments. The proposed breastwalls will be approximately 12 inches in thickness, will be doweled into the existing stone masonry wall and will extend 6 inches below existing grade in front of the abutments. The proposed tieback anchors will penetrate into the existing bedrock. The proposed drilled micropiles are arranged in 4 groups of 6 drilled micropiles, each located on one side of the existing abutments. Each group of drilled micropiles will include 3 vertical and 3 battered micropiles.

1.4.2 Bridge 77.28

The proposed construction at Bridge 77.28 will be limited to the south abutment only and includes a proposed reinforced concrete breastwall with tieback anchors going through the existing stone masonry wall and the breastwall. The proposed breastwall will be approximately 12 inches in thickness, will be doweled into the existing stone masonry wall and will extend to the mudline. The tiebacks will penetrate into the existing naturally deposited granular soil or into bedrock. Existing stone masonry will be repointed, and a new concrete cap will be constructed over a portion of the south abutment.

1.4.3 Milepost 73 Corridor and Milepost 78 Corridor

We understand that the proposed improvements at the milepost 73 and milepost 78 corridors will include the installation of bi-axial or tri-axial geogrids to improve the trackbed stability.

2 Geology and Existing Geotechnical Information

The geologic setting of each site is described in the United State Geological Survey (USGS) East Lee and Stockbridge Surficial and Bedrock Geology Quadrangle maps. Bedrock Depths come from the Massachusetts Depth to Bedrock Project (Mabee 2023).

Based on the maps above referenced, the soil profile encountered at the four sites generally consists of railroad embankment fill, alluvial deposits, glacial deposits, and bedrock in descending order. Every layer was not encountered at every site. The alluvium deposits consist of soils deposited by the Housatonic River. The glacial deposits consist of glacially ice-laid deposits, such as glacial till, or glacial meltwater, such as fine-grained deposits or coarse-grained deposits. Beneath the glacial deposits are various bedrock formations. The bedrock across the four sites generally consists of dolomite marble or other similar dolostone.

2.1 Bridge 76.23

The geology of Bridge 76.23 is described in the USGS East Lee Surficial Geology Quadrangle (Holmes 1967) and the East Lee Bedrock Geology Quadrangle (Ratcliffe 1975).

The surficial soils at Bridge 76.23 are mapped as Glacial Till. However, based on surrounding site topography, there is likely a man-made railroad embankment carrying the tracks in the vicinity of the bridge and extending to the south. The Glacial Till soils are defined as a non-sorted to poorly sorted mixture of soils varying in particle size from boulders to clay with a few inclusions of stratified sand and gravel. The Glacial Till was deposited directly by glacial ice which advanced generally from northwest to southeast. Depth to bedrock is mapped as 0 to 16 feet in the vicinity of the project site.

The bedrock is mapped as mainly quartzose micaceous tremolitic dolomite marble. This marble is a component of the Stockbridge Formation.

2.2 Bridge 77.28

The geology of Bridge 77.28 is described in the USGS East Lee Surficial Geology Quadrangle (Holmes 1967) and the East Lee Bedrock Geology Quadrangle (Ratcliffe 1975).

The surficial soils at Bridge 77.28 are mapped as Alluvium. However, based on site topography, there is likely a man-made railroad embankment carrying the tracks in the vicinity of the bridge and extending to the north and south. The alluvium is defined as silt, sand, and gravel, in modern flood plains and in swales. The alluvium is noted to occur in a low terrace subject to floods. Depth to bedrock is mapped as 16 to 33 feet in the vicinity of the project site.

The bedrock is mapped as mainly massive white dolomite marble. This marble is a component of the Stockbridge Formation.

2.3 Milepost 73 Corridor

The geology of the MP73 corridor is described in the USGS Stockbridge Surficial Geology Quadrangle (Holmes 1962) and the Stockbridge Bedrock Geology Quadrangle (Ratcliffe 1974).

The surficial soils at the MP73 corridor are mapped as artificial fill. There is a man-made railroad embankment carrying the tracks in the vicinity of the corridor and extending to the east. The surrounding soil deposits are described as alluvium, which is defined as silt, sand, and gravel, in modern flood plains and in swales. The alluvium is noted to occur in a low terrace subject to floods. Depth to bedrock is mapped as 16 to 33 feet in the vicinity of the project site.

The bedrock is mapped as dolostone and dolomite marble. These are both components of the Stockbridge Formation.

2.4 Milepost 78 Corridor

The geology of the MP78 corridor is described in the USGS East Lee Surficial Geology Quadrangle (Holmes 1962) and the East Lee Bedrock Geology Quadrangle (Ratcliffe 1974).

The surficial soils at the MP78 corridor are mapped as alluvium, which is defined as silt, sand, and gravel, in modern flood plains and in swales. The alluvium is noted to occur in a low terrace subject to floods. Nearby areas of the adjacent Housatonic River are shown as swamp deposits, defined as organic matter, undecomposed to partly decomposed, generally mixed with sand and silt and locally peaty. Mineral matter is stated to accumulate by colluvial, alluvial, or eolian processes. Depth to bedrock is mapped as varying from as shallow as 7 to 16 feet in the south to 66 to 131 feet in the north of the project site.

The bedrock is mapped as dolostone and dolomite marble. These are both components of the Stockbridge Formation.

3 Subsurface Exploration

3.1 General

A subsurface exploration program consisting of test borings, test probes, and geotechnical laboratory testing was performed for this project by HDR. The approximate location of the test borings and probes performed at the project site is shown in **Figure 1A** through **Figure 1E**. The boring logs and probe sketches from the subsurface exploration program are provided in **Appendix A**. The geotechnical laboratory test results are included on the boring logs and are presented as **Appendix B**.

3.2 Subsurface Exploration Program

3.2.1 Subsurface Exploration Program

HDR performed a subsurface exploration program consisting of 11 test borings (B-73-1 to B-73-3, B-76-1 to B-76-2, B-77-1, and B-78-1 to B-78-5) drilled at the project sites. Three test borings (B-73-1 to B-73-3) were drilled at the MP73 corridor between 1/10/2025 and 1/13/2025; two test borings (B-76-1 to B-76-2) were drilled at Bridge 76.23 between 1/2/2025 and 1/8/2025; one test boring (B-77-1) was drilled at Bridge 77.28 between 1/8/2025 and 1/9/2025; five test borings (B-78-1 to B-78-5) were drilled at the MP78 corridor between 1/14/2025 and 1/15/2025. Additionally, two series of abutment probes were conducted to refusal or to an elevation presumed to be below the abutment foundation at the front and back sides of both Bridge 76.23 abutments and the back side of the south abutment of Bridge 77.28. The borings and probes were performed by New England Boring Contractors of Taunton, Massachusetts.

The test borings were advanced using a hi-rail truck mounted Mobile B-53 drill rig with drive and wash drilling techniques. A 4-inch inside diameter (ID) casing was used during drilling to advance the boreholes. The depths of the borings ranged from 15.3 to 21 feet below top of tie at the MP73 corridor; from 20 to 26 feet below top of tie at Bridge 76.23; and from 13 to 16 feet below top of tie at the MP78 corridor. The boring performed Bridge 77.28 extended to 33.7 feet below top of tie. The abutment probes at Bridge 76.23 and Bridge 77.28 were performed with an AW-size rod advanced with a 140-pound safety hammer to depths ranging from 8 inches to 23 feet or until refusal was achieved.

Standard Penetration Test (SPT), in general accordance with ASTM D1586, was performed during drilling. Standard penetration testing entails driving an approximately 1.38-inch ID (approximately 2-inch outside diameter - OD) split spoon sampler into a soil layer using a 140-lb weight (hammer) dropping freely from a height of 30 inches while recording the number of hammer blows (blow count) for 4 consecutive advancements of the split spoon measuring 6 inches each, for a total advancement of the split spoon of 24 inches.

For this project, a safety hammer operated by cathead lift and rope was used during the SPTs. Split spoon samples were generally obtained at standard 5-foot intervals starting at ground surface, unless otherwise shown on the boring logs.

Rock coring was performed in general accordance with ASTM D-2113 using an NX-size rock core barrel as directed by the field engineer. Borings where rock coring was not performed were terminated upon split spoon and/or rollerbit refusal or after drilling into the refusal material for a minimum of 6 inches.

Groundwater monitoring wells were not installed as part of this exploration program. Groundwater measurements in the boreholes was measured using a weighted tape. The test borings were backfilled with drill cuttings and ballast upon track boring completion and with bentonite and grout upon bridge boring completion.

3.2.2 Drilling Oversight

A HDR engineer observed the drilling of the test borings on a full-time basis. The HDR engineer recorded the blow counts during the SPTs, described the soil and rock samples recovered in general accordance with the Modified Burmister Soil Classification System, described the rock cores, evaluated rock core recovery and Rock Quality Designation (RQD) and prepared the exploration logs. The RQD is defined as the sum of all the rock core pieces greater than 4 inches in length divided by the length of the rock core run, times one hundred. The samples collected during drilling were stored in sealed containers and transported off site for review by HDR engineers and geotechnical laboratory testing.

3.3 Geotechnical Laboratory Testing

Geotechnical laboratory testing was performed on selected soil and bedrock samples from the test borings, to evaluate engineering properties.

Two grain size analyses (ASTM D6913), four Atterberg Limits Determinations (ASTM D4318) and one compressive strength of rock test (ASTM D7012 method C) were performed on soil and rock samples obtained from the borings by GeoTesting Express of Acton, Massachusetts. A summary of geotechnical laboratory test results on soil and rock samples is provided in **Table 3.1** and **Table 3.2**, respectively.

TABLE 3.1 – Summary of Geotechnical Laboratory Testing on Soil Samples

Site	Boring ID	Sample ID	Gravel (%)	Sand (%)	Fines (%)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
MP 73 Corridor	B-73-1	S-3	---	---	---	20	29	17	12
	B-73-1	S-4	---	---	---	47	40	22	18
Bridge 77.28	B-77-1	S-3	32.5	44.3	23.2	---	---		
	B-77-1	S-5 & S-6	60.7	32.4	6.9	---	---		
MP 78 Corridor	B-78-4	S-1	---		---	25	Sample determined to be non-plastic		
	B-78-5	S-2	---	---	---	20	28	23	5

TABLE 3.2 – Summary of Geotechnical Laboratory Testing on Rock Samples

Site	Boring ID	Sample ID	Unit Weight (pcf)	Unconfined Compression Strength (psi)
Bridge 76.23	B-76-1	C-3	162	43,501

4 Subsurface Conditions

The subsurface conditions encountered in the borings varied slightly between the locations explored. Detailed soil descriptions, layer thicknesses, SPT N-values, laboratory testing results, and other notes collected during drilling are provided in the boring logs and laboratory test results in the Appendices.

The subsurface soil stratifications and groundwater conditions shown on the boring logs are representative of the conditions encountered only at the actual boring location. Variations in the overall site subsurface conditions may occur and should be expected between boring locations and across the site in areas that were not explored. The boundary between layers provided in the boring logs are approximate and are based on observations of split-spoon samples, drilling fluid color, drill cuttings and drill rig behavior. The actual transition between layers may be gradual or more abrupt than shown on the boring logs.

It should also be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and could be influenced by the nearby Housatonic River. In addition, a seasonal effect will also occur in which higher groundwater levels are normally recorded during or after rainy seasons and/or prolonged rain events. High groundwater conditions should be evaluated as part of the overall site preparations including impacts on shallow excavations, groundwater control measures, dewatering, etc.

4.1 Bridge 76.23

Borings B-76-1 and B-76-2 were performed at this station and terminated in Bedrock. Five probes were taken at the north abutment, and three probes were taken at the south abutment to evaluate the abutments geometry. Probes were terminated upon refusal.

4.1.1 Soils

Railroad Embankment Fill – Fill was encountered in boring B-76-1 at the ground surface and boring B-76-2 below the abutment stone. This layer consists of railroad ballast at the ground surface followed by varying amounts of sand, gravel, and silt. The Fill was found to be predominantly gravel on the south side and predominantly sand on the north side. The layer thickness was 14 feet to 15.6 feet. The SPT N-values ranged from 16 blows per foot (bpf) to 47 bpf, with an average of 27 bpf. The N-values recorded in the top of this layer are likely artificially inflated due to frozen ground conditions at the time of testing.

4.1.2 Bedrock

The top of rock was found at depths ranging from 14 feet to 15.6 feet below the top of tie in the borings performed at this location. Rock consisted of hard slightly to extremely weathered medium grained dolomite marble. For the rock cores performed at this station, the rock recovery ranged from 58% to 81% and RQD was between 0% and 67%. Based on one tested rock sample collected from this site, the unconfined compressive strength is 43,501 psi, corresponding to Extremely Strong rock on the International Society for Rock Mechanics (ISRM) strength scale. Multiple core barrel jams were encountered due to natural fractures in the rock. The drilling fluid was lost to the fractures while drilling both borings.

4.1.3 Groundwater

Groundwater was encountered within boring B-76-1 at 10 feet below the top of tie, on January 3, 2025. Groundwater was measured in a borehole with casing to a depth of 15 feet.

4.2 Bridge 77.28

Boring B-77-1 was performed at this station and terminated in Bedrock. Two probes were conducted behind the abutment wall to help identify the shape of the buried structure. Probes were terminated upon refusal or at a depth of 23 ft.

4.2.1 Soils

Railroad Embankment Fill – Fill was encountered in boring B-77-1 at the ground surface. This layer consisted of railroad ballast at the ground surface followed by a coarse-grained layer consisting of varying amounts of sand, gravel, and up to 20 percent of silt. The layer thickness was approximately 12 feet. The SPT N-values ranged from 10 bpf to 21 bpf, with an average of 16 bpf. The N-values recorded in the top of this layer are likely inflated due to frozen ground conditions at the time of testing.

Alluvium – Underlaying the Railroad Embankment Fill, a naturally deposited Alluvium layer was encountered in the boring. The Alluvium layer consisted predominantly of Gravel with varying amounts of fine to coarse sand or silt. The layer thickness was 14 feet in the borings. The SPT N-values ranged from 14 bpf to 18 bpf, with an average of 17 bpf.

Glacial Till – Underlaying the Alluvium layer, a Glacial Till layer was encountered in the boring. The Glacial Till layer consisted predominantly of mixture of gravel, sand, and silt. The layer thickness was approximately 5 feet. The SPT taken in this layer reached refusal on a boulder. A 2-foot-thick boulder was encountered in this layer.

4.2.2 Bedrock

The top of rock was found at a depth of 33 feet in the boring performed at this bridge. Rock coring was not performed in this boring, but bedrock was confirmed by drilling with a rollerbit approximately 0.7 feet into bedrock, by split-spoon refusal and by observation of drill cuttings. Observation of drill cuttings confirmed the bedrock consisted of dolomite marble.

4.2.3 Groundwater

Groundwater was encountered within boring B-77-1 at 15 feet below the top of tie, on January 9, 2025. Groundwater was measured in a borehole with casing to a depth of 24 feet.

4.3 Milepost 73 Corridor

Borings B-73-1, B-73-2, and B-73-3 were performed at this site and terminated in alluvium.

4.3.1 Soils

Railroad Embankment Fill – Fill was encountered in B-73-1, B-73-2, and B-73-3 at the ground surface. This layer consisted of varying amounts of gravel, sand, and silt. The upper Fill soils were mostly railroad ballast. Boring B-73-2 encountered coal fragments in the Fill layer. The layer thickness varied from 2 to 3 feet in the borings. The SPT N-values ranged from 28 bpf to 39 bpf, with an average of 33 bpf. The N-values recorded in the top of this layer are likely inflated due to frozen ground conditions at the time of testing.

Clay – Underlaying the Fill layer a naturally deposited Clay layer was encountered in boring B-73-1. The naturally deposited Clay layer consisted predominantly of plastic fine-grained soils with more than 35% in weight of sand. Gravel or wood fragments were also observed in the samples collected in this layer. The layer thickness was found to be approximately 16 feet in boring B-73-1. The SPT N-values ranged from 4 bpf to 11 bpf, with an average of 8 bpf.

Alluvium – Underlaying the Fill and/or Clay layers a naturally deposited Alluvium layer was encountered in the borings. The naturally deposited Alluvium layer consisted predominantly of fine to coarse sand, with varying amounts of gravel and fines. The borings were terminated in this layer. The SPT N-values ranged from 12 bpf to 32 bpf, with an average of 21 bpf.

4.3.2 Groundwater

Groundwater was measured within the recent borings at a depth of 3 feet in B-73-1 on January 13, 2025, at a depth of 3 feet in B-73-2 on January 13, 2025, and at a depth of 4 feet in B-73-3 on January 10, 2025. Measurements were obtained after casing removal.

4.4 Milepost 78 Corridor

Borings B-78-1, B-78-2, B-78-3, B-78-4, and B-78-5 were performed at this station. Borings B-78-1, B-78-2, and B-78-5 were terminated in Alluvium, and borings B-78-3 and B-78-4 were terminated in bedrock.

4.4.1 Soils

Railroad Embankment Fill – Fill was encountered in borings B-78-1, B-78-2, B-78-3, B-78-4 and B-78-5 at the ground surface. This layer was consistently mixed with organics toward the bottom of this layer. The Fill soils consisted of railroad ballast. Coal was encountered in the Fill in borings B-78-3, B-78-4, and B-78-5. The layer thickness varied from 0.5 to 3 feet in the borings. The SPT N-values ranged from 20 bpf to 44 bpf, with an average of 32 bpf. The N-values recorded in the top of this layer are likely inflated due to frozen ground conditions at the time of testing.

Organics – Underlying, and often intermixed with the Fill layer, a layer of Organics was encountered in borings B-78-1, B-78-3, B-78-4, and B-78-5. The Organics layer consists predominantly of black silt, with varying amounts of sand, gravel, and inorganic fines. The layer thickness varied from 1.5 feet to 5 feet in the borings. The SPT N-values ranged from 7 bpf to 44 bpf, with an average of 25 bpf. Some of the higher SPT N-values represent blow counts over cobbles or boulders and may not be representative of the consistency of this layer.

Alluvium – Underlaying the Fill and/or Organics, a naturally deposited Alluvium layer was encountered in borings B-78-1 through B-78-5. The naturally deposited Alluvium layer consisted predominantly of fine to coarse sand, with varying amounts of gravel or silt. Boulders and cobbles were encountered in this layer in borings B-78-1, B-78-2, and B-78-4. The layer thickness observed in the borings where it was fully penetrated varied from 6 to 11.5 feet. The SPT N-values ranged from 12 bpf to 71 bpf, with an average of 42 bpf.

4.4.2 Groundwater

Groundwater was encountered at a depth of 2 feet in B-78-1 on January 14, 2025 after casing removal, at a depth of 10 feet in B-78-2 on January 14, 2025 with casing to 9 ft, at a depth of 2

feet in B-78-3 on January 15, 2025 after casing removal, at a depth of 2 feet in B-78-4 on January 15, 2025 after casing removal, and at a depth of 5 feet in B-78-5 on January 15, 2024 after casing removal.

5 Geotechnical Evaluation and Recommendations

The analyses and recommendations included in this report are based on the generalized subsurface conditions obtained from the subsurface exploration program and our understanding of the proposed project. If significant variations from the generalized subsurface conditions presented in this report appear during construction, or if changes occur in the design of the proposed structures, it will be necessary to re-evaluate these recommendations.

Per the AREMA MRE (Part 4 - 4.4.6), the design installation and testing of drilled micropiles should be executed in accordance with Publication No. FHWA NHI-05-039. We recommend that the design, installation and testing of tieback anchors be performed in accordance with the provisions of the Post Tensioning Institute (PTI) Recommendations for Prestressed Rock and Soil Anchors, latest edition.

Calculation packages for drilled micropiles, tieback anchors and seismic design are included in this report as **Appendix C**.

5.1 Geotechnical Implications of Site Subsurface Conditions

Geotechnical issues associated with the design and construction of the proposed structures and track improvements are as follows:

Loss of Drilling Water During Drilling: The HDR borings performed for this project utilized a system of recirculating drilling fluid to convey spoils from the bottom of the boring as the drill bit advances. The HDR field engineer occasionally observed a sudden or a gradual loss of drilling fluid while drilling into the bedrock. Loss of drilling water was observed during bedrock coring at Bridge 76.23 and Bridge 77.28. Loss of drilling water during drilling is an indication of relatively fractured rock that may result in grout loss during micropile and tieback anchors installation.

Presence of Unsuitable Organics: Organic soils, up to 5 feet in thickness, were encountered in selected borings along the MP78 Corridor. These soils are susceptible to short- and long-term settlements and are unsuitable for track support.

Presence of Unsuitable Fine-Grained Soil Deposits: Fine-grained Clay soils, approximately 16 feet in thickness, were encountered in boring B-73-1 at the western end of the MP 73 corridor. These soils are susceptible to long-term settlement and are unsuitable for track support. Furthermore, the existing fine-grained soils have low hydraulic conductivity that will hamper infiltration possibly causing drainage issues.

5.2 Bridge 76.23

5.2.1 Bridge Seat and Backwall Structure on Drilled Micropiles

5.2.1.1 STRUCTURAL LOADS AND STRUCTURE CONFIGURATION

The proposed bridge girders will be placed on a new precast bridge seat and backwall to be supported on deep foundations. We understand that the precast structure will essentially span

over the existing abutments, discharging loads primarily onto the proposed deep foundations. The maximum factored loads provided by the HDR Structural team include axial, longitudinal (in the direction parallel to the bridge girders) and lateral (perpendicular to the bridge girders) loads acting on the pile cap. The HDR Structural team provided six factored load combinations (ASD Group I through ASD Group VI).

The Geotechnical team reviewed the provided loads and selected three load combinations to be used for deep foundation design (ASD group I, group III and group VI were evaluated to be the worst-case scenarios). The selected load combinations are as follows.

Group I

- An axial compression load of 500.36 kips
- A longitudinal force of 46.45 kips
- A transverse lateral force of 26.82 kips

Group III

- An axial compression load of 400.29 kips
- A maximum and minimum longitudinal force of 171.56 kips and -97.24 kips
- A transverse lateral force of 27.54 kips

Group VI

- An axial compression load of 357.40 kips
- A maximum and minimum longitudinal force of 205.05 kips and -138.69 kips
- A transverse lateral force of 24.59 kips

5.2.1.2 DRILLED MICROPILES FOUNDATIONS

Based on the subsurface conditions encountered within the test borings performed at the site, we recommend that each proposed precast structure be founded on two groups of six (6) Type A drilled micropiles. The micropile groups should be installed on each side of the existing abutments and should include three (3) vertical micropiles and three (3) battered micropiles, with batter of 30 degrees. We understand that a micropile spacing of 2.5 feet on-center was proposed by the Structural team.

The drilled micropiles should be cased over the existing fill and should develop their bond strength in the existing bedrock. The permanent casing should have a minimum outside diameter of 12.75 inches and 0.5 inches thick walls. The casing should penetrate a minimum of 12 inches in the bearing layer. The micropile reinforcement should consist of a center threaded rebar with a minimum core diameter of 1.69 inches (#14 thread bar). Rebar yield strength should be 75 ksi. The grout-to-ground bond strengths will be developed through bonding of the grout to the surrounding bond layer. Anticipated grout-to-ground bond strengths vary based on density and type of the bearing layer and are anticipated to range from 150 psi to 300 psi. Grout should be placed using a tremie pipe starting at the toe of the micropile. The minimum 28-day grout compressive strength shall be 5.0 ksi. For corrosion protection, the center rebar and couplers shall be galvanized and fully embedded in grout with a minimum cover of 3 inches. A steel

thickness of 1/8 inches all-around sacrificial steel should be accounted for in structural calculations for the permanent casing which will come in contact with the site soils.

5.2.1.3 DRILLED MICROPILE LENGTHS

The total drilled micropiles lengths are listed in **Table 5.1**. In evaluating micropile lengths for biding purpose, a resistance factor of 0.55 was used in accordance with chapter 10.5.5.2.5 of the AASHTO LRFD Bridge Design Specifications to obtain the factored geotechnical axial compression resistance of the proposed micropiles. The drilled micropiles lengths listed in **Table 5.1** are for bidding purposes only. We recommend that a contingency of 60 feet be assumed in evaluating pile lengths for bidding purposes.

5.2.1.4 DRILLED MICROPILE DESIGN

The final micropile factored geotechnical axial compression resistance shall be based on the results of a verification test as described herein. The test micropile should develop a nominal geotechnical axial compression resistance that equals 1.5 times the maximum factored axial compression load on single micropile (resulting from load cases provided by the HDR Structural team).

The design of the proposed drilled micropile group under lateral loads was performed using the software GROUP by Ensoft, using the load combinations provided by the HDR Structural team and drilled micropiles with features as described herein. The results of the GROUP analysis, including maximum moment, maximum shear, maximum axial compression load and maximum deflection, are listed in **Table 5.1**. The results of the group analysis were used to perform structural checks to verify the structural performance of the proposed drilled micropiles. The drilled micropile permanent casing lengths indicated in **Table 5.1** have been evaluated to "bridge" unsuitable soils present at the site and to provide stiffness to resist lateral loads (casing length below the point of fixity).

TABLE 5.1 – Summary of Drilled Micropiles (DMP) Lengths, Maximum Moment, Maximum Shear and Top Displacement Under Lateral Loads

Site	Bridge 76.23
Total Length of DMP (ft) – Bidding Purpose Only	21 (vertical) 24 (battered)
Cased Length of DMP (ft)	16 (vertical) 19 (battered)(1)
Maximum Moment from Lateral Loading (in-kips)	837
Maximum Shear from Lateral Loading (kips)	49.5
Maximum Deflection from Lateral Loading (in)	<0.5
Maximum Factored Axial Compression Load on single micropile (kips)	84.4
Nominal Geotechnical Axial Compression Resistance (Factored Load x 1.5)	126.6

(1) Casing to plunge at least 1 foot into bond stratum. Casing length based on depth to bedrock, pile batter, and on depth to the point of fixity.

5.2.1.5 DRILLED MICROPILE SETTLEMENT

Total settlement of the proposed drilled micropiles bonded as described herein, under the loads indicated by HDR's Structural Team, are expected to be less than 0.5 inches.

5.2.2 Bridge Abutments with Tieback Anchors

The existing abutment walls of Bridge 76.23 will be retrofitted with breastwalls installed in front of the abutments, doweled into the existing abutment stones. Tieback anchors will be installed through the breastwall and the existing stone masonry walls. We understand that the tieback anchors will be resisting the earth pressure and pressure from live load surcharge. The live load surcharge was provided by the HDR Structural team and was approximately 1882 psf (Cooper E80 loading).

The angle of installation of the tieback anchors will depend on site access and on the machinery used for the installation of the tiebacks. Therefore, tieback anchors should be designed by the contractor following the minimum performance criteria provided by HDR. The tieback anchors at Bridge 76.23 should be designed to resist a total horizontal load of 9.5 kips/ft per abutment, resulting in an average horizontal load of 76 kips per tieback anchor assuming a minimum of two (2) tieback anchors per abutment are installed.

Anchors shall be constructed using threaded bar tendons conforming ASTM A722/A722M type II. Relaxation shall not exceed the values from relaxation curves provided by the manufacturer. Prestressing steel should have Class I corrosion protection consisting of plastic sheath with grout fill (double encapsulation of the entire anchor). The tieback anchor drilled borehole shall be backfilled with minimum 4 ksi, Type II cement grout. Centralizers shall be used after installation of the threaded bar. A bond breaker should be installed over the unbonded length of the tieback anchor. Lock-off load should be 75% of the design load. A steel trumpet shall be installed after the lock-off load is applied. The trumpet shall be backfilled with corrosion inhibiting grout or grease.

5.3 Bridge 77.28

5.3.1 Bridge Abutments with Tieback Anchors

The existing south abutment of Bridge 77.28 will be retrofitted with a breastwall installed in front of the abutment, doweled into the existing abutment stones. The breastwall will cover the majority of the abutment and west wingwall face. Tieback anchors will be installed through the breastwall and the existing stone masonry wall. We understand that the tieback anchors will be resisting the earth pressure and pressure from live load surcharge. The live load surcharge was provided by the HDR Structural team and was approximately 1882 psf (Cooper E80 loading).

The angle of installation of the tieback anchors will depend on site access and on the machinery used for the installation of the tiebacks. Therefore, tieback anchors should be designed by the contractor following the minimum performance criteria provided by HDR. The tieback anchors at Bridge 76.23 should be designed to resist a total horizontal load of 15.5 kips/ft per abutment. A minimum of five (5) tieback anchors per abutment should be installed.

Anchors shall be constructed using threaded bar tendons conforming ASTM A722/A722M type II. Relaxation shall not exceed the values from relaxation curves provided by the manufacturer. Prestressing steel should have Class I corrosion protection consisting of plastic sheath with grout fill (double encapsulation of the entire anchor). The tieback anchor drilled borehole shall be backfilled with minimum 4 ksi, Type II cement grout. Centralizers shall be used after installation of the threaded bar. A bond breaker should be installed over the unbonded length of the tieback

anchor. Lock-off load should be 75% of the design load. A steel trumpet shall be installed after the lock-off load is applied. The trumpet shall be backfilled with corrosion inhibiting grout or grease.

5.4 Seismic Design Parameters

5.4.1 Seismic Site Class

The Seismic Site Class was determined in accordance with Chapter 9 of the AREMA MRE. Based on this procedure and on data from the borings the Seismic Site Class for the two bridges was evaluated to be Site Class C.

5.4.2 Spectral Response Accelerations

The seismic site class and seismic design parameters were evaluated using the procedure described in AREMA MRE.

The peak ground acceleration (PGA), 0.2-seconds (S_{MS}), and 1-second (S_{M1}) spectral response accelerations for the two bridge sites are summarized in **Table 5.3** and **Table 5.4**.

TABLE 5.3 – **Summary of Spectral Response Accelerations – Bridge 76.23**

Return Period (years)	PGA	0.2 sec	0.1 sec
190	0.0194	0.0412	0.0115
743	0.0429	0.0875	0.0257
2475	0.0835	0.1590	0.0466

Note – Values of PGA, S_{MS} and S_{M1} spectral response accelerations are provided as a fraction of g, the acceleration of gravity.

TABLE 5.4 – **Summary of Spectral Response Accelerations – Bridge 77.28**

Return Period (years)	PGA	0.2 sec	0.1 sec
190	0.0194	0.0413	0.0115
743	0.0430	0.0876	0.0257
2475	0.0836	0.1592	0.0467

Note – Values of PGA, S_{MS} and S_{M1} spectral response accelerations are provided as a fraction of g, the acceleration of gravity.

6 Geotechnical Construction Considerations

6.1 Site Excavations

6.1.1 General

Excavation should conform to OSHA health and safety standards for excavation contained in 29 CFR Part 1926, latest edition. Excavation height, depth and slope should conform to these OSHA standards and all local, State, and Federal safety regulations. As a safety measure, it is recommended that vehicles and soil piles be kept a minimum lateral distance from the crest of excavations. On-site construction safety is solely a responsibility of the Contractor. The information provided herein is provided as a service to our client and should not be interpreted to mean that HDR is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

6.1.2 Excavation Slopes and Support of Excavation

It is anticipated that excavations will be accomplished by sloping or benching the sides of the excavations. However, if an engineered support of excavation system will be required, the engineered support of excavation systems should be selected by the Contractor and designed by an experienced Professional Engineer registered in the State of Massachusetts retained by the Contractor using the minimum values included in this report. Possible engineered support of excavation systems include cantilevered systems such as sheetpiles and soldier pile and lagging support of excavation, with or without bracing. If the support of excavation will extend within the bearing zone of existing or proposed structures or railroad track, the support of excavation should be cut below finished grade and abandoned in place after construction.

6.1.3 Dewatering

Dewatering will be necessary at Bridge 77.28, where a cofferdam will be installed for the construction of the proposed breastwall and tieback anchors. At this site, dewatering may be accomplished by means of a series of sumps and sump pumps. Sumps should extend to a sufficient depth in order to properly dewater the work area and allow construction in the dry. Groundwater/riverwater should be lowered to a minimum of one foot below the working grade. Sumps should be provided with filters suitable to prevent pumping of fine-grained soil particles.

The Contractor should dispose dewatering water in accordance with local, State and Federal regulations. Recommendations for disposal of dewatering water is beyond the scope of this report and should be evaluated separately.

Based on the groundwater levels measured in the borings at Bridge 76.23 and in the track borings groundwater is unlikely to be present in excavations during construction of the proposed improvements and dewatering should not be necessary.

6.2 Backfill Compaction and Backfill Gradations

Backfill should be placed in 12-inch maximum loose lift thickness (evaluated prior to compaction) or 6-inch lifts thickness in restricted areas such as trenches, behind walls or around footings/breastwalls. Backfill should be compacted to a minimum Relative Compaction (RC,

defined as backfill target dry density as a percentage of backfill maximum dry density, obtained as described in ASTM D-1557) as follows:

- RC= 95 percent underneath structures, pavement (pavement base/subbase) and utilities
- RC= 92 percent in landscape areas.

Backfill moisture during compaction should not be higher than the optimum moisture content plus 2% and should not be lower than the optimum moisture content minus 2%.

Crushed Stone should be placed in loose lift thicknesses of maximum 12 inches and should be compacted with heavy compaction equipment to achieve a dry, unyielding subgrade.

Table 6.1 presents the gradation requirement for imported material of for on-site material to be reused.

Table 6.1 – Gradation Requirements of Imported and On-Site Material

Sieve Size	Percent Finer by Weight				
	Common Fill (M1.02.0-1)	**Sand (M1.04.1-1)**	**Structural Fill Wall Backfill (M1.03.0-1)**	**3/4" Crushed Stone (M2.01.4)**	**Pavement Subbase (M1.03.1-1)**
6-inch	100	-	-	-	-
3-inch	-	-	-	-	100
2-inch	90-100	-	100	-	-
1-1/2 inch	-	-	-	-	70-100
1-inch	-	-	-	100	-
3/4-inch	-	-	70-100	90-100	50-85
1/2-inch	-	100	50-85	10-50	-
3/8-inch	-	85-100	-	0-20	-
No. 4	20-65	60-100	40-75	0-5	30-60
No. 10	-		-	-	-
No. 16	-	35-80	-	-	-
No. 50	-	10-55	8-28	-	-
No. 60	-	-	-	-	-
No. 100	-	2-10	-	-	-
No. 200	0-12		0-10	-	0-10

Testing of the placed and compacted backfill should be performed to verify that the recommended relative compaction and moisture content have been achieved by the Contractor. Backfill testing should be performed by an experienced testing agency using methods and equipment as

described in ASTM D6938 or, alternatively, ASTM D1556. Testing frequency should be 1 test per backfill lift per every 2,500 square feet of backfill placed.

6.3 Reuse of On-Site Soils

Existing site soils may be re-used as common fill, regardless of gradation, provided the soil meets environmental requirements, it is free of organics, debris, or other unsuitable material, and can be compacted to the required density and moisture content. On-site soils can be re-used as structural backfill underneath structures, provided they meet the gradation requirements in **Table 6.1**.

If off-site disposal of soil is required, the disposal should be performed by the Contractor in accordance with applicable Federal, State, and local regulations. The evaluation of existing site soil for off-site disposal purpose was not included in the scope of this report.

6.4 Micropile Installation and Testing

Prior to installation of production drilled micropiles, one sacrificial element should be installed and tested by the Contractor to confirm drilled micropile resistance. Proof testing of 5% of the production micropiles or a minimum of 2 micropiles should be performed during production micropiles installation. We recommend that one micropile be tested in each pile group on the side of the bridge with fixed bearings.

The drilling technique used should limit vibrations and disturbance near sloped ground. Based on the list of drilling methods described in the FHWA NHI-05-039, rotary duplex drilling methods are recommended. Drilling methods such as sonic drilling should be avoided due to excessive vibration. Suitable drilling tools include tri-cone rollerbit of appropriate diameter. However, down-the-hole (DTH) hammer may be required to expeditiously drill the micropile rock socket.

The general construction sequence for drilled micropiles should consist of the following steps. The micropile casing is drilled to the target cased depth. At the target cased depth, the drill bit or DTH hammer and rods are advanced into the bedrock to the target bond depth. At the target bond depth, the drilling tools are removed from the casing and rock socket, and the borehole is thoroughly flushed to remove debris. After the Engineer has sounded the bottom of the micropile, a center rebar with appropriate centralizers and bottom spacer is placed in the borehole with tremie grout placed in the annular space between the inside of the casing/rock socket and reinforcement. Grout top-off should be performed to make up for possible grout loss into fractures.

It is recommended that micropiles are installed in a staggered pattern (do not drill a new micropile next to a micropile that has fresh grout) to avoid disturbance to freshly grouted micropiles. The Contractor should not place micropiles adjacent to each other until the grout in previously installed micropile sets. Drilled micropiles spaced closer than a clear spacing of at least 3 diameters should be installed a minimum of 24 hours apart.

Water is typically used to clean and flush the hole during drilling. Polymer-based drilling mud may also be used instead of water to improve cleaning the micropile hole. Bentonite slurries should not be used as this slurry type reduces the bond strength. The contractor should be prepared to dewater the area of the micropiles. Excavating the area around each micropile 3 to 4 feet below

grade may help accumulate and contain drilling water before pumping to a water containment sump. Dewatering should be performed as described in this report.

The rebar centralizers should be spaced 10 feet on-center, with the bottom centralizer placed minimum 3 feet from the bottom of micropile and the top centralizer 3 feet below the top of casing. A 3-inch bottom spacer shall be placed at the bottom of the rebar to provide the necessary grout coverage.

The tremie pipe should be placed at the bottom of the borehole after reinforcement has been installed. Care should be taken so that the tremie pipe does not damage or interfere with the centralizers for the rebar. The tremie pipe may be withdrawn while installing grout but it shall always remain below the top of grout in the micropile.

The Contractor should schedule the sequence of operations so each excavation can be completed, reinforcing steel placed, and the concrete poured in a continuous, rapid, and orderly manner.

6.5 Tieback Anchors Installation and Testing

We recommend that the installation and testing of tieback anchors be performed in accordance with the provisions of the Post Tensioning Institute (PTI) Recommendations for Prestressed Rock and Soil Anchors.

Performance testing to 133% of the design load should be performed on the first production tieback at Bridge 76.23 and on the first and second tiebacks at Bridge 77.28. The results of performance testing should be used by the contractor to calibrate the installation of the remaining production anchors and eventually, take corrective action to improve anchors performance. Proof testing to 133% of the design load should be performed on the remaining production tieback anchors. Creep testing should also be performed during performance testing. After testing is completed, the lock-off load should be applied, and lift-off should be performed to check the locked-off load.

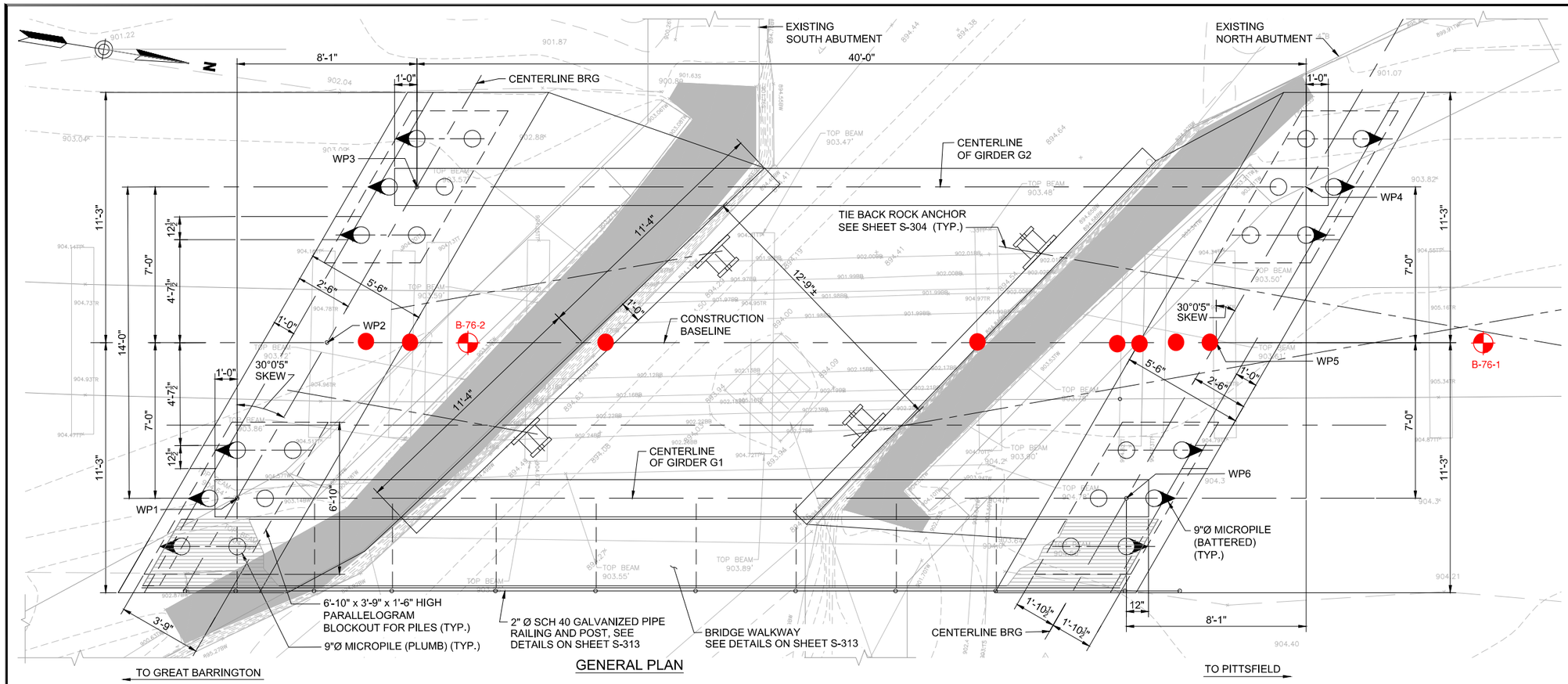
7 Limitations

This report presents our findings, recommendations and considerations for design and construction for the Berkshire Line Improvements in Lee and Lenox, Massachusetts. This report has been prepared in accordance with generally accepted geotechnical engineering practice. No warranty, express or implied, is made relative to liability for direct, indirect, incidental, consequential or special loss or damage or other liability of any nature arising form said party's use of such report or reliance upon any of its content.

The analyses and recommendations submitted are based on the data available to HDR at the time of submission in February 2025. The conclusions and foundation information presented herein are based on site field reconnaissance, research and available literature, review of available design/construction drawings by others, and subsurface explorations performed by others made available to HDR. The report does not reflect assumed soil, rock, and/or groundwater variations that may occur between locations mentioned or at other points in time and confirmed by borings to be taken at a later date. Variations in conditions, if any, may become evident during construction of the structure and roadway, at which time a re-evaluation of the information presented may become warranted. In the event of such changes subsequent to submission of this report, the information presented should be reviewed by HDR's geotechnical staff for continued applicability.

FIGURES

FIGURE 1A - BORING LOCATION PLAN – BRIDGE 76.23
FIGURE 1B - BORING LOCATION PLAN – BRIDGE 77.28
FIGURE 1C - BORING LOCATION PLAN – MILEPOST 73 CORRIDOR
FIGURE 1D - BORING LOCATION PLAN – MILEPOST 73 CORRIDOR (SOUTH)
FIGURE 1E - BORING LOCATION PLAN – MILEPOST 73 CORRIDOR (NORTH)



GENERAL PLAN

NOTES:

1. BORING LOCATIONS SHOWN THUS: B-76-2

2. PROBE LOCATIONS SHOWN THUS:

3. BORINGS PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF TAUNTON, MA IN JANUARY 2025.

4. BORINGS OBSERVED BY AN HDR ENGINEER ON A FULL TIME BASIS. REFER TO BORING LOGS FOR MORE INFORMATION.

5. BORINGS WERE BACKFILLED WITH DRILL CUTTINGS AND BALLAST AFTER COMPLETION.

6. BORINGS LOCATED BASED ON TAPING AND LINE OF SIGHT FROM EXISTING SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

7. ELEVATION DATUM IS NAVD88

ISSUE	DATE	DESCRIPTION	BY	CHKD	APP.

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

REHABILITATION OF BRIDGE 76.23

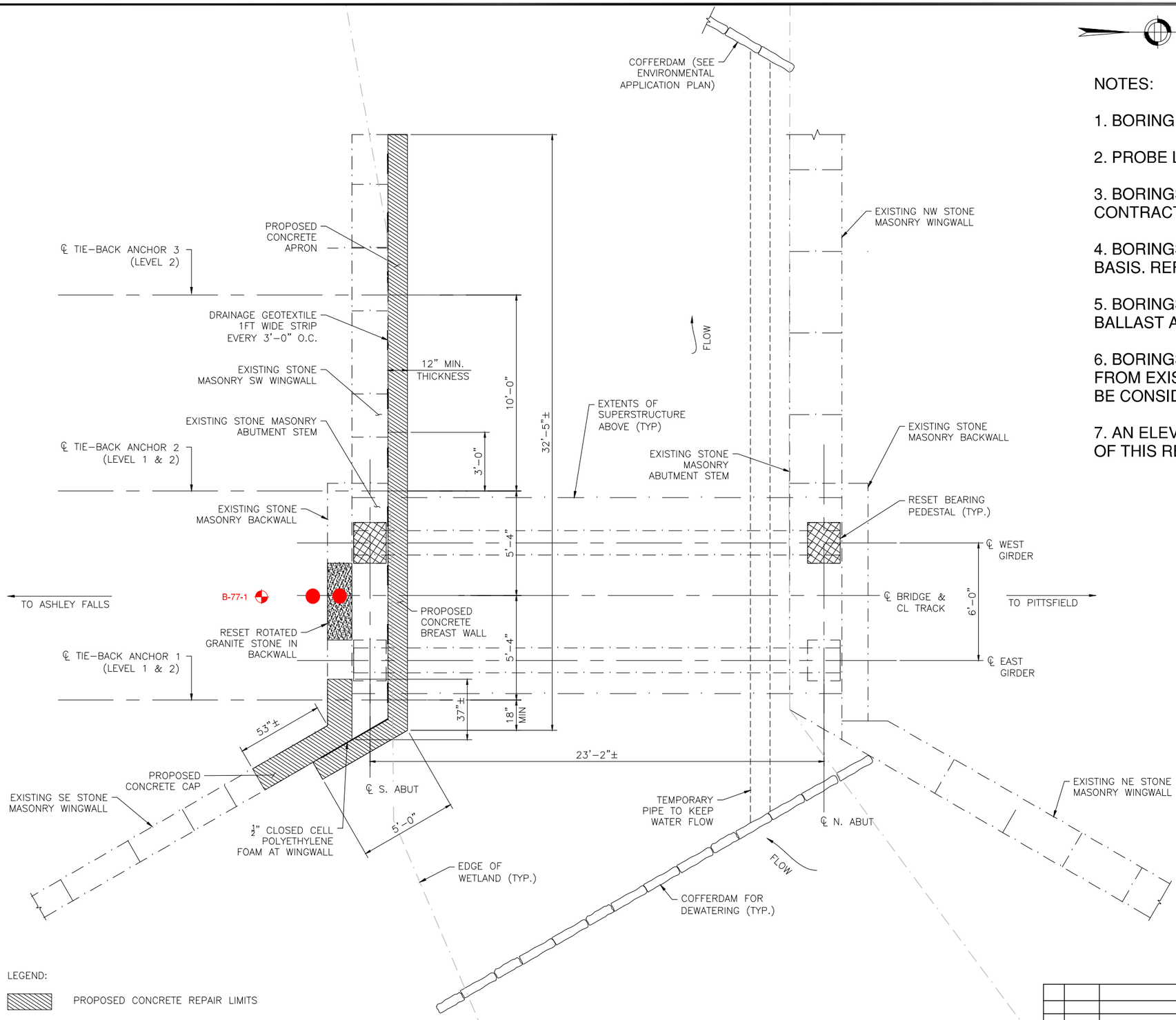
BORING LOCATION PLAN

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: 3/16"=1'	DRAWN BY	DESIGN BY	CHECK BY		ISSUE
DATE: 2/27/2025	DD	RM	MR	SHEET: FIGURE 1A	

C:\pw\working\east01\d4180910\76.23_S1_3_BRIDGE DETAILS.dwg



BRIDGE PLAN – PROPOSED WORK

NOTES:

1. BORING LOCATIONS SHOWN THUS: B-77-1

2. PROBE LOCATIONS SHOWN THUS:

3. BORINGS PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF TAUNTON, MA IN JANUARY 2025.

4. BORINGS OBSERVED BY AN HDR ENGINEER ON A FULL TIME BASIS. REFER TO BORING LOGS FOR MORE INFORMATION.

5. BORINGS WERE BACKFILLED WITH DRILL CUTTINGS AND BALLAST AFTER COMPLETION.

6. BORINGS LOCATED BASED ON TAPING AND LINE OF SIGHT FROM EXISTING SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

7. AN ELEVATION SURVEY WAS NOT AVAILABLE AT THE TIME OF THIS REPORT.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

REHABILITATION OF BRIDGE 77.28 OVER MOUNT WASHINGTON BROOK

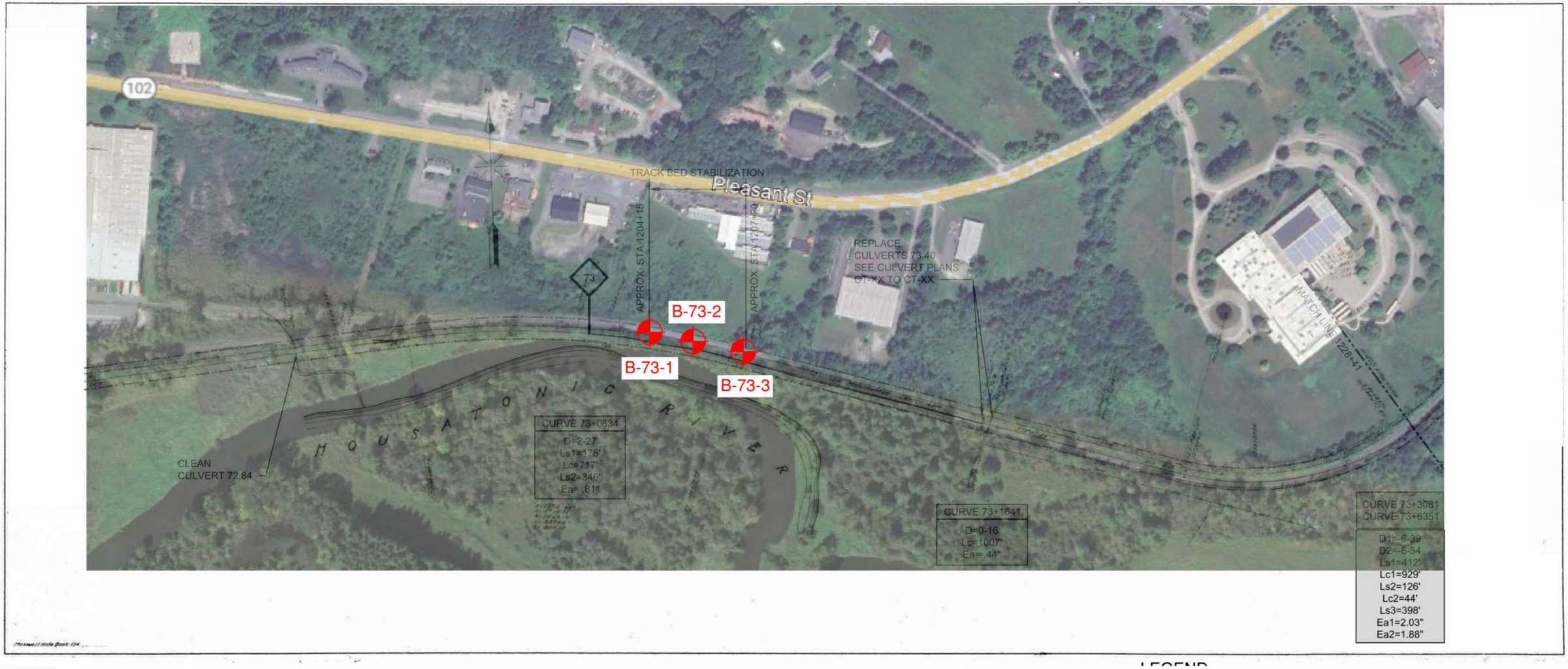
BORING LOCATION PLAN

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: 3/16"=1'	DRAWN BY	DESIGN BY	CHECK BY	ISSUE
DATE: 2/27/2025	BMH	RM	MR	SHEET: FIGURE 1B

LEE



NOTES:

1. BORING LOCATIONS SHOWN THUS: B-73-1

2. BORINGS PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF TAUNTON, MA IN JANUARY 2025.

3. BORINGS OBSERVED BY AN HDR ENGINEER ON A FULL TIME BASIS. REFER TO BORING LOGS FOR MORE INFORMATION.

4. BORINGS WERE BACKFILLED WITH DRILL CUTTINGS AND BALLAST AFTER COMPLETION.

5. BORINGS LOCATED BASED ON TAPING AND LINE OF SIGHT FROM EXISTING SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

6. ELEVATION DATUM IS NAVD88.

MASSDOT BERKSHIRE LINE TRACK IMPROVEMENT

PLAN SHEET 2 OF 15
STA. 1175+61 TO STA. 1228+41

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

SCALE: 1/8"=40'	DRAWN BY	DESIGN BY	CHECK BY	ISSUE
DATE: 2/27/2025	RM	RM	MR	SHEET: FIGURE 1C

LENOX

NOTES:

1. BORING LOCATIONS SHOWN THUS:

2. BORINGS PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF TAUNTON, MA IN JANUARY 2025.

3. BORINGS OBSERVED BY AN HDR ENGINEER ON A FULL TIME BASIS. REFER TO BORING LOGS FOR MORE INFORMATION.

4. BORINGS WERE BACKFILLED WITH DRILL CUTTINGS AND BALLAST AFTER COMPLETION.

5. BORINGS LOCATED BASED ON TAPING AND LINE OF SIGHT FROM EXISTING SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

6. ELEVATION DATUM IS NAVD88.

MASSDOT BERKSHIRE LINE TRACK IMPROVEMENT

MILEPOST 78 CORRIDOR - SOUTH

STA. 1439+61 TO STA. 1492+41

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

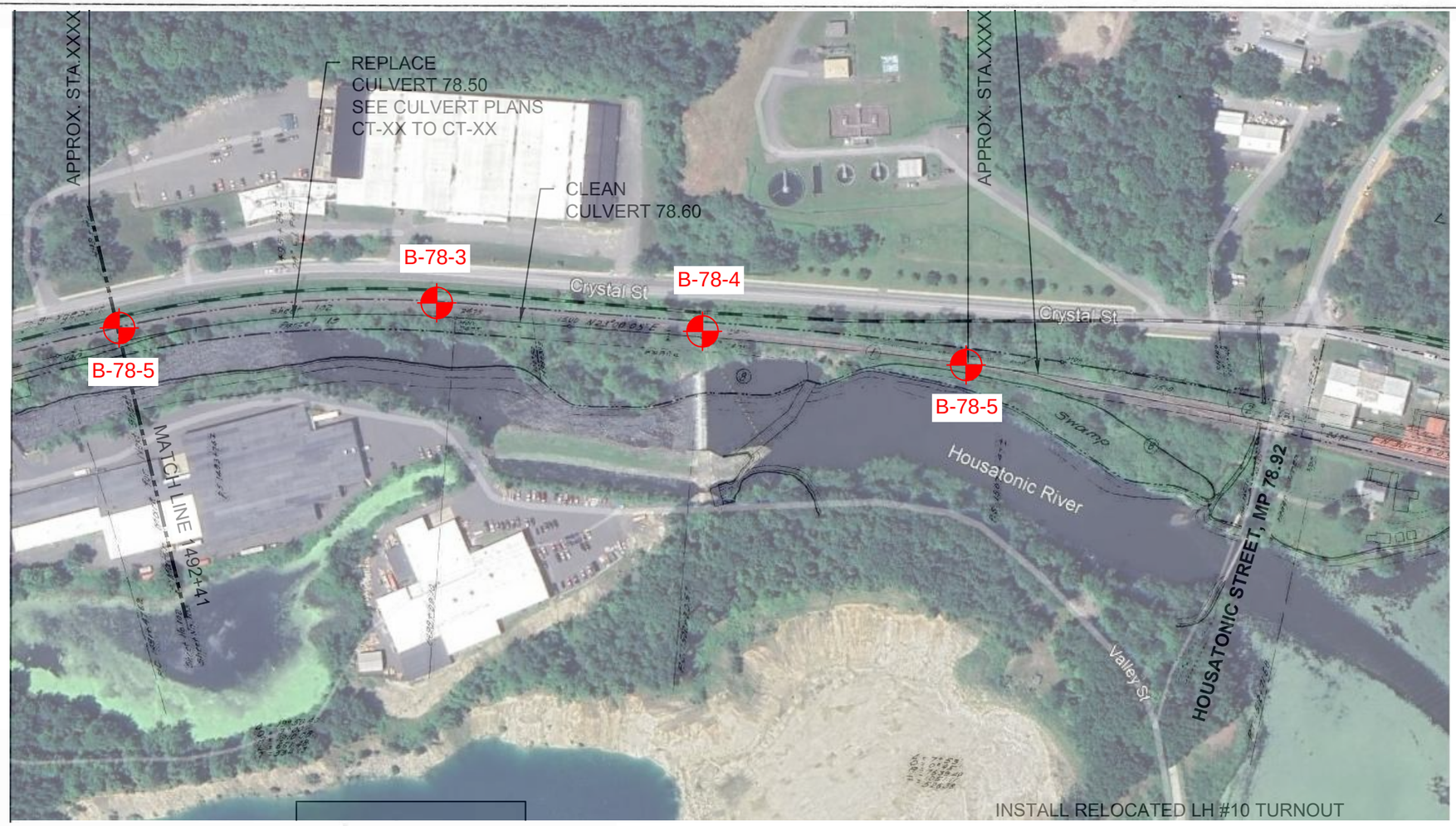
HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: 1/8"=20'	DRAWN BY	DESIGN BY	CHECK BY	ISSUE
DATE: 2/27/2025	RM	RM	MR	

SHEET: FIGURE 1D

LENOX



NOTES:

1. BORING LOCATIONS SHOWN THUS: B-73-1

2. BORINGS PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF TAUNTON, MA IN JANUARY 2025.

3. BORINGS OBSERVED BY AN HDR ENGINEER ON A FULL TIME BASIS. REFER TO BORING LOGS FOR MORE INFORMATION.

4. BORINGS WERE BACKFILLED WITH DRILL CUTTINGS AND BALLAST AFTER COMPLETION.

5. BORINGS LOCATED BASED ON TAPING AND LINE OF SIGHT FROM EXISTING SITE FEATURES. BORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE.

6. ELEVATION DATUM IS NAVD88.

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

MASSDOT BERKSHIRE LINE TRACK IMPROVEMENT

MILEPOST 78 CORRIDOR - NORTH

STA. 1492+41 TO STA. 1545+21

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

SCALE: 1"=300'	BAR	DRAWN BY	DESIGN BY	CHECK BY		ISSUE
DATE: 2/27/2025		RM	RM	MR	SHEET: FIGURE 1E	

APPENDIX A

SUBSURFACE EXPLORATION PROGRAM

APPENDIX A.1

TEST BORING LOGS

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-73-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2931083 **EAST** 180453
DATE STARTED 1/13/25 **COMPLETED** 1/13/25
STATION --- **OFFSET** ---
GROUND ELEVATION 850 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 3.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring. Top sample observed to be frozen
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	850		Gray GRAVEL, some fine to coarse Sand, trace Silt, medium dense, dry [Ballast]	SPT 1	13	17-13-15-18 (28)		Ground surface defined as the top of the railroad tie.
5	845		Gray CLAY, some fine Sand, trace Gravel, trace Wood, stiff, wet	SPT 2	92	5-4-7-9 (11)		1/16 in thread rolled from sample material.
10	840		Gray fine to coarse CLAY and SAND, little Gravel, stiff, wet	SPT 3	71	4-4-5-5 (9)	LL=29, PL=17, PI=12. MC=20%	1/16 in thread rolled from sample material.
15	835		Gray CLAY, trace fine to coarse Sand, soft, wet	SPT 4	50	1-2-2-2 (4)	LL=40, PL=22, PI=18. MC=47%	1/32 in thread rolled from sample material.
20	830		Gray fine to coarse SAND, some Silt, trace Gravel, medium dense, wet	SPT 5	50	5-14-14-8 (28)		Borehole backfilled with cuttings at the end of drilling.

Bottom of borehole at 21.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-73-2

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2931069 **EAST** 180626
DATE STARTED 1/13/25 **COMPLETED** 1/13/25
STATION --- **OFFSET** ---
GROUND ELEVATION 851 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 3.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring. Top sample observed to be frozen.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	850		Brown fine to coarse SAND and GRAVEL, trace Silt, trace Coal, dense, dry [Ballast]	SPT 1	50	27-17-22-16 (39)		Ground surface defined as the top of the railroad tie.
5	845		Brown fine to coarse SAND, some Clay, little Gravel, medium dense, wet	SPT 2	63	4-6-7-9 (13)		1/8 in thread rolled from sample material.
10	840		Brown fine to coarse SAND, some Gravel, some Clay, medium dense, wet	SPT 3	54	5-10-13-11 (23)		1/8 in thread rolled from sample material.
15	835		Brown fine to coarse SAND, some Gravel, some Silt, medium dense, wet	SPT 4	8	7-6-6-7 (12)		Borehole backfilled with cuttings at the end of drilling.

Bottom of borehole at 16.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-73-3

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2931060 **EAST** 180708
DATE STARTED 1/10/25 **COMPLETED** 1/10/25
STATION --- **OFFSET** ---
GROUND ELEVATION 851 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 4.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring. Top sample observed to be frozen.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	850		Gray GRAVEL, some fine to coarse Sand, little Silt, medium dense, dry [Ballast]	SPT 1	58	14-11-20-23 (31)		Ground surface defined as the top of the railroad tie.
5	845		Brown fine to coarse SAND, some Silt, dense, wet	SPT 2	75	12-12-20-26 (32)		
10	840		Brown fine to coarse SAND, little Gravel, little Silt, medium dense, wet	SPT 3	38	12-9-6-12 (15)		
15			Brown GRAVEL, some fine to coarse Sand, little Silt, very dense, wet	SPT 4	50	16-31-50/4 (50/4)		Rock fragments encountered in the tip of sample S-4. Borehole backfilled with cuttings at the end of drilling.

Bottom of borehole at 15.3 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-76-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2944273 **EAST** 183812
DATE STARTED 1/2/25 **COMPLETED** 1/3/25
STATION --- **OFFSET** ---
GROUND ELEVATION 904 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** M. Pham
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 10.0 ft measured with casing to 14 ft
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Behind bridge 76.23 north abutment.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	904		Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, dry [Ballast]	SPT 1	29	6-7-9-11 (16)		Ground surface elevation defined as the top of the railroad tie. Top sample frozen due to freezing temperatures.
5	900		Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, wet	SPT 2	33	10-9-9-16 (18)		
10	895		▽ Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, wet	SPT 3	42	6-9-12-20 (21)		
15	890		Gray, hard, slightly weathered, moderately fractured, medium grained DOLOMITE MARBLE	RC 1	58 (0)			Top of rock at 14 ft below ground surface. Drill into rock 1 ft to start coring. Rock cores C-1 and C-2 stopped after only 1 ft with core barrel jams likely due to natural rock fractures. No water return while rock coring deeper than 18 feet
			Gray, hard, slightly weathered, extremely fractured, medium grained DOLOMITE MARBLE	RC 2	67 (0)			
			Gray, hard, slightly weathered, slightly fractured, medium grained DOLOMITE MARBLE	RC 3	81 (67)		Unconfined Compressive Strength = 43501 psi. Bulk Density = 162 pcf	
20	885							
			Gray, hard, slightly weathered, slightly fractured, medium grained DOLOMITE MARBLE	RC 4	65 (57)			
25	880							Borehole backfilled with grout and bentonite at the end of drilling.

Bottom of borehole at 26.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-76-2

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2944228 **EAST** 183819
DATE STARTED 1/6/25 **COMPLETED** 1/8/25
STATION --- **OFFSET** ---
GROUND ELEVATION 904 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING ---
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Through bridge 76.23 south abutment.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Bridge includes a 2 ft void between the top of tie and the top of the bridge seat where this boring was drilled.					Ground surface elevation defined as the top of the railroad tie.
			Stone abutment blocks					
	900							
5								Drilled 2 ft beyond abutment block to confirm not just a joint in the masonry stones.
			Gray GRAVEL, little fine to coarse Sand, trace Silt, dense, moist	SPT 1	42	4-27-20-18 (47)		
	895							
10			Gray GRAVEL, little fine to coarse Sand, trace Silt, dense, wet	SPT 2	33	21-14-17-16 (31)		
	890							
15			Brown GRAEL and fine to coarse Sand, little Silt, very dense, wet	SPT 3	71	39-50/1 (50/1)		Rock fragments in tip of sample S-3.
			Gray, hard, slightly weathered, moderately fractured, medium grained DOLOMITE MARBLE	RC 1	61 (31)			Rock core C-1 stopped after 3 ft with core barrel jams likely due to natural rock fractures.
	885							
20			Bottom of borehole at 20.0 feet.					Boring stopped at 20 ft due to equipment failure in freezing conditions. Borehole backfilled with bentonite and grout at the end of drilling.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-77-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2949237 **EAST** 185132
DATE STARTED 1/8/25 **COMPLETED** 1/9/25
STATION --- **OFFSET** ---
GROUND ELEVATION _____ **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 15.0 ft measured with casing to 24 ft
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Behind bridge 77.28 south abutment.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Black GRAVEL, little fine to coarse Sand, trace Silt, medium dense, dry [Ballast]	SPT 1	29	19-12-9-12 (21)		Ground surface defined as the top of the railroad tie. Top sample frozen due to freezing temperatures.
5			Brown fine to coarse SAND, some Gravel, little Silt, medium dense, moist	SPT 2	50	7-7-9-8 (16)		
10			Brown fine to coarse SAND, some Gravel, some Silt, medium dense, moist	SPT 3	33	6-5-5-5 (10)	44.3% Sand, 32.5% Gravel, 23.2% Fines	
15			▽ Brown fine to coarse SAND, some Gravel, little Silt, trace roots/wood, medium dense, wet	SPT 4	21	14-7-7-9 (14)		Roots and buried vegetation indicate likely bottom of fill layer.
20			Brown GRAVEL, some fine to coarse Sand, trace Silt, medium dense, wet	SPT 5	13	19-8-10-10 (18)	S-5 and S-6 combined: 60.7% Gravel, 32.4% Sand, 6.9% Fines	
25			Brown GRAVEL, some fine to coarse Sand, trace Silt, medium dense, wet	SPT 6	42	18-10-8-8 (18)		Strata change at 28 ft inferred based on casing advancment difficulty.
30			Brown GRAVEL and fine to coarse Sand, some Silt, very dense, wet	SPT 7	92	43-23-50/1 (50/1)		Multiple 6 in to 1 ft cobbles encountered and drilled through.
			Weathered Dolomite	SPT 8	63	52-50/2 (50/2)		Borehole backfilled with cuttings at the end of drilling.
			Bottom of borehole at 33.7 feet.					

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-78-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2954845 **EAST** 184279
DATE STARTED 1/14/25 **COMPLETED** 1/14/25
STATION --- **OFFSET** ---
GROUND ELEVATION _____ **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 2.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring. Top sample observed to be frozen.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Black GRAVEL, some fine to coarse Sand, some Organic Silt, medium dense, wet [Ballast]	SPT 1	50	26-17-12-13 (29)		Ground surface defined as the top of the railroad tie.
5			Black GRAVEL and Organic SILT, little fine Sand, very dense, wet	SPT 2	125	6-50/2 (50/2)		Organic odor noted during sampling and drilling.
10			Gray fine SAND, some Silt, little Gravel, medium dense, wet	SPT 3	50	11-12-14-17 (26)		
15			Gray fine to coarse SAND, some Silt, some Gravel, dense, wet	SPT 4	33	10-25-20-25 (45)		Borehole backfilled with cuttings at the end of drilling.

Bottom of borehole at 16.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-78-2

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2955276 **EAST** 184232 **DATE STARTED** 1/14/25 **COMPLETED** 1/14/25
STATION --- **OFFSET** --- **GROUND ELEVATION** 950 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman **GROUND WATER LEVELS:**
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety **AT TIME OF DRILLING** 10.0 ft measured with casing to 9 ft
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE **AT END OF DRILLING** ---
NOTES Track boring. Top sample observed to be frozen. **AFTER DRILLING** ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	950		Dense, gray fine to coarse SAND, some Gravel, little Organic Silt, trace Coal, dense, wet [Ballast]	SPT 1	67	44-20-17-13 (37)		Ground surface defined as the top of the railroad tie.
								Boulder encountered at 3 ft so boring was offset 4 ft to the south before continuing.
5	945		Medium dense, brown fine to coarse SAND and GRAVEL, little Silt, medium dense, wet	SPT 2	43	4-6-15-50/3 (21)		
								Boulder encountered at 6 ft and drilled through.
10	940		▽ Dense, gray, fine to coarse SAND, some Gravel, little Silt, dense, wet	SPT 3	33	23-23-25-35 (48)		
15	935		Very dense, gray GRAVEL, some fine to coarse Sand, little Silt, very dense, wet	SPT 4	29	42-37-34-39 (71)		Borehole backfilled with cuttings at the end of drilling.

Bottom of borehole at 16.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-78-3

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2955792 **EAST** 184219
DATE STARTED 1/14/25 **COMPLETED** 1/14/25
STATION --- **OFFSET** ---
GROUND ELEVATION 951 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 2.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring. Top sample observed to be frozen.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	950		Top 18 in: Black ORGANIC SILT, some fine to coarse Sand, little Gravel, trace Coal, dense, wet [Ballast]	SPT 1	75	23-18-26-33 (44)		Ground surface defined as the top of the railroad tie.
			▽ Bottom 6 in: Brown fine to coarse SAND, some Gravel, trace Silt, dense, wet					
5	945		Very dense brown GRAVEL, some fine to coarse Sand, little Silt, very dense, wet	SPT 2	54	33-31-40-62 (71)		Strata chqange inferred at 7 ft based on casing advancement difficulty.
10	940		Medium dense brown fine to coarse SAND, some Silt, medium dense, wet	SPT 3	33	7-10-9-10 (19)		Casing refusal at 13 ft indicates strata change. Drill into rock for 2 ft to confirm bedrock. Borehole backfilled with cuttings at the end of drilling.
15			Bottom of borehole at 15.0 feet.					

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-78-4

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2956399 **EAST** 184352
DATE STARTED 1/15/25 **COMPLETED** 1/15/25
STATION --- **OFFSET** ---
GROUND ELEVATION 953 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 2.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring. Top sample observed to be frozen.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	953		Black ORGANIC SILT, some fine to coarse Sand, trace Coal, medium dense, wet [Ballast]	SPT 1	83	27-11-9-11 (20)	Sample determined to be non-plastic	Ground surface defined as the top of the railroad tie.
	950		Brown fine to coarse SAND, some Gravel, some Silt, medium dense, wet					
5			Brown fine SAND, little Silt, little Gravel, dense, moist	SPT 2	67	8-16-32-46 (48)		
	945							6 in cobble drillled through.
10			Very dense gray GRAVEL, some fine to coarse Sand, trace Silt, very dense, wet	SPT 3	75	100/4 (100/4)		Borehole backfilled with cuttings at the end of drilling.
	940							

Bottom of borehole at 13.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-78-5

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2956837 **EAST** 184470
DATE STARTED 1/15/25 **COMPLETED** 1/15/25
STATION --- **OFFSET** ---
GROUND ELEVATION **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 5.0 ft measured after casing removal
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Track boring on causeway. Top sample observed to be frozen.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Dense black GRAVEL, some fine to coarse Sand, trace Silt, dense, dry [Ballast]	SPT 1	21	19-20-12-32 (32)		Ground surface defined as the top of the railroad tie.
5			Loose black fine to medium SAND and ORGANIC SILT, loose, wet	SPT 2	42	5-3-4-5 (7)	LL=28, PL=23, PI=5. MC=20%	Organic odor noted during sampling and drilling. Color and odor inform strata change at 3 ft. Strata change inferred based on casing advancement difficulty.
10			Medium dense gray fine to coarse SAND, little Gravel, trace Silt, medium dense, wet	SPT 3	50	5-4-8-7 (12)		
15			Medium dense brown fine to coarse SAND, some Gravel, little Silt, medium dense, wet	SPT 4	33	9-9-13-19 (22)		Borehole backfilled with cuttings at the end of drilling.

Bottom of borehole at 16.0 feet.

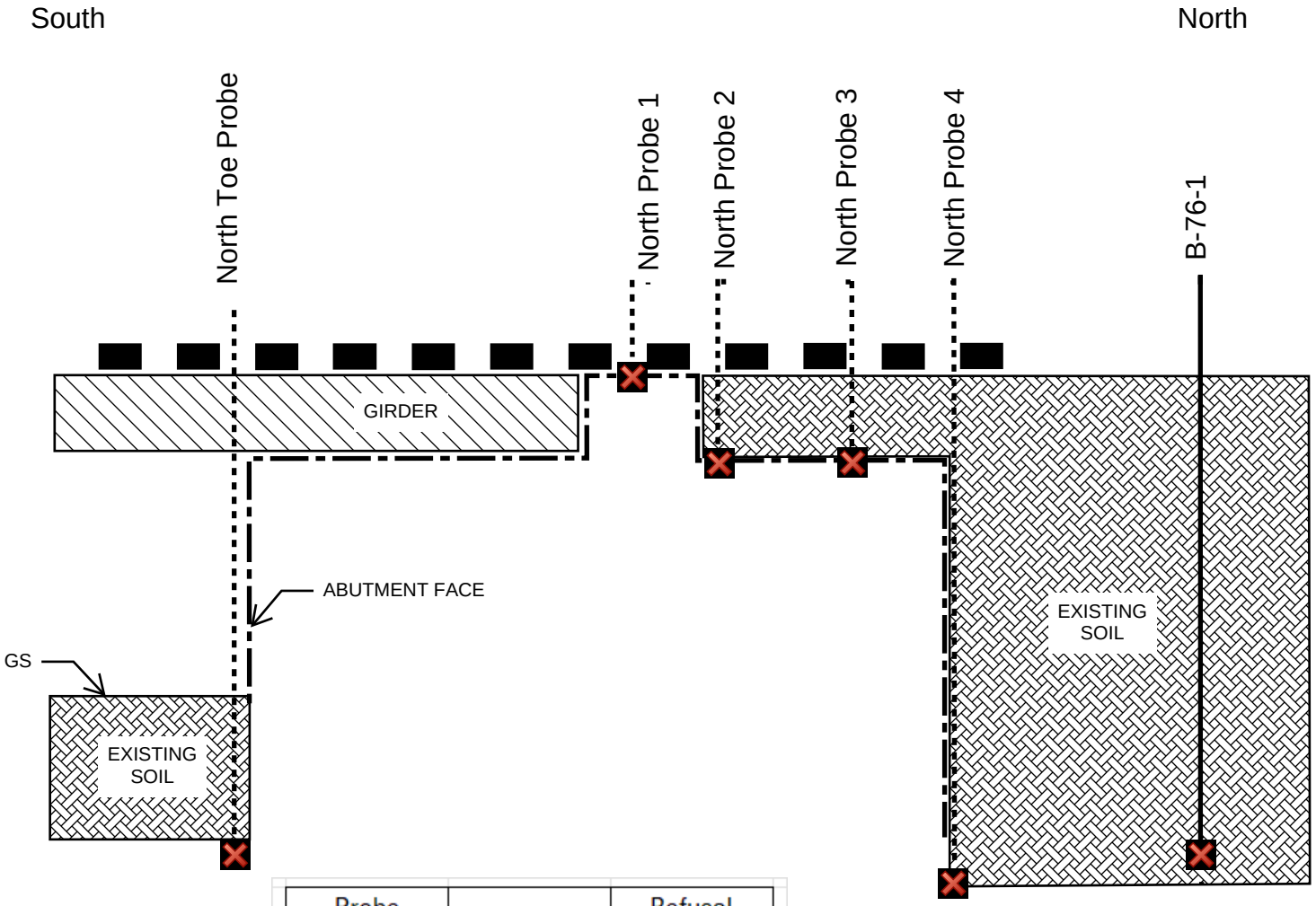
Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/27/25 16:45 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

APPENDIX A.2

ABUTMENT PROBE SKETCHES

Probes Sketch
Bridge 76.23 North Abutment



Probe Number	Distance	Refusal Depth (ft)
1	5.8	1.0
2	6.8	2.5
3	8.5	2.5
4	10.0	15.0
Toe	-0.3	13.5
B-76-1	23.0	14.0

1. Boring/probe refusal depth measured from top of RR tie
2. Distance measured from the abutment face along rail centerline
3. The proposed abutment shape is inferred based on results of probes and borings

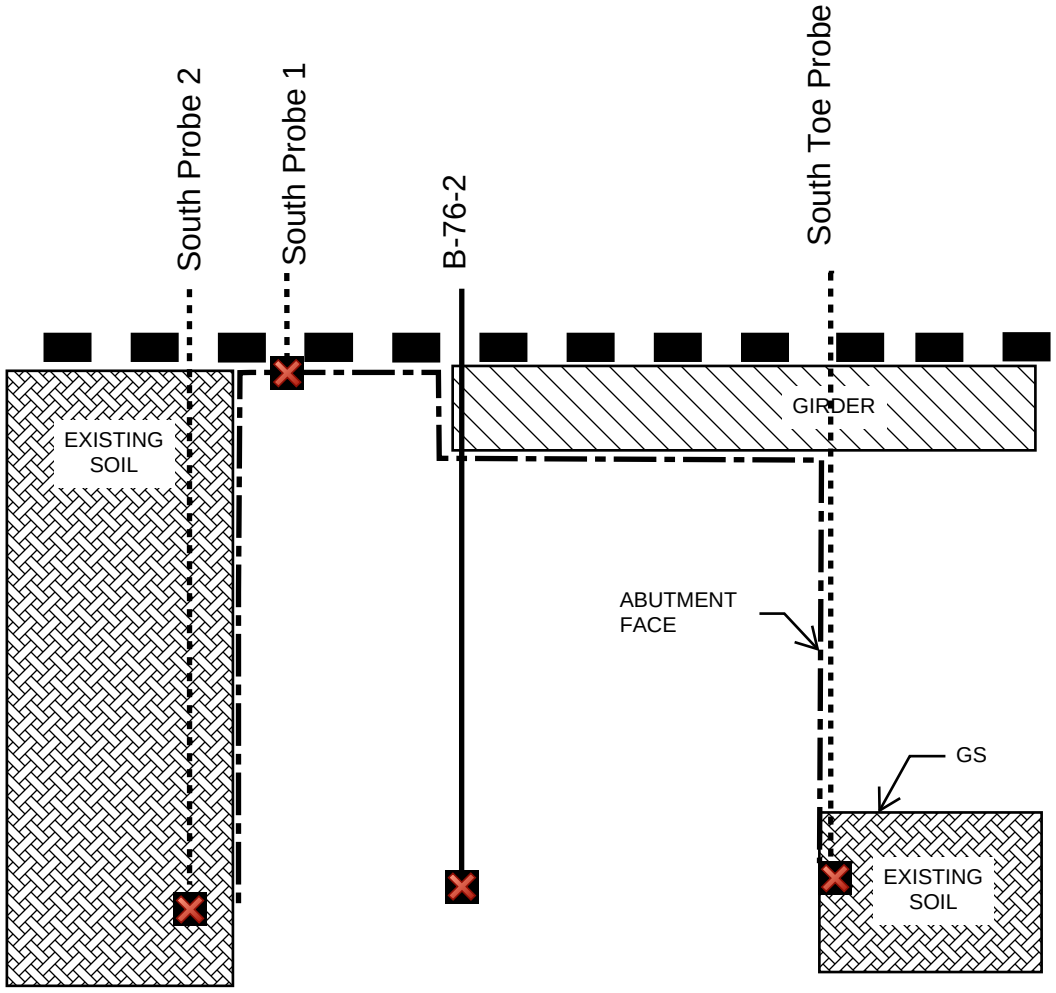
Legend

- PROBE
- BORING
- ABUTMENT
- R/R TIE
- REFUSAL OR TERMINATION

Berkshire Line Improvements
MassDOT Rail & Transit Division

Probes Sketch
Bridge 76.23 South Abutment

South North



Legend

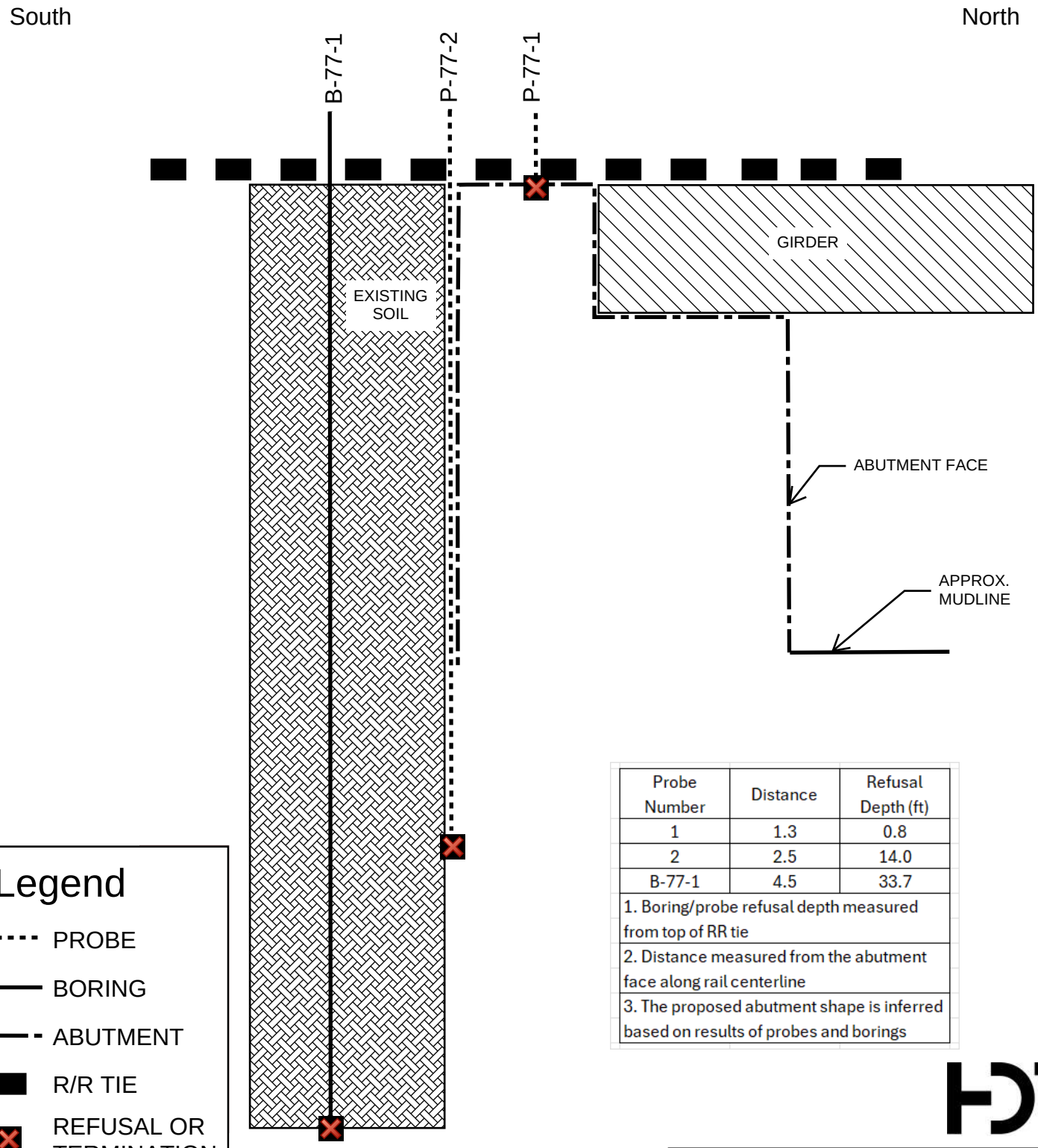
- PROBE
- BORING
- ABUTMENT
- R/R TIE
- REFUSAL OR TERMINATION

Probe Number	Distance	Refusal Depth (ft)
1	6.5	1.0
2	7.9	15.5
Toe	-0.3	15.0
B-76-2	4.5	15.0

1. Boring/probe refusal depth measured from top of RR tie
2. Distance measured from the abutment face along rail centerline
3. The proposed abutment shape is inferred based on results of probes and borings

Berkshire Line Improvements
MassDOT Rail & Transit Division

Probes Sketch
Bridge 77.28 South Abutment



Probe Number	Distance	Refusal Depth (ft)
1	1.3	0.8
2	2.5	14.0
B-77-1	4.5	33.7

1. Boring/probe refusal depth measured from top of RR tie
2. Distance measured from the abutment face along rail centerline
3. The proposed abutment shape is inferred based on results of probes and borings

Legend

- PROBE
- BORING
- ABUTMENT
- R/R TIE
- REFUSAL OR TERMINATION

Berkshire Line Improvements
MassDOT Rail & Transit Division

APPENDIX B

LABORATORY TEST RESULTS

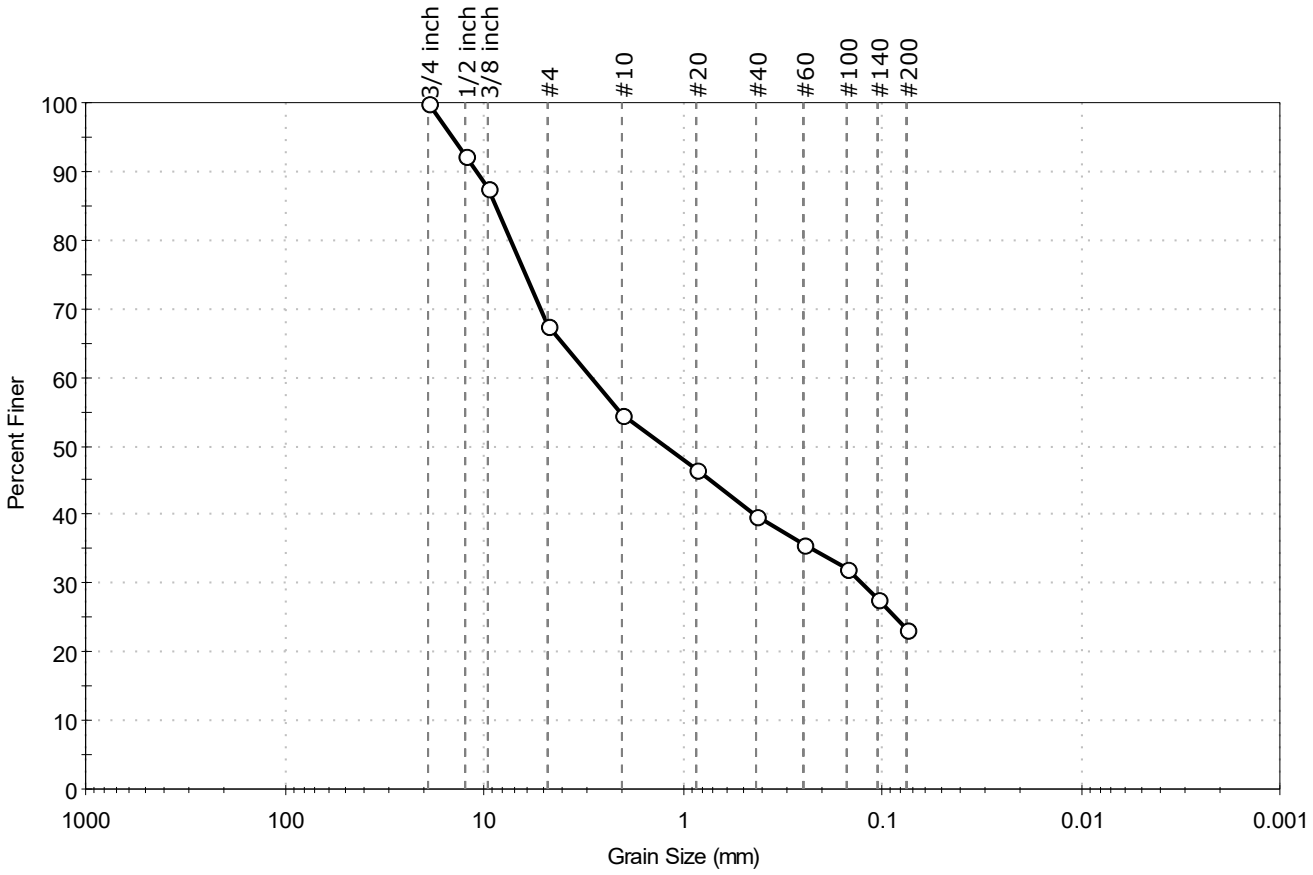
APPENDIX B.1

GEOTECHNICAL LABORATORY TEST RESULTS ON SOIL SAMPLES

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-77-1	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-3	Test Date:	01/30/25	Checked By:	ank
Depth :	9-11	Test Id:	802217		

Test Comment: ---
Visual Description: Moist, dark grayish brown silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	32.5	44.3	23.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	92		
3/8 inch	9.50	88		
#4	4.75	68		
#10	2.00	54		
#20	0.85	47		
#40	0.42	40		
#60	0.25	36		
#100	0.15	32		
#140	0.11	28		
#200	0.075	23		

Coefficients

D_{85} = 8.6640 mm
D_{30} = 0.1260 mm
D_{60} = 2.8823 mm
D_{15} = N/A
D_{50} = 1.2188 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

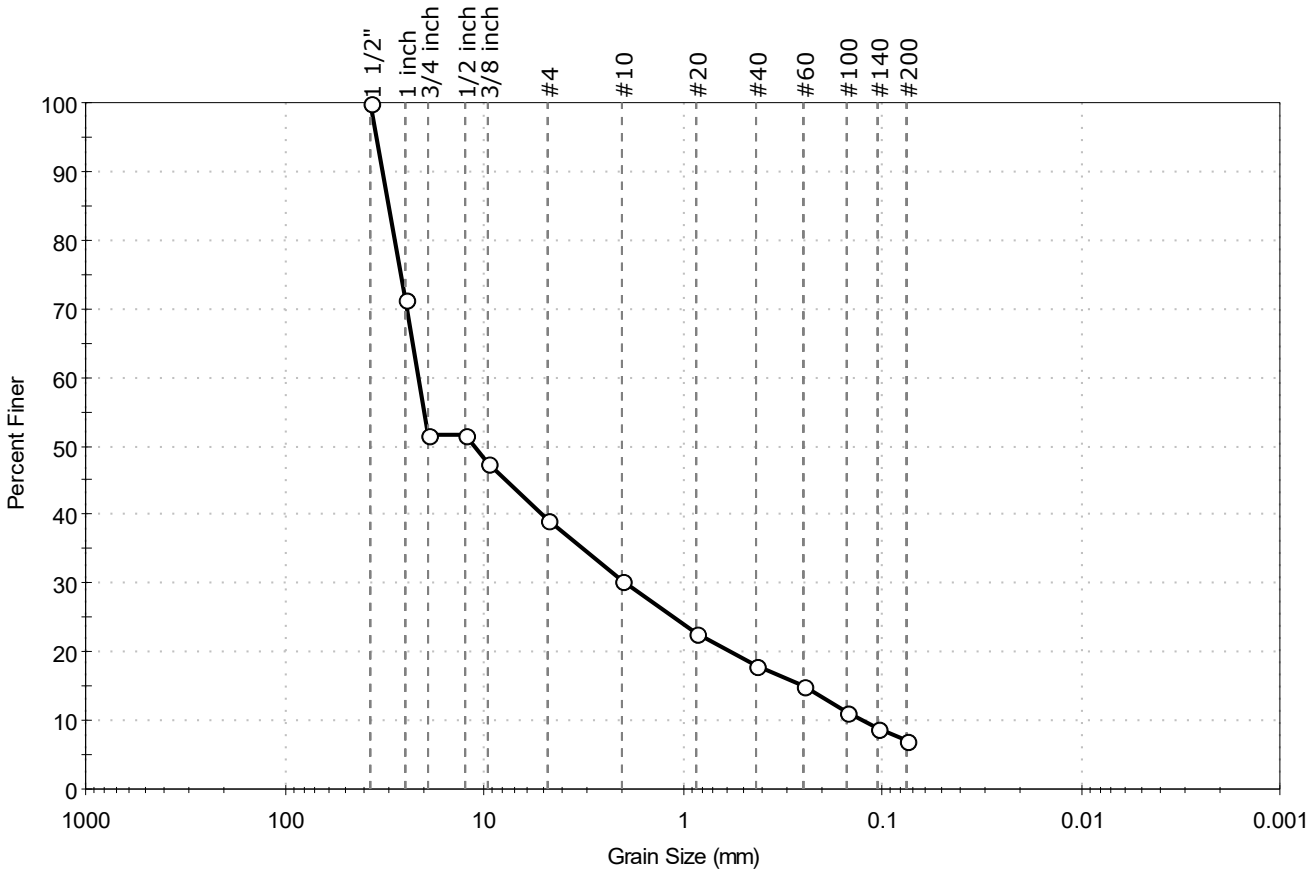
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-77-1	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-5, S-6	Test Date:	01/29/25	Checked By:	ank
Depth :	24-26	Test Id:	802218		
Test Comment:	---				
Visual Description:	Moist, olive brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	60.7	32.4	6.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	71		
3/4 inch	19.00	52		
1/2 inch	12.50	52		
3/8 inch	9.50	48		
#4	4.75	39		
#10	2.00	30		
#20	0.85	23		
#40	0.42	18		
#60	0.25	15		
#100	0.15	11		
#140	0.11	9		
#200	0.075	6.9		

Coefficients

D_{85} = 30.3345 mm	D_{30} = 1.8931 mm
D_{60} = 21.3656 mm	D_{15} = 0.2543 mm
D_{50} = 11.2383 mm	D_{10} = 0.1252 mm
C_u = 170.652	C_c = 1.340

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

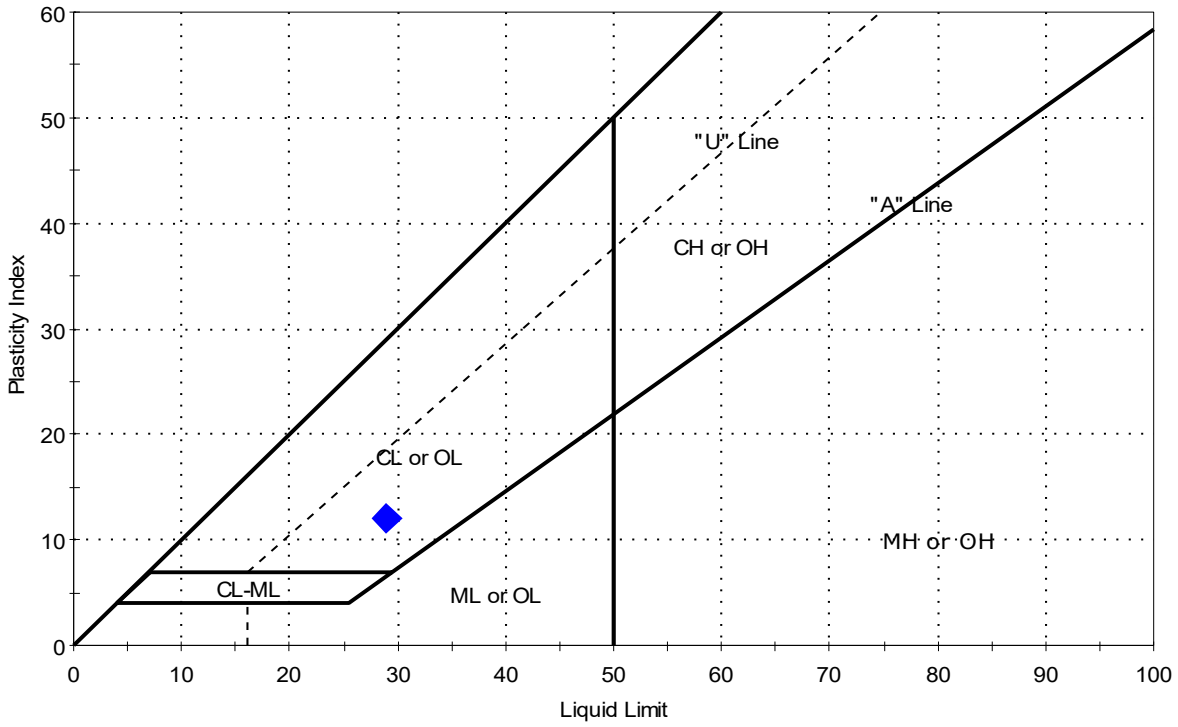
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-73-1	Sample Type:	Jar	Tested By:	cam
Sample ID:	S-3	Test Date:	01/29/25	Checked By:	ank
Depth :	9-11	Test Id:	802219		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown sandy clay with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-3	B-73-1	9-11	20	29	17	12	0.2	

Sample Prepared using the WET method

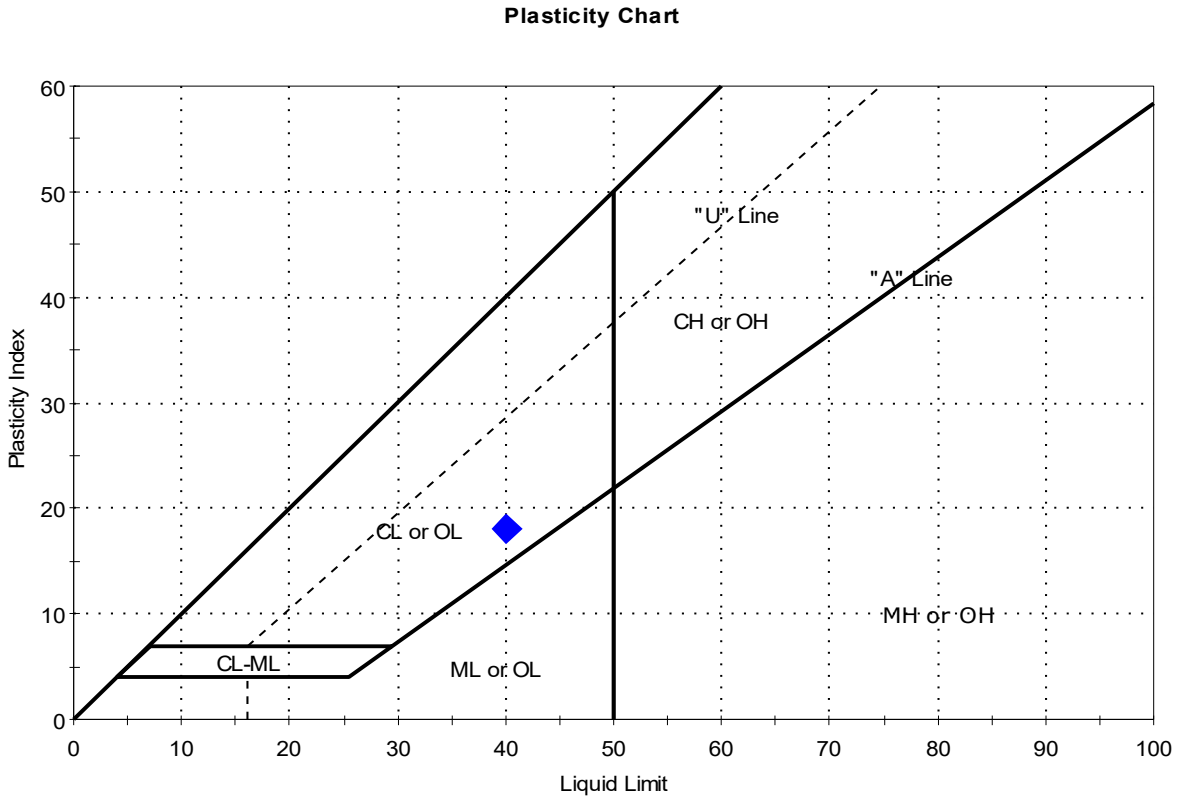
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-73-1	Sample Type:	Jar	Tested By:	cam
Sample ID:	S-4	Test Date:	01/30/25	Checked By:	ank
Depth :	14-16	Test Id:	802220		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-4	B-73-1	14-16	47	40	22	18	1.4	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-78-4	Sample Type:	Jar	Tested By:	cam
Sample ID:	S-1	Test Date:	01/28/25	Checked By:	ank
Depth :	0-2	Test Id:	802222		
Test Comment:	---				
Visual Description:	Moist, very dark gray sand with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-1	B-78-4	0-2	25	n/a	n/a	n/a	n/a	

Dry Strength: LOW

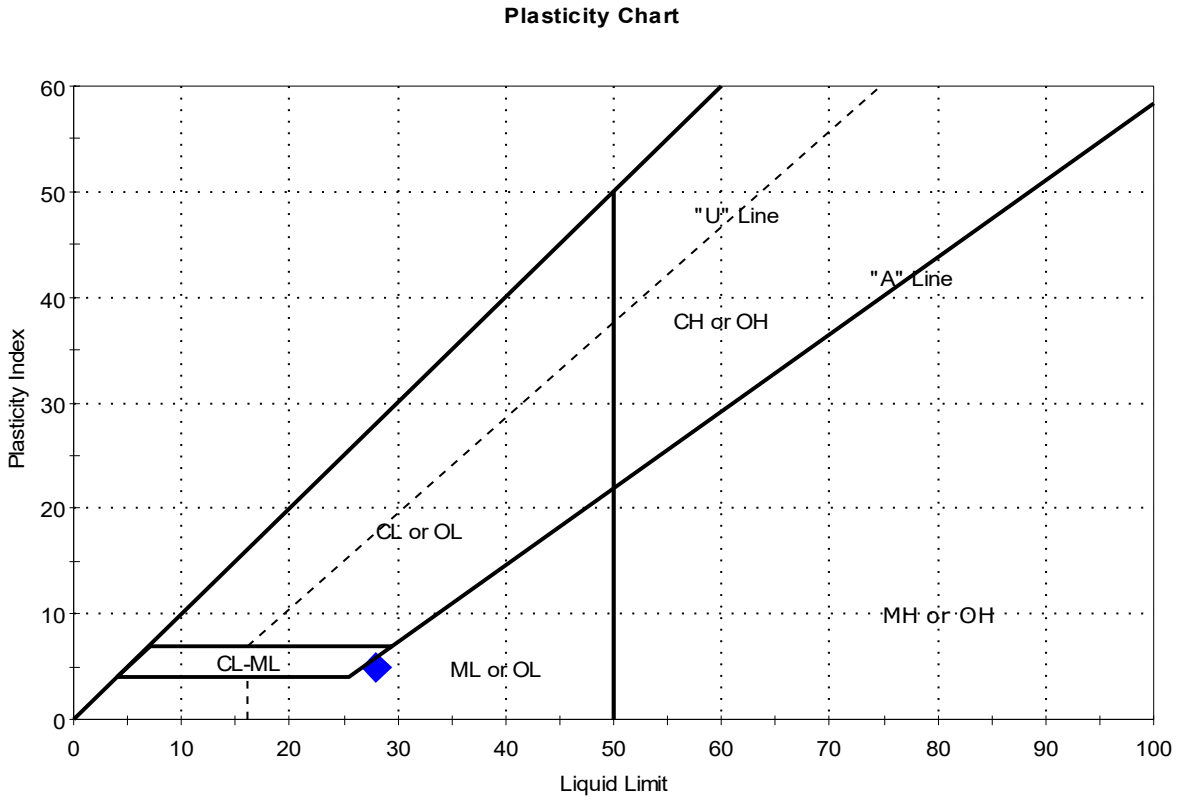
Dilatancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-78-5	Sample Type:	Jar	Tested By:	cam
Sample ID:	S-2	Test Date:	01/30/25	Checked By:	ank
Depth :	4-6	Test Id:	802221		
Test Comment:	---				
Visual Description:	Moist, very dark brown silt with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-2	B-78-5	4-6	20	28	23	5	-0.7	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

APPENDIX B.2

GEOTECHNICAL LABORATORY TEST RESULTS ON BEDROCK SAMPLES

GeoTesting EXPRESS
A Sercel Business

Client:	HDR Engineering, Inc.				
Project:	Berkshire Line Track Improv.				
Location:	Lee and Lennox, MA			Project No:	GTX-320464
Boring ID:	B-76-1	Sample Type:	Core	Tested By:	jlw
Sample ID:	C-3	Test Date:	01/29/25	Checked By:	smd
Depth :	17-21	Test Id:	802223		
Test Comment:	---				
Visual Description:	See photograph(s)				
Sample Comment:	---				

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
B-76-1	C-3	17-21 ft	162	43501	1	No	1,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

GeoTesting EXPRESS
A Sercel Business

Client:	HDR Engineering, Inc.	Test Date:	1/29/2025
Project Name:	Berkshire Line Track Improv.	Tested By:	cml
Project Location:	Lee and Lennox, MA	Checked By:	smd
GTX #:	320464		
Boring ID:	B-76-1		
Sample ID:	C-3		
Depth, ft:	17-21		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.37	4.37	4.37
Specimen Diameter, in:	1.99	1.98	1.99
Specimen Mass, g:	578.07		
Bulk Density, lb/ft^3	162	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

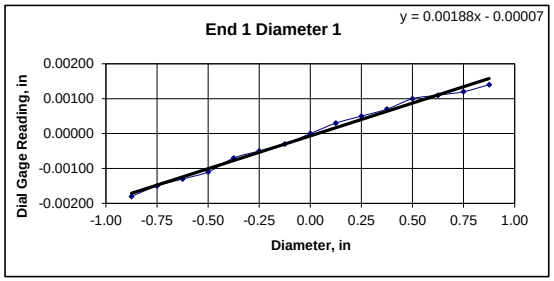
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00180	-0.00150	-0.00130	-0.00110	-0.00070	-0.00050	-0.00030	0.00000	0.00030	0.00050	0.00070	0.00100	0.00110	0.00120	0.00140
Diameter 2, in (rotated 90°)	0.00020	0.00020	0.00020	0.00020	0.00020	0.00010	0.00010	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00020	-0.00040	-0.00040

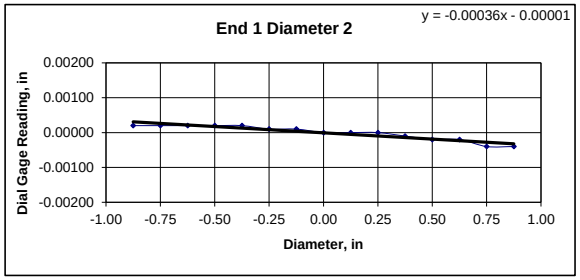
Difference between max and min readings, in:
0° = 0.00320 90° = 0.00060

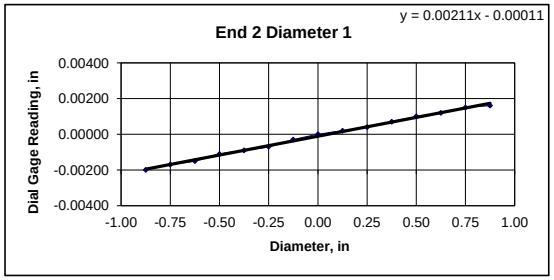
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00200	-0.00170	-0.00150	-0.00110	-0.00090	-0.00070	-0.00030	0.00000	0.00020	0.00040	0.00070	0.00100	0.00120	0.00150	0.00160
Diameter 2, in (rotated 90°)	-0.00060	-0.00050	-0.00040	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00020	0.00030	0.00040	0.00040	0.00050	0.00050	0.00050

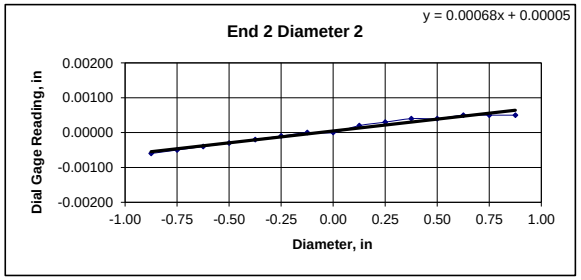
Difference between max and min readings, in:
0° = 0.0036 90° = 0.0011

Maximum difference must be < 0.0020 in. Difference = ± 0.00180
Flatness Tolerance Met? NO









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00188
Angle of Best Fit Line: 0.10772

End 2:
Slope of Best Fit Line 0.00211
Angle of Best Fit Line: 0.12081

Maximum Angular Difference: 0.01310

Parallelism Tolerance Met? NO
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00036
Angle of Best Fit Line: 0.02063

End 2:
Slope of Best Fit Line 0.00068
Angle of Best Fit Line: 0.03896

Maximum Angular Difference: 0.01833

Parallelism Tolerance Met? NO
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00320	1.987	0.00161	0.092	YES
Diameter 2, in (rotated 90°)	0.00060	1.987	0.00030	0.017	YES
END 2					
Diameter 1, in	0.00360	1.987	0.00181	0.104	YES
Diameter 2, in (rotated 90°)	0.00110	1.987	0.00055	0.032	YES

Maximum angle of departure must be ≤ 0.25°
Perpendicularity Tolerance Met? YES

Client:	HDR Engineering, Inc.	Test Date:	1/29/2025
Project Name:	Berkshire Line Track Improv.	Tested By:	cml
Project Location:	Lee and Lennox, MA	Checked By:	smd
GTX #:	320464		
Boring ID:	B-76-1	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	C-3		
Depth (ft):	17-21		
Visual Description:	See photographs		

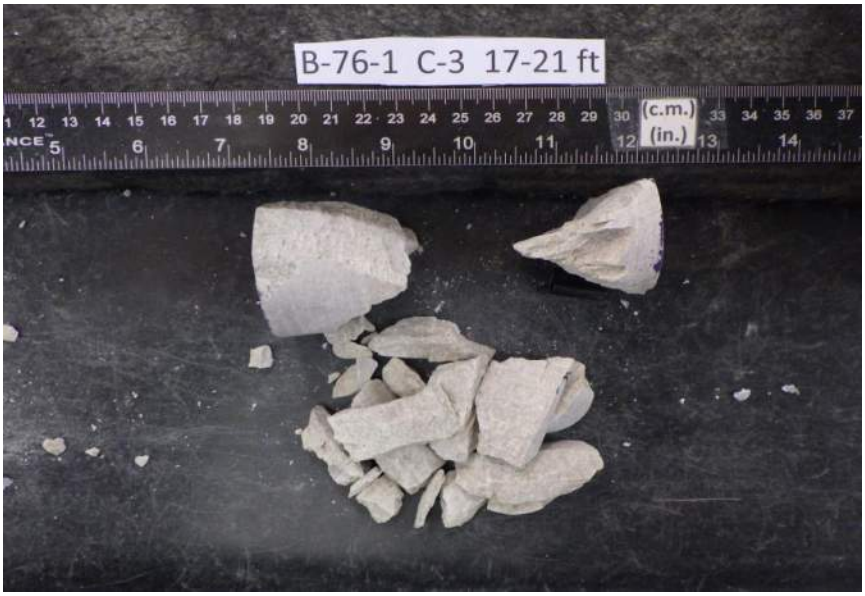
BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS		
END 1		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES
END 2		
Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	HDR Engineering, Inc.
Project Name:	Berkshire Line Track Improv.
Project Location:	Lee and Lennox, MA
GTX #:	320464
Test Date:	1/29/2025
Tested By:	gp
Checked By:	smd
Boring ID:	B-76-1
Sample ID:	C-3
Depth, ft:	17-21

After cutting and grinding



After break

APPENDIX C

CALCULATION PACKAGES

APPENDIX C.1

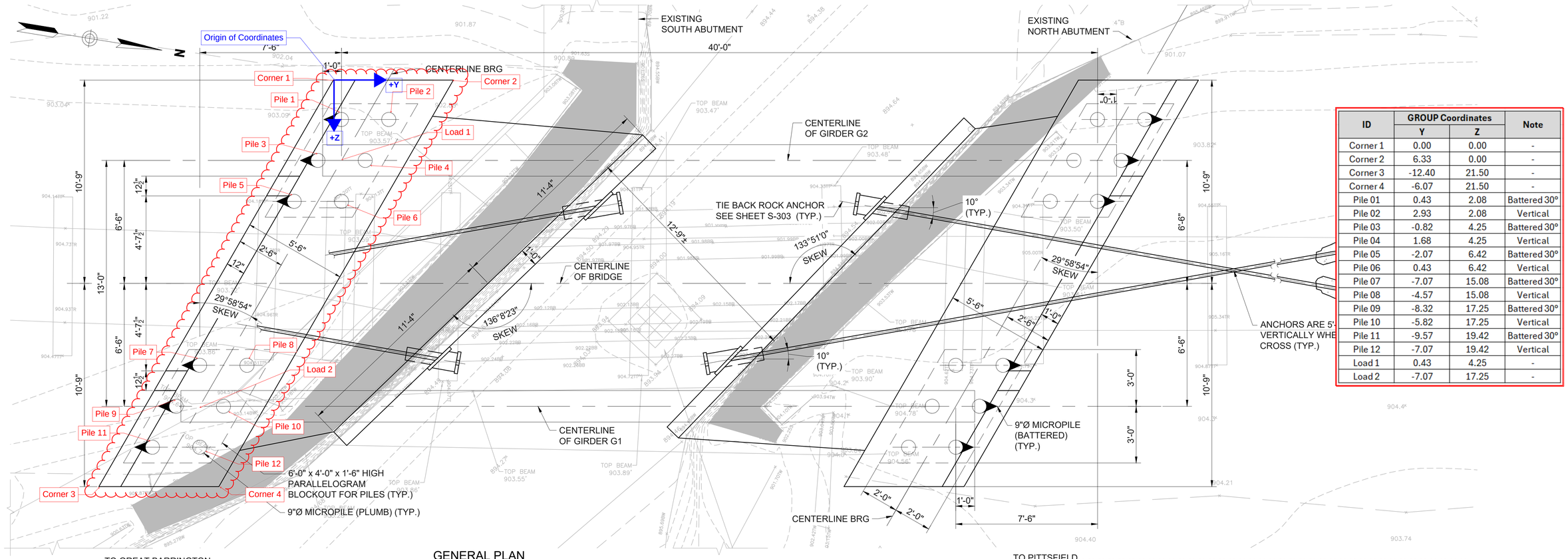
DRILLED MICROPILES

HOUSATONIC RAILROAD

BRIDGE 76.23

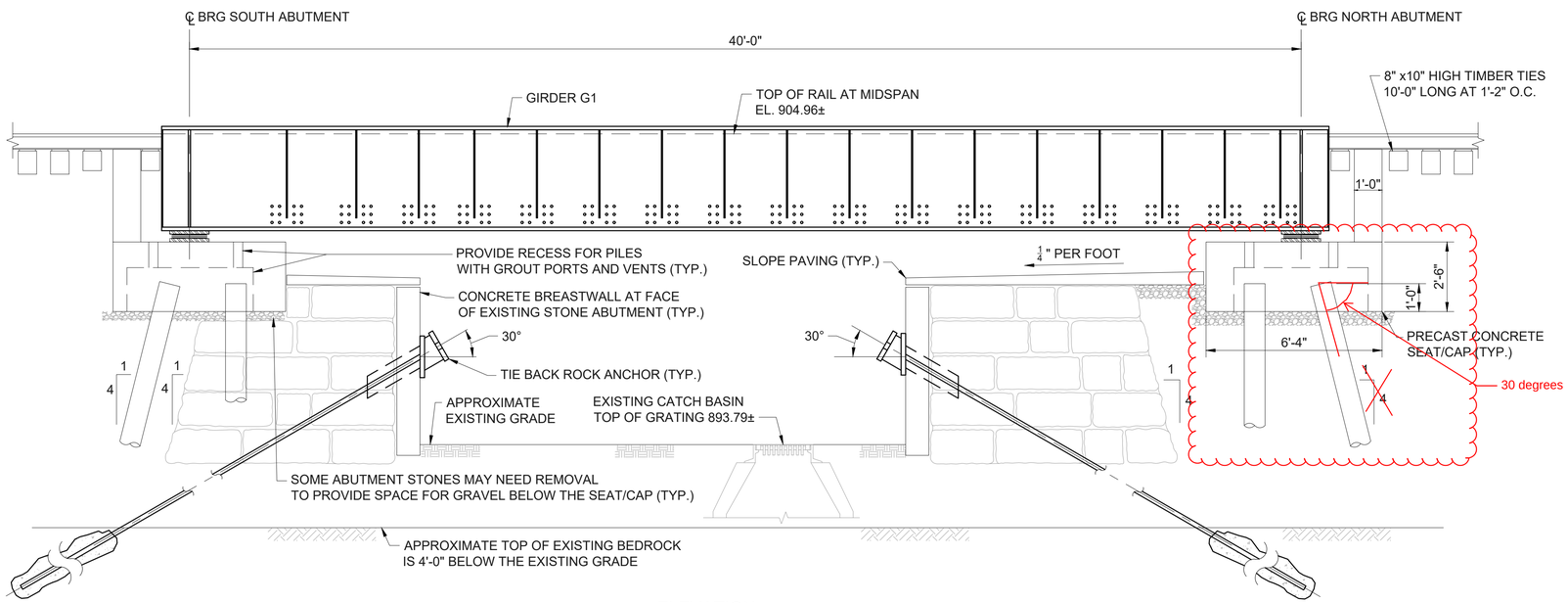
MICROPILE CALCULATION PACKAGE

MICROPILE LAYOUT

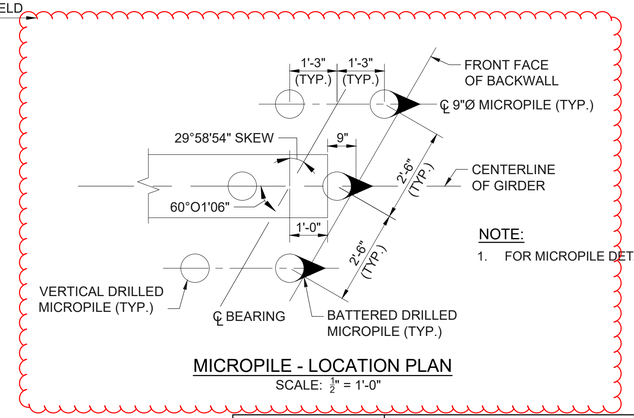


ID	GROUP Coordinates		Note
	Y	Z	
Corner 1	0.00	0.00	-
Corner 2	6.33	0.00	-
Corner 3	-12.40	21.50	-
Corner 4	-6.07	21.50	-
Pile 01	0.43	2.08	Battered 30°
Pile 02	2.93	2.08	Vertical
Pile 03	-0.82	4.25	Battered 30°
Pile 04	1.68	4.25	Vertical
Pile 05	-2.07	6.42	Battered 30°
Pile 06	0.43	6.42	Vertical
Pile 07	-7.07	15.08	Battered 30°
Pile 08	-4.57	15.08	Vertical
Pile 09	-8.32	17.25	Battered 30°
Pile 10	-5.82	17.25	Vertical
Pile 11	-9.57	19.42	Battered 30°
Pile 12	-7.07	19.42	Vertical
Load 1	0.43	4.25	-
Load 2	-7.07	17.25	-

GENERAL PLAN
SCALE: $\frac{3}{8}$" = 1'-0"



ELEVATION
SCALE: $\frac{3}{8}$" = 1'-0"



NOTE:
1. FOR MICROPILE DETAILS SEE SHEET S-307.

MICROPILE - LOCATION PLAN
SCALE: $\frac{1}{2}$" = 1'-0"

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO. XXXXXX

REHABILITATION OF BRIDGE 76.23
GENERAL PLAN AND ELEVATION

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110-2378
(617) 357-7700

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

SCALE: N.T.S.	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 12/27/24	DD	SLB	JQW	SHEET: S–301	

MICROPILE LOADING

LOADING MAGNITUDE ACTING OVER PILE CAP

I	
D+L+E+LLS	
Max	
Factor	1.00
Vert	500.36
Long	46.45
Trans	26.82

III		III	
Group I+0.5W+WL+LF+F		Group I+0.5W+WL+LF+F	
Max		Min	
	1.25		1.25
Vert	400.29	Vert	400.29
Long	171.56	Long	-97.24
Trans	27.54	Trans	27.54

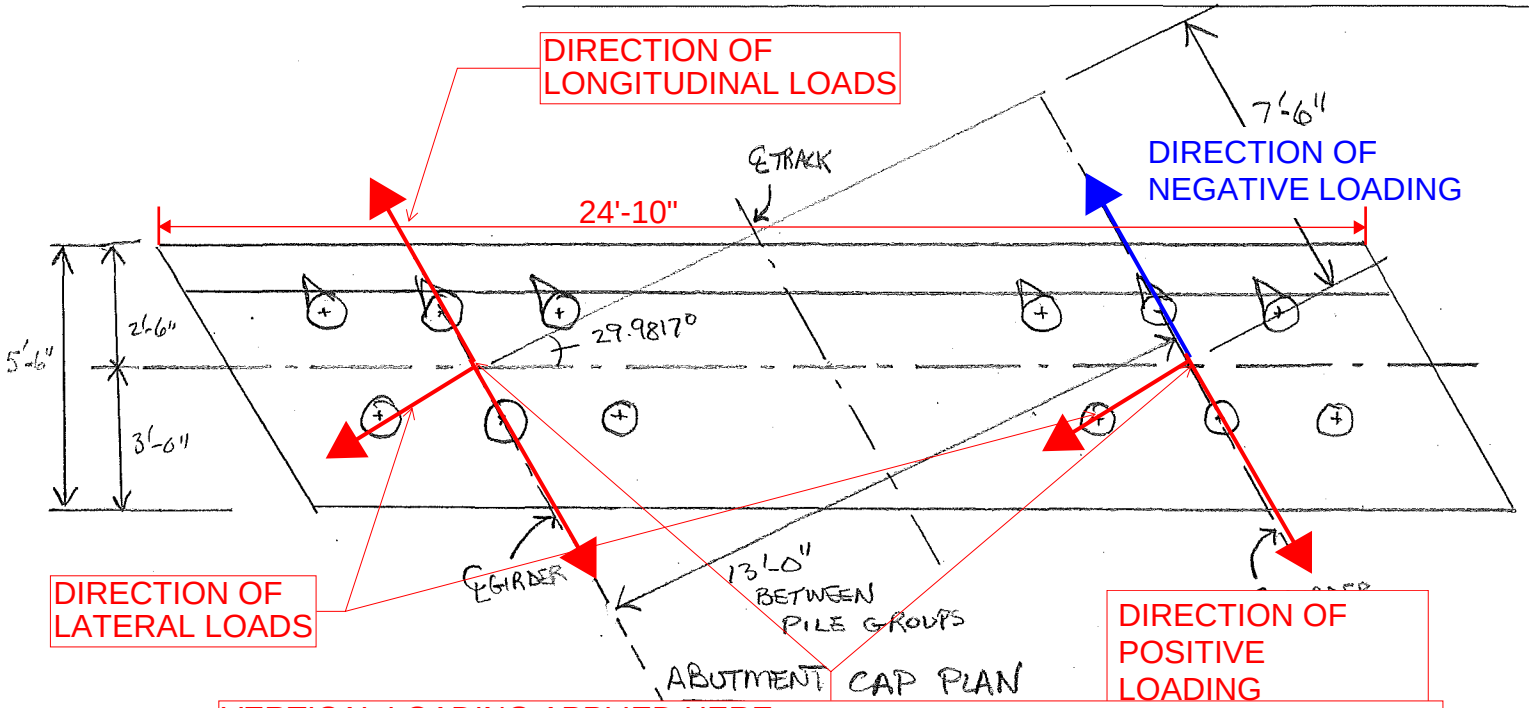
VI		VI	
Group III + OF		Group III + OF	
Max		Min	
	1.40		1.40
Vert	357.40	Vert	357.40
Long	205.05	Long	-138.69
Trans	24.59	Trans	24.59

Notes:
1) Loads were provided by HDR Structural Team on 2/19/2025.
2) Loads represent total loads acting on rails over pile cap.

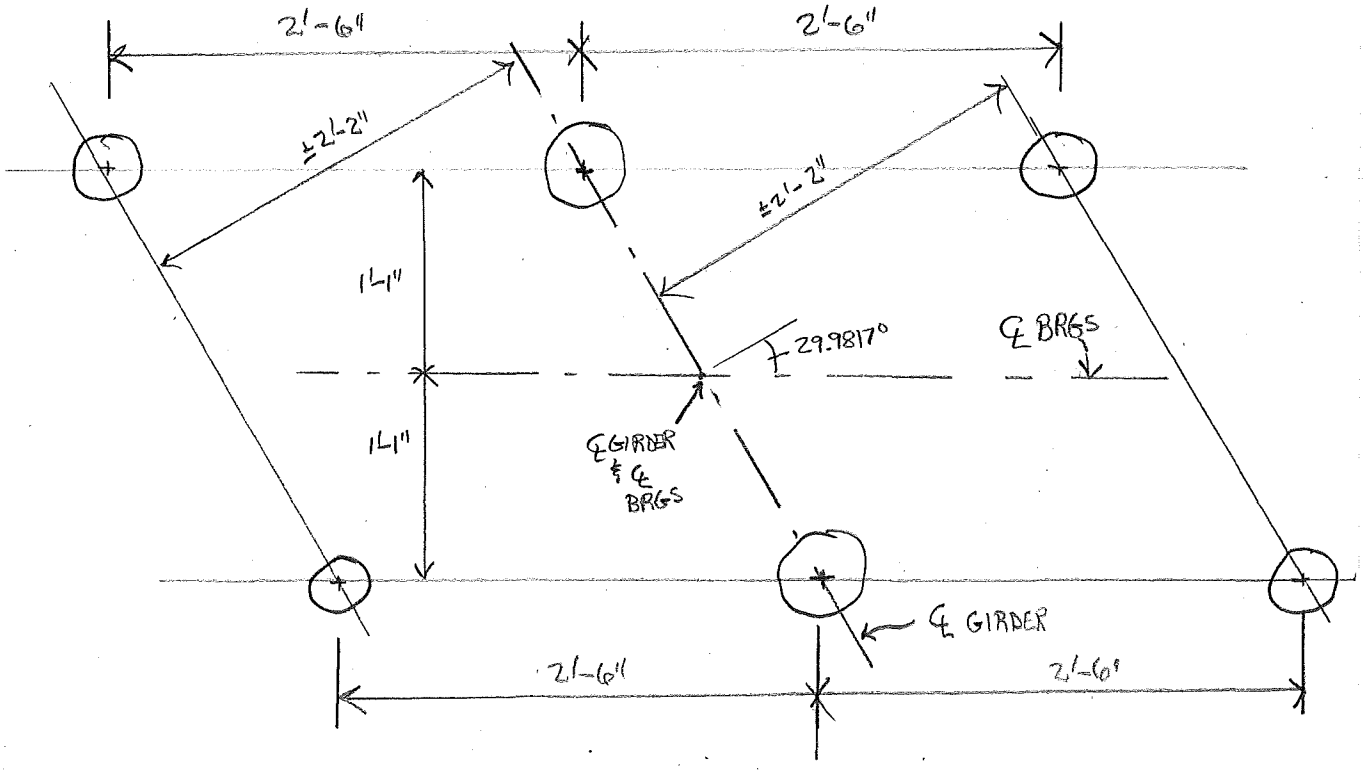
LOADING MAGNITUDE ACTING OVER EACH RAIL

	Fx	Fy	Fz
	lb	lb	lb
Group III, Positive	200145	85780	13770
Group III, Negative	200145	-48620	13770
Group VI, Positive	178700	102525	12295
Group VI, Negative	178700	-69345	12295
Group I, Positive	250180	23225	13410
Group I, Negative	250180	-23225	13410

Project:	Computed:	Date:
Subject:	Checked:	Date:
Task:	Page:	of:
Job #:	No:	



VERTICAL LOADING APPLIED HERE
- LOAD APPLIED INTO THE PAGE REPRESENT DOWNWARD LOADS
- LOAD APPLIED TOWARD THE READER REPRESENT UPLIFT/TENSION LOADS



PILE LAYOUT
TYP @ EACH GIRDER BEARING

LOADING SCHEME OF 6-PILE AND 12-PILE MICROPILE SECTIONS

BORING LOGS

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-76-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2944296 **EAST** 183810
DATE STARTED 1/2/25 **COMPLETED** 1/3/25
STATION --- **OFFSET** ---
GROUND ELEVATION 905 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** M. Pham
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 10.0 ft / Elev 895.0 ft measured with casing to 14 ft
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Behind bridge 76.23 north abutment. Top sample frozen due to freezing temperatures
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0	905		Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, dry [Ballast]	SPT 1	29	6-7-9-11 (16)		Ground surface elevation defined as the top of the railroad tie.
5	900		Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, wet	SPT 2	33	10-9-9-16 (18)		
10	895		▽ Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, wet	SPT 3	42	6-9-12-20 (21)		
15	890		Gray, hard, slightly weathered, moderately fractured, medium grained DOLOMITE MARBLE	RC 1	58 (0)			Top of rock at 14 ft below ground surface. Drill into rock 1 ft to start coring. Rock cores C-1 and C-2 stopped after only 1 ft with core barrel jams likely due to natural rock fractures. No water return while rock coring deeper than 18 feet
			Gray, hard, slightly weathered, extremely fractured, medium grained DOLOMITE MARBLE	RC 2	67 (0)			
			Gray, hard, slightly weathered, slightly fractured, medium grained DOLOMITE MARBLE	RC 3	81 (67)		Unconfined Compressive Strength = 43501 psi. Bulk Density = 162 pcf	
20	885							
			Gray, hard, slightly weathered, slightly fractured, medium grained DOLOMITE MARBLE	RC 4	65 (57)			
25	880							Borehole backfilled with grout and bentonite at the end of drilling.

Bottom of borehole at 26.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/4/25 15:26 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-76-2

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2944243 **EAST** 183821
DATE STARTED 1/6/25 **COMPLETED** 1/8/25
STATION --- **OFFSET** ---
GROUND ELEVATION 904 ft NAVD88 **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING ---
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Through bridge 76.23 south abutment.
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Bridge includes a 2 ft void between the top of tie and the top of the bridge seat where this boring was drilled.					Ground surface elevation defined as the top of the railroad tie.
			Stone abutment blocks					
	900							
5			Gray GRAVEL, little fine to coarse Sand, trace Silt, dense, moist	SPT 1	42	4-27-20-18 (47)		Drilled 2 ft beyond abutment block to confirm not just a joint in the masonry stones.
	895							
10			Gray GRAVEL, little fine to coarse Sand, trace Silt, dense, wet	SPT 2	33	21-14-17-16 (31)		
	890							
15			Brown GRAEL and fine to coarse Sand, little Silt, very dense, wet	SPT 3	71	39-50/1 (50/1)		Rock fragments in tip of sample S-3.
			Gray, hard, slightly weathered, moderately fractured, medium grained DOLOMITE MARBLE	RC 1	61 (31)			Rock core C-1 stopped after 3 ft with core barrel jams likely due to natural rock fractures.
	885							
20			Bottom of borehole at 20.0 feet.					Boring stopped at 20 ft due to equipment failure in freezing conditions. Borehole backfilled with bentonite and grout at the end of drilling.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 2/4/25 15:26 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

AXIAL RESULTS

Client:	**MassDOT**
Project:	**Housatonic Railroad**
Project Number:	**10370244**
Project Mgr:	**June Wu**
QC Reviewers:	**Max Rolandi**
Deliverable Reviewed:	**Ryan Lavorati**
Date Transmitted:	**2/20/2025**
Review Deadline:	
Actual Review Date:	

Calculation Title :	**Micropile Axial Calculation Package**
Calculation Number:	1
Supersedes:	NA
Superseded By:	NA

Micropile calculation package covers the design aspects of the proposed deep foundation elements for Bridge 76.23. The pile cap geometry and loading on the pile cap are provided by HDR structural team. The pile type, diameter, length, reinforcement, and casing are based on calculations and the boring logs provided herein by the HDR geotechnical team. The results of these axial analyses can be found at the end of this package

Names / Signatures:

Name	Ryan Lavorati	
Signature RTL		2/12/2025
	Calculated by	
Name	Max Rolandi	
Signature MR		2/17/2025
	Checked by	
Name	Ryan Lavorati	
Signature RTL		2/18/2025
	Updated by	
Name	Max Rolandi	
Signature MR		2/19/2025
	Back Checked by	

Design Manager Approval: MR	2/25/2025
Name	
Signature	Date
Design, Responsible Engineer or Project Manager	

Drilled Micropile Geotechnical Axial Compression Resistance

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

Objective: Evaluate the geotechnical axial resistance for the proposed drilled micropile using the approach described in the Micropile Design and Construction manual (FHWA NHI-05-039) and AASHTO LRFD Bridge Design Specifications.

References:
1) FHWA NHI-05-039 Micropile Design and Construction
2) AASHTO LRFD Bridge Design Specifications.
3) Boring Logs 76-B-1 & 76-B-2 drilled by NEBC between 01-06-2025 and 01-07-2025
4) AREMA Manual for Railway Engineering 2021

Assumptions:

General:

1 Evaluate resistance of single micropile.
2 Micropile Type: Type A - Gravity-head pressure micropiles.
3 Neglect micropile end-bearing resistance.
4 Center-to-center pile spacing is 30 inches

Problem Specific:

1 Grout-to-Ground bond occurring in rock
2 Bottom of structure elevation 898.75
3 Embedment lengths referenced in this evaluation are related to axial micropile resistance.

Procedure:
1. Evaluate the soil stratigraphy:
Soil stratigraphy based on data from recent borings. See attached calculations for the assumed soil stratigraphy
2. Evaluate soil properties:
Grout-to-Ground bond values based on FHWA Micropile Design Manual FHWA-NHI-05-039, Table 5-3.
3. Evaluate the micropile geotechnical axial compression resistance as described in FHWA Micropile Design Manual FHWA-NHI-05-039

Calculations: Nominal geotechnical axial resistance of drilled micropile evaluated as:

$Rn = \alpha_b * \pi d_b * L_b$

α_b =grout-to-ground bond strength
d_b =drilled micropile diameter
L_b= Bond length

Factored geotechnical axial resistance of drilled micropile evaluated as:

$Rr = \varphi_b * R_n$

φ_b =resistance factor

A resistance factor of 0.55 was used for evaluation of pile lengths for bidding purposes.

Attachments: Drilled Micropile Calculations
Table 4.3 —Dimensions and Yield Strength DSI Threadbar
Table 4.5 —Dimensions and Yield Strength Common Micropile Types & Sizes
Table 5.3—Summary of Typical α_b Values Micropile Design

MassDOT Berkshire Line - Bridge 76.23
Lee & Lenox, Massachusetts
Drilled Micropiles Calculations - Geotechnical Axial Compression Resistance

Data:

Ground Surface El. (boring - ft)	901.3	
Bottom of Pile cap Depth Below Finished grade (ft)	2.5	
Bottom of pile cap Elevation (ft)	898.8	
GW Depth (ft)	18.0	Based on 76-B-1 & 76-B-2
GW Elevation (ft)	883.3	
Drilled Micropile Bond length (ft)	5.0	
Drilled Micropile Total length (ft)	21.0	
Drilled Micropile Cased length (ft)	16.0	
Bearing Layer (soil/rock))	rock	
Resistance factor	0.55	Resistance factor for rock
Casing Type	Nucor	
Casing OD (in)	12.75	
Casing Thickness (in)	0.5	
Rock Socket Diameter (in)	10.25	Minimum [Casing OD - 1 inch for assumed tooling clearance, Rock Socket Diameter]
Casing (yield Strength (ksi)	80	
Rebar Selection	#14	
Rebar Diameter (in)	1.69	
Rebar Area (in^2)	2.25	
Rebar Yield Strength (ksi)	75	
Concrete Strength (ksi)	5.0	
Steel Young Modulus (ksi)	29000	

Notes:

Based on 76-B-1 & 76-B-2

Soil Properties

Layer	Layer Cased or Uncased	Layer Top (ft)	Layer Bottom (ft)	Layer Top Elevation (ft)	Layer Bottom Elevation (ft)	Drilled Micropile Type	Bond Strength a (psi)	DMP Nominal Resistance (kip)	DMP Factored Resistance (kip)
Fill	Cased	0	15	901.3	886.3	A	NA		
Sandstone	Cased	15	16.0	886.3	885.3	A	NA		
Limestone	Uncased	16	21.0	885.3	880.3	A	150.0	290	159

Approximate Drilled Micropile Structural Axial Compression Resistance Calculations
(For the purpose of comparison with Geotecnical Resistance)

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

Objective: Estimate the axial structural compressive capacity for the proposed micrpiles, for the purpose of comparison with the geotechnical capacity. The structural engineer should perform their own detailed evaluations. Axial loads, lateral loads, and bending moments in each pile of the pile group were calculated using the software GROUP. The axial and lateral loads acting on the pile cap transfered to each pile are provided by HDR structural team.

References: 1) FHWA NHI-05-039 Micropile Design and Construction
2) AISC Design Manual Sections B, F, H

Calculations:

	DMP Diameter (in)	12.75
	Grout Diameter (in)	10.25
	Thickness (in)	0.50
	Bar Weight (lb/ft)	7.7
fy:	Steel Yield Stress (ksi)	75
f'c:	Grout Strength (ksi)	5
	Bar Diameter (in)	1.69
Ag:	Gross Area of Grout (in^2) uncased	80.3
	Gross Area of Grout (in^2) cased	106.2
Ab:	Area of Steel Bar (in^2)	2.25
	Z (in^3)	75.07
	S (in^3)	56.71
	E (ksi)	29000

Compression:

Compressive Strength of Grout	160.5	kips
Compressive Strength of Steel	79.3	kips
Allowable Compressive Load for Uncased Length:	240	kips
Allowable Tension Load for Uncased Length:	93	kips

5.7 STEP 6: STRUCTURAL DESIGN OF MICROPILE UNCASED LENGTH

The allowable compression load for the uncased length of a micropile is given as:

$$P_{c-allowable} = \left(0.4 f_c' \times A_{grout} + 0.47 F_{y-bar} \times A_{bar}\right) \quad \text{(Eq. 5-7)}$$

For the uncased portion of the pile, the reinforcing bar yield stress used in the calculations in compression is assumed to not exceed 600 MPa (87 ksi) (i.e., to prevent grout crushing at an assumed strain of 0.003 unless data is provided demonstrating that the confined grout can sustain higher strain levels without crushing).

The allowable tension load for the uncased length of a micropile is given as:

$$P_{t-allowable} = 0.55 F_{y-bar} \times A_{bar} \quad \text{(Eq. 5-8)}$$

		Yielding	Local Buckling (Non Compact)	Local Buckling (Slender Walls)
	Ma=Mn/Ω			
	Ω=	1.67		
	Mn=FyZ (in-ft)=	5630	5608	21284
	Ma (in-ft)=	281	280	1062
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	772.9	Based on Group III, Pin, Positive Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	143.4	Based on Group III, Pin, Negative Longitudinal	
	Pr/Pc=	0.4		
(from GROUP)	**M (kip-in)=**	395.1	Based on Group III, Fix, Positive Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	131.5	Based on Group III, Fix, Negative Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	812.2	Based on Group VI, Pin, Positive Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	67.1	Based on Group VI, Pin, Negative Longitudinal	
	Pr/Pc=	0.4		
(from GROUP)	**M (kip-in)=**	415.8	Based on Group VI, Fix, Positive Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	88.4	Based on Group VI, Fix, Negative Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	558.0	Based on Group I, Pin, Positive Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	348.0	Based on Group I, Pin, Negative Longitudinal	
	Pr/Pc=	0.3		
(from GROUP)	**M (kip-in)=**	288.7	Based on Group I, Fix, Positive Longitudinal	
	Pr/Pc=	0.2		
(from GROUP)	**M (kip-in)=**	187.2	Based on Group I, Fix, Negative Longitudinal	

See GROUP Results table				Axial Compr./Tens. (kip)		Axial Compr.+ Moment (kip)			
Pile ID	**Load (kip)**	**Lateral (kip)**	**M (kip-ft)**	**Allow Str (kip)**	**CHECK**	**Allow M (kip-ft)**	**P+M**	**CHECK**	
8	53.9	17.2	64.4	240	OK	280	0.43	OK	Group III, Pin, Pos.
7	45.8	4.4	11.9	240	OK	280	0.14	OK	Group III, Pin, Neg.
12	84.0	9.8	32.9	240	OK	280	0.45	OK	Group III, Fix, Pos.
11	39.1	3.0	11.0	240	OK	280	0.12	OK	Group III, Fix, Neg.
8	53.5	18.0	67.7	240	OK	280	0.44	OK	Group VI, Pin, Pos.
11	48.3	2.2	5.6	240	OK	280	0.22	OK	Group VI, Pin, Neg.
12	84.4	10.2	34.6	240	OK	280	0.46	OK	Group VI, Fix, Pos.
11	46.0	2.0	7.4	240	OK	280	0.12	OK	Group VI, Fix, Neg.
8	49.3	13.2	46.5	240	OK	280	0.35	OK	Group I, Pin, Pos.
7	47.0	8.8	29.0	240	OK	280	0.20	OK	Group I, Pin, Neg.
12	72.8	7.3	24.1	240	OK	280	0.38	OK	Group I, Fix, Pos.
12	56.5	4.5	15.6	240	OK	280	0.29	OK	Group I, Fix, Neg.

Drilled Micropile Geotechnical Axial Compression Resistance

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

Table 5-3. Summary of Typical α_{bond} (Grout-to-Ground Bond) Values for Micropile Design.

Soil / Rock Description	Grout-to-Ground Bond Ultimate Strengths, kPa (psi)			
	Type A	Type B	Type C	Type D
Silt & Clay (some sand) (soft, medium plastic)	35-70 (5-10)	35-95 (5-14)	50-120 (5-17.5)	50-145 (5-21)
Silt & Clay (some sand) (stiff, dense to very dense)	50-120 (5-17.5)	70-190 (10-27.5)	95-190 (14-27.5)	95-190 (14-27.5)
Sand (some silt) (fine, loose-medium dense)	70-145 (10-21)	70-190 (10-27.5)	95-190 (14-27.5)	95- 240 (14-35)
Sand (some silt, gravel) (fine-coarse, med.-very dense)	95-215 (14-31)	120-360 (17.5-52)	145-360 (21-52)	145-385 (21-56)
Gravel (some sand) (medium-very dense)	95-265 (14-38.5)	120-360 (17.5-52)	145-360 (21-52)	145-385 (21-56)
Glacial Till (silt, sand, gravel) (medium-very dense, cemented)	95-190 (14-27.5)	95-310 (14-45)	120-310 (17.5-45)	120-335 (17.5-48.5)
Soft Shales (fresh-moderate fracturing, little to no weathering)	205-550 (30-80)	N/A	N/A	N/A
Slates and Hard Shales (fresh-moderate fracturing, little to no weathering)	515-1,380 (75-200)	N/A	N/A	N/A
Limestone (fresh-moderate fracturing, little to no weathering)	1,035-2,070 (150-300)	N/A	N/A	N/A
Sandstone (fresh-moderate fracturing, little to no weathering)	520-1,725 (75.5-250)	N/A	N/A	N/A
Granite and Basalt (fresh-moderate fracturing, little to no weathering)	1,380-4,200 (200-609)	N/A	N/A	N/A

Type A: Gravity grout only
Type B: Pressure grouted through the casing during casing withdrawal
Type C: Primary grout placed under gravity head, then one phase of secondary "global" pressure grouting
Type D: Primary grout placed under gravity head, then one or more phases of secondary "global" pressure grouting

Drilled Micropile Geotechnical Axial Compression Resistance

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

Table 4-3. Dimensions and Yield Strength for DSI Threadbar.

Steel Grade	Bar Diameter mm (in)	Area mm^2 (in^2)	Yield Strength kN (kip)	Diameter over Threads mm (in.)	Bar Weight kg/m (lbs/lf)
520[1]	32 (#10)	819 (1.27)	424 (95)	36.3 (1.43)	6.41 (4.30)
	36 (#11)	1006 (1.56)	520 (117)	40.9 (1.61)	7.91 (5.31)
	43 (#14)	1452 (2.25)	751 (169)	47.2 (1.86)	11.39 (7.65)
	57 (#18)	2581 (4.0)	1335 (300)	63.5 (2.5)	20.24 (13.6)
550[2]	63 (2.5in)	3168 (4.91)	1747 (393)	69.1 (2.72)	24.86 (16.7)

Notes: [1]Grade 500 steel has yield stress of f_y= 520 MPa (75 ksi) and tensile strength of f_u = 690 MPa (100 ksi).
[2]Grade 550 steel has yield stress of f_y= 552 MPa (80 ksi) and tensile strength of f_u = 700 MPa (102 ksi).

Table 4.5 - Dimensions and Yield Strength of Common Micropile Types & Sizes

Outside Diameter	Thickness	Inside Diameter	Weight	Cross Sectional Area	Total Area of Pile	Internal Volume	External Surface Area	Moment of Inertia	SECTION MODULUS	
									Elastic	Plastic
in mm	in mm	in mm	lbs/ft kg/m	in^2 cm^2	in^2 cm^2	ft^3/ft m^3/m	ft^2/ft m^2/m	in^4 cm^4	in^3 cm^3	in^3 cm^3
7 177.8	0.5 12.7	6 152.4	34.74 51.71	10.21 65.87	38.48 248.29	0.196 0.018	1.83 0.56	54.24 2257.70	15.5 253.96	21.17 346.86
8.625 219.075	0.5 12.7	7.625 193.675	43.43 64.63	12.76 82.34	58.43 376.94	0.32 0.029	2.26 0.69	105.72 4400.36	24.51 401.65	33.05 541.58
9.625 244.475	0.5 12.7	8.625 219.075	48.77 72.59	14.33 92.47	72.76 469.42	0.406 0.038	2.52 0.77	149.63 6228.24	31.09 509.52	41.67 682.92
10.75 273.05	0.5 12.7	9.75 247.65	54.79 81.54	16.10 103.88	90.76 585.56	0.518 0.048	2.81 0.86	211.95 8822.03	39.43 646.18	52.57 861.52
12.75 323.85	0.5 12.7	11.75 298.45	65.48 97.45	19.24 124.14	127.68 823.72	0.753 0.070	3.34 1.02	361.54 15048.59	56.71 929.36	75.07 1230.22
14 355.6	0.5 12.7	13 330.2	72.16 107.40	21.21 136.81	153.94 993.15	0.922 0.086	3.67 1.12	483.76 20135.45	69.11 1132.48	91.17 1493.95
16 406.4	0.5 12.7	15 381	82.85 123.31	24.35 157.08	201.06 1297.17	1.227 0.114	4.19 1.28	731.94 30465.73	91.49 1499.30	120.17 1969.18
18 457.2	0.5 12.7	17 432	93.54 139.22	27.49 177.35	254.47 1642.0	1.576 0.146	4.71 1.44	1053.17 43836	117.02 1918	153.17 2510

Drilled Micropile Geotechnical Axial Compression Resistance

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

Table 10.5.5.2.5-1—Resistance Factors for Geotechnical Resistance of Axially Loaded Micropiles

Limit State	Method/ Ground Condition	Resistance Factor
Compression Resistance of Single Micropile, ϕ_{stat}	Side Resistance (Bond Resistance): Presumptive Values	0.55[1]
	Tip Resistance on Rock O'Neill and Reese (1999)	0.50
	Side Resistance and Tip Resistance Load Test	Values in Table 10.5.5.2.3-1, but no greater than 0.70
Block Failure, ϕ_{bl}	Clay	0.60
Uplift Resistance of Single Micropile, ϕ_{up}	Presumptive Values	0.55[1]
	Tension Load Test	Values in Table 10.5.5.2.3-1, but no greater than 0.70
Group Uplift Resistance, ϕ_{ug}	Sand & Clay	0.50

[1] Apply to presumptive grout-to-ground bond values for preliminary design only in Article C10.9.3.5.2.

Table 10.5.5.2.5-2—Resistance Factors for Structural Resistance of Axially Loaded Micropiles

Section / Loading Condition		Resistance Factor
Pile Cased Length	Tension, φ_{TC}	0.80
	Compression, φ_{CC}	0.75
Pile Uncased Length	Tension, φ_{TU}	0.80
	Compression, φ_{CU}	0.75

MICROPILE INPUTS

Client:	**MassDOT**
Project:	**Housatonic Railroad**
Project Number:	**10370244**
Project Mgr:	**June Wu**
QC Reviewers:	**Max Rolandi**
Deliverable Reviewed:	**Ryan Lavorati**
Date Transmitted:	**2/20/2025**
Review Deadline:	
Actual Review Date:	

Calculation Title :	**Micropile GROUP Calculation Package**
Calculation Number:	1
Supersedes:	NA
Superseded By:	NA

Micropile calculation package covers the design aspects of the proposed deep foundation elements for Bridge 76.23. The pile cap geometry and loading on the pile cap are provided by HDR structural team. The pile type, diameter, length, reinforcement, and casing are based on calculations and the boring logs provided herein by the HDR geotechnical team. The results of these lateral analyses can be found at the end of this package

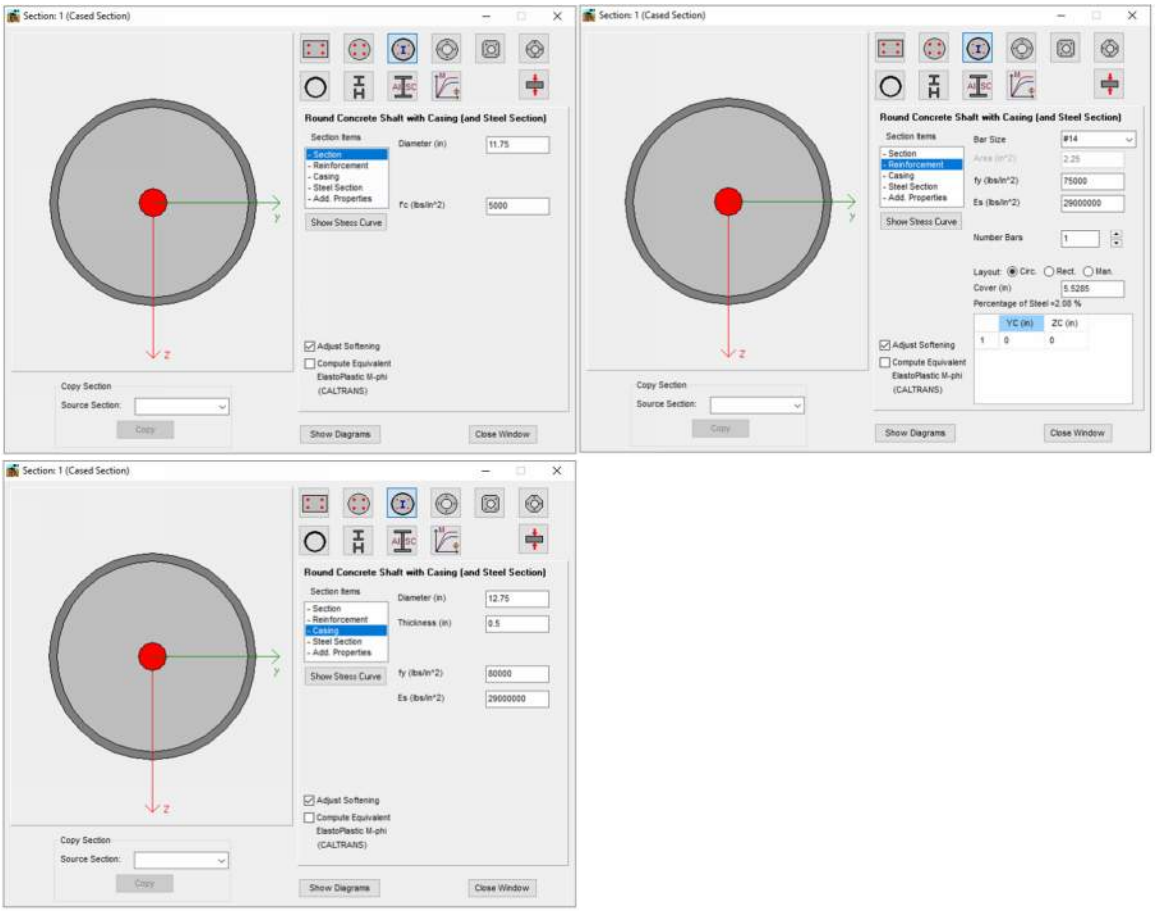
Names / Signatures:

Name	Ryan Lavorati	
Signature RTL		2/12/2025
	Calculated by	
Name	Max Rolandi	
Signature MR		2/17/2025
	Checked by	
Name	Ryan Lavorati	
Signature RTL		2/18/2025
	Updated by	
Name	Max Rolandi	
Signature MR		2/19/2025
	Back Checked by	

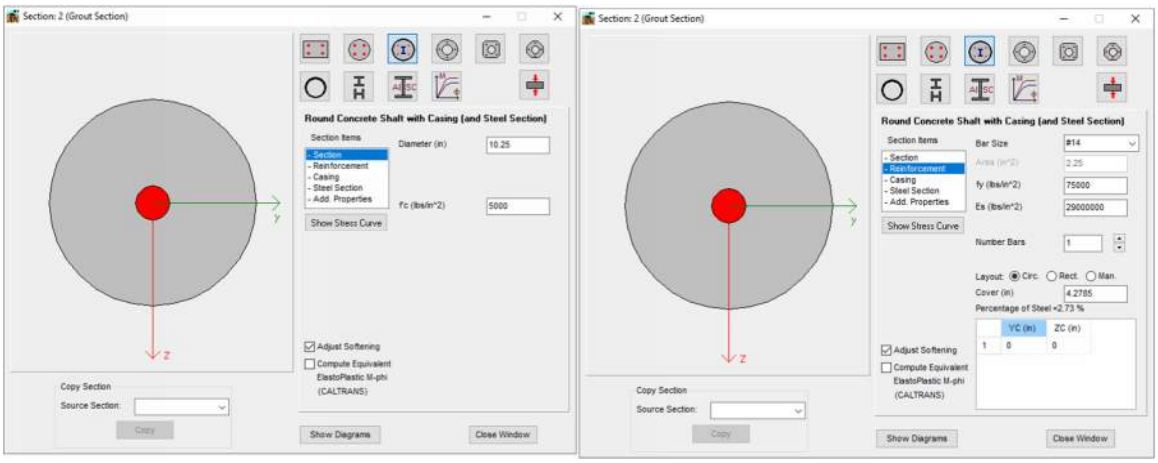
Design Manager Approval: MR	2/25/2025
Name	
Signature	Date
Design, Responsible Engineer or Project Manager	

GROUP INPUTS

Cased Section



Grouted Section



Pile Properties

Pile Properties

Prop. Type	Sections	Increments	Total Length (ft)	Method of Installation
1	1: Pile Sections	200	21	Drilled Shafts (Bored Piles
2	2: Pile Sections	200	24	Drilled Shafts (Bored Piles

Add Row | Insert Row | Delete Row

Pile Sections 1

Sectior	Top (ft)	Bottom (ft)	Cross Section Index
1	0	16	1
2	16	21	2

Add Row | Insert Row | Delete Row

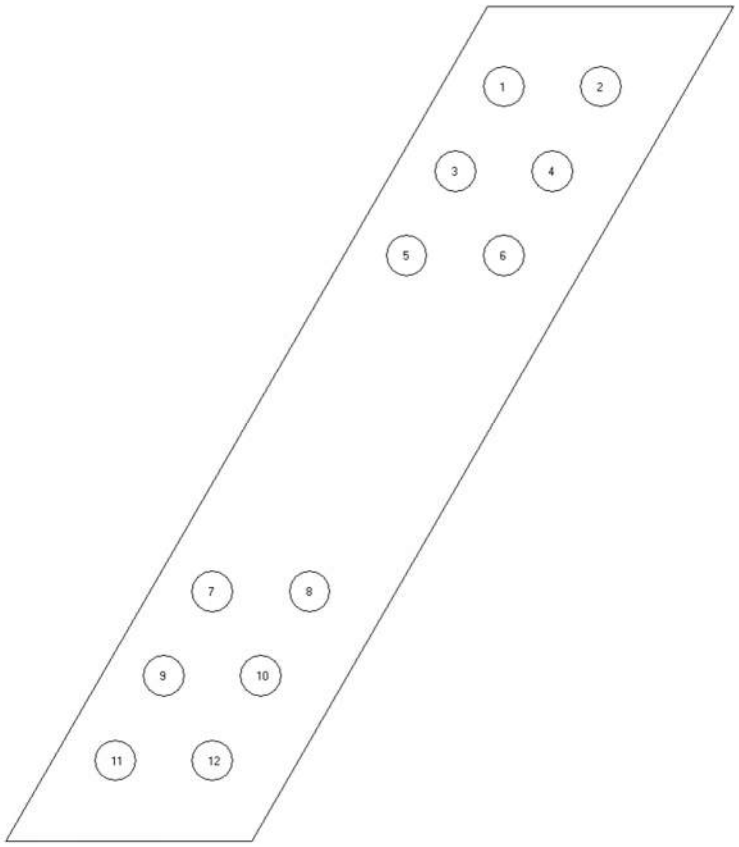
Pile Sections 2

Sectior	Top (ft)	Bottom (ft)	Cross Section Index
1	0	19	1
2	19	24	2

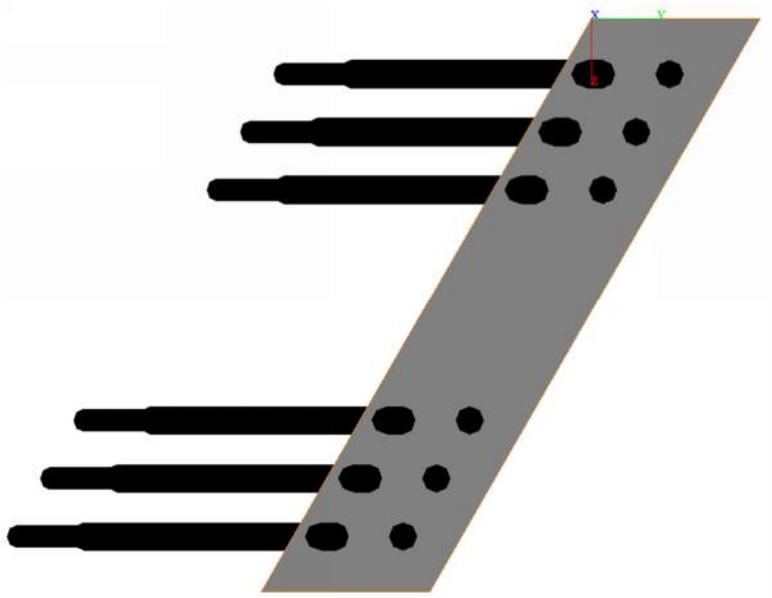
Add Row | Insert Row | Delete Row

Pile Cap Arrangement and Coordinates

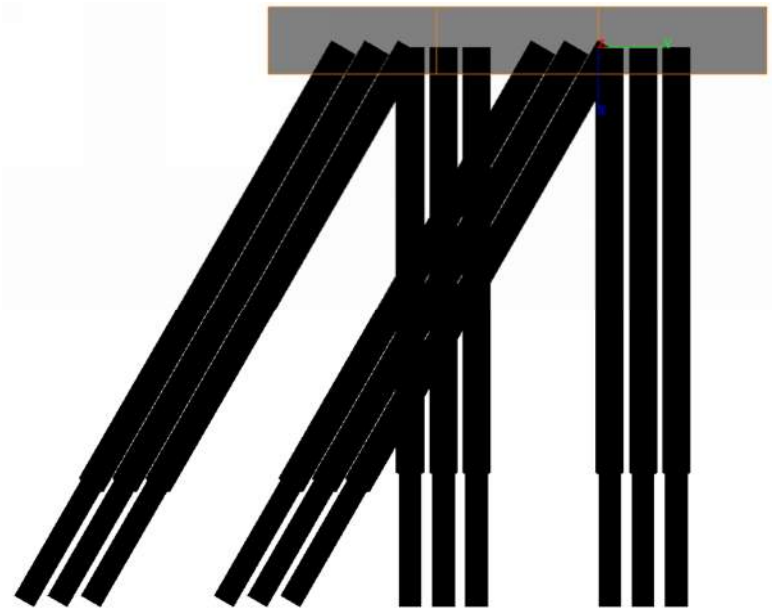
Pile Numbering Scheme



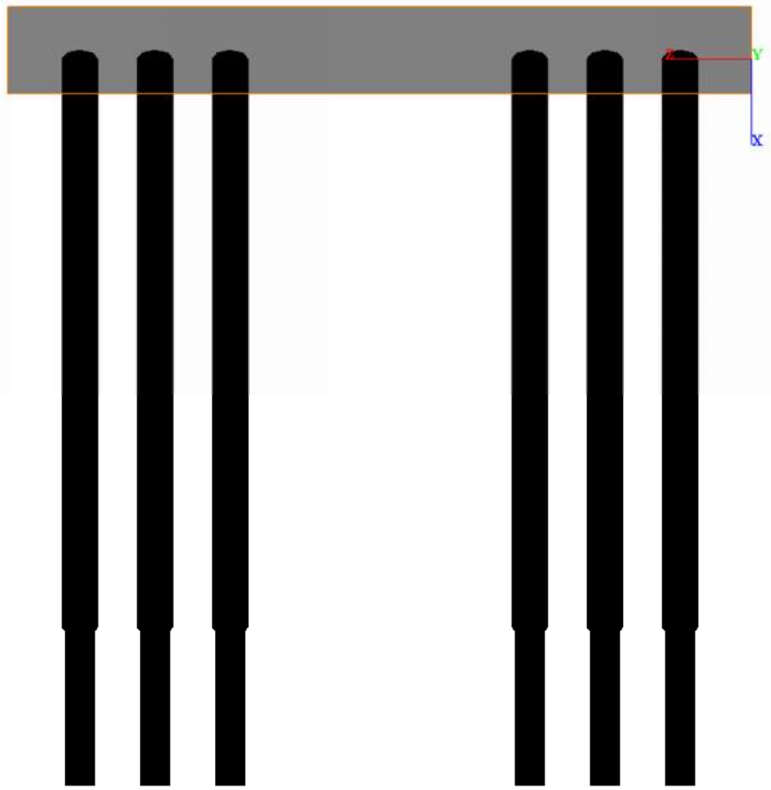
YZ Plane (looking down at pile cap)



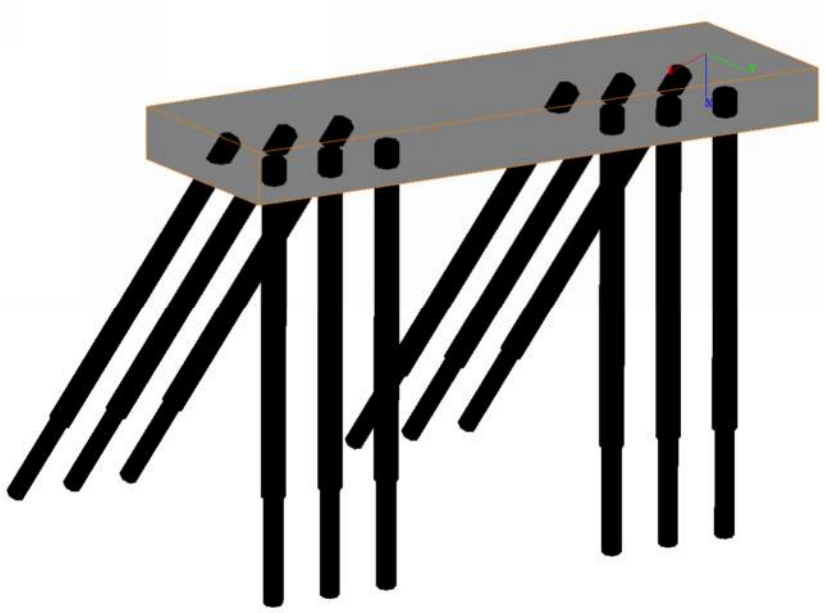
YX Plane (looking from the right-hand side of pile cap)



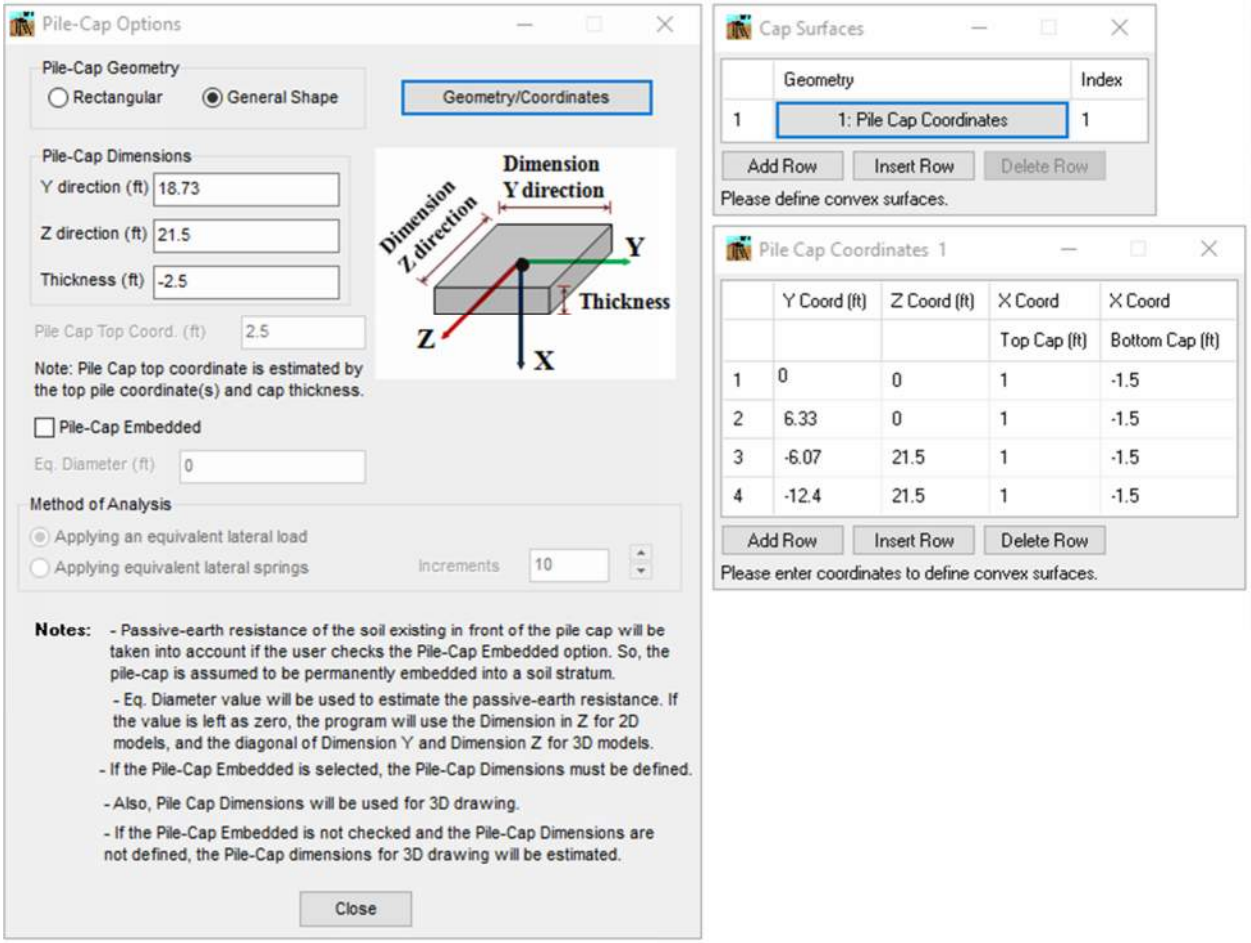
ZX Plane (looking at the front fat of the pile cap)



XYZ Plane (3D view)



Pile Cap Options



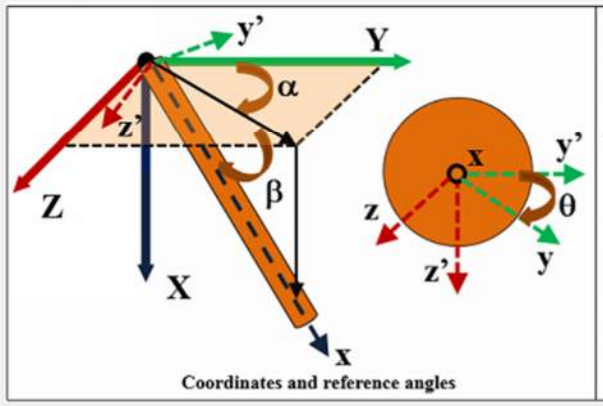
Pile Head Coordinates

Pile-Head Coordinates (3-D)

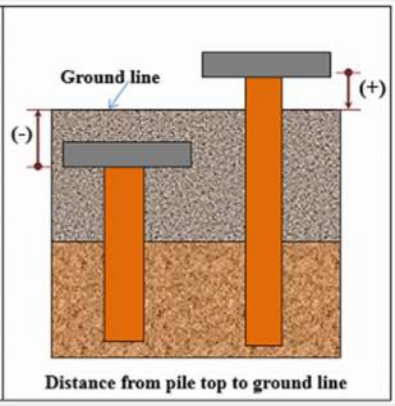
Pile #	Pile-Top Vertical X-Coordinates, (ft)	Pile-Top Horizontal Y-Coordinates, (ft)	Pile-Top Horizontal Z-Coordinates, (ft)	Angle Alpha* (use 0 for vertical pile) (DEG)	Angle Beta** (use 90 for vertical pile) (DEG)	Angle Theta (section rotation) (DEG)	Vert. Dist. from Pile Top to Ground Line ***, (ft)
1	0	0.43	2.08	0	120	0	0
2	0	2.93	2.08	0	90	0	0
3	0	-0.82	4.25	0	120	0	0
4	0	1.68	4.25	0	90	0	0
5	0	-2.07	6.42	0	120	0	0
6	0	0.43	6.42	0	90	0	0
7	0	-7.07	15.08	0	120	0	0
8	0	-4.57	15.08	0	90	0	0
9	0	-8.32	17.25	0	120	0	0
10	0	-5.82	17.25	0	90	0	0
11	0	-9.57	19.42	0	120	0	0
12	0	-7.07	19.42	0	90	0	0

Add Row | Insert Row | Delete Row

* Angle Alpha, angle from Y(+) Axis to the projection of pile on the Y-Z plane (use 0 for vertical pile)
** Angle Beta, angle from the projection of pile on the Y-Z plane to the pile axis (use 90 for vertical pile)
*** Distance from pile top to ground line
(+) positive if soil ground line is below the pile top
(-) negative if soil ground line is above the pile top



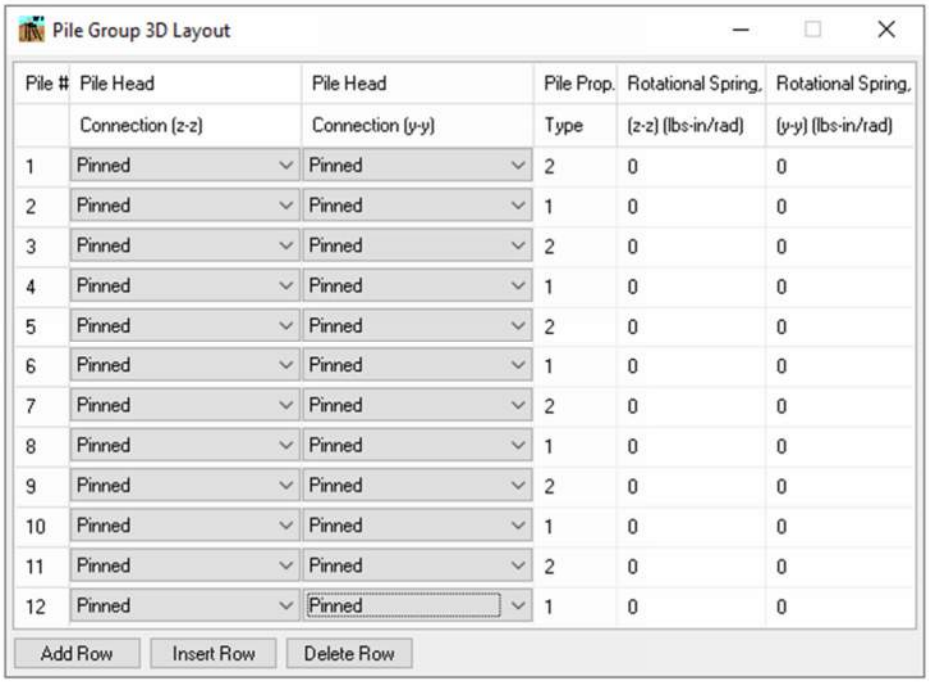
Coordinates and reference angles



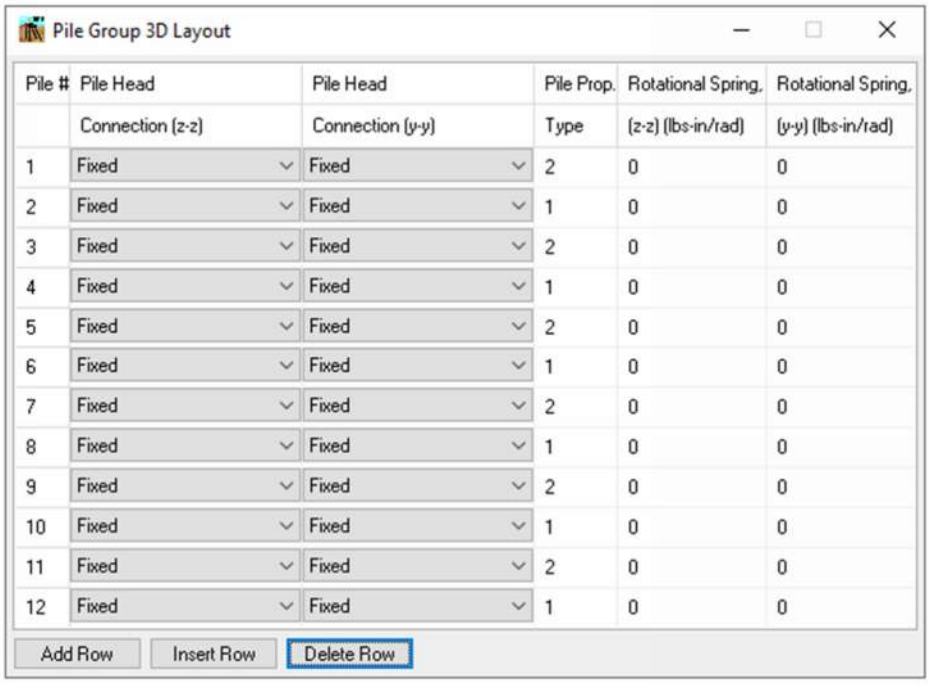
Distance from pile top to ground line

Pile Group 3D Layout

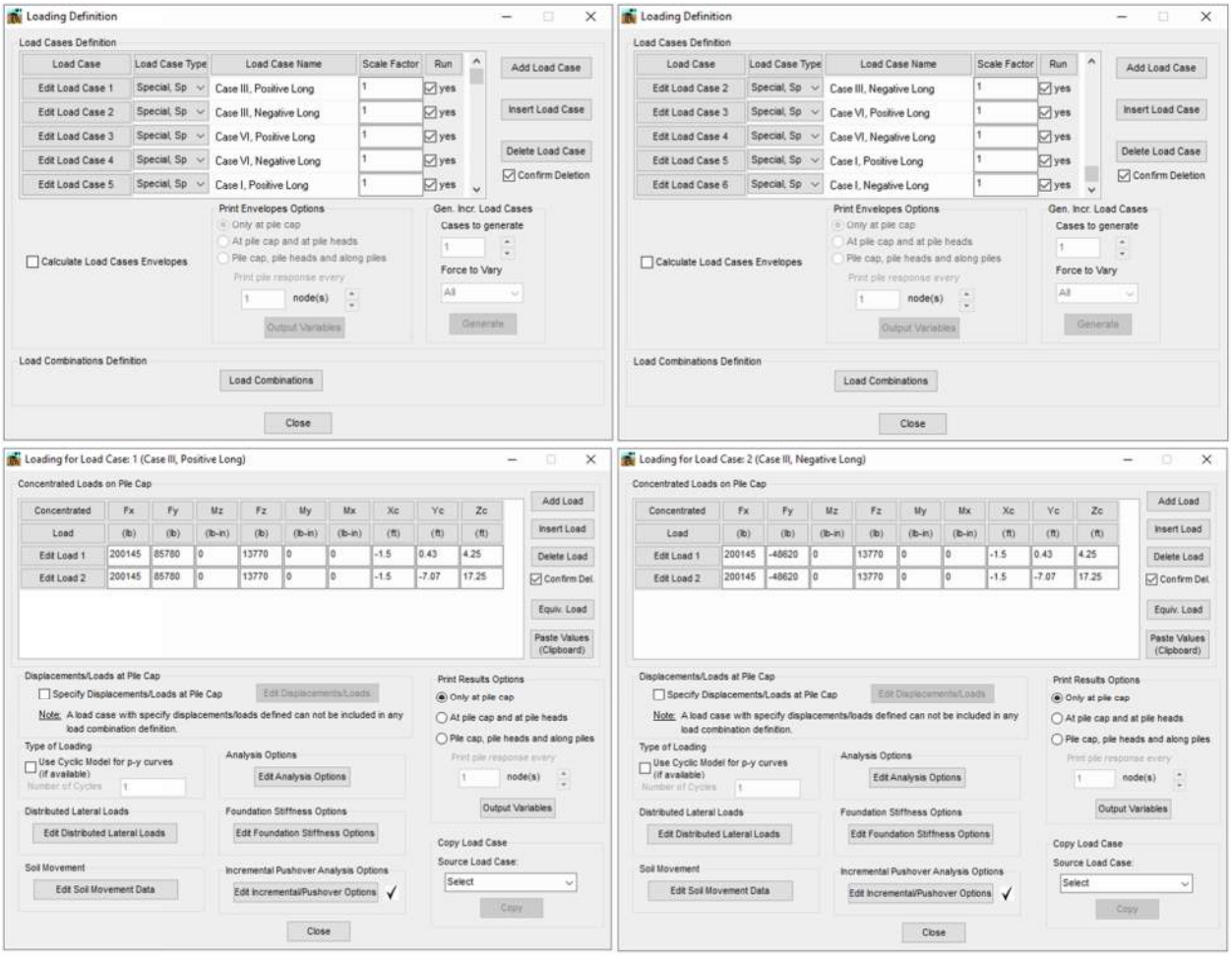
Pinned Condition

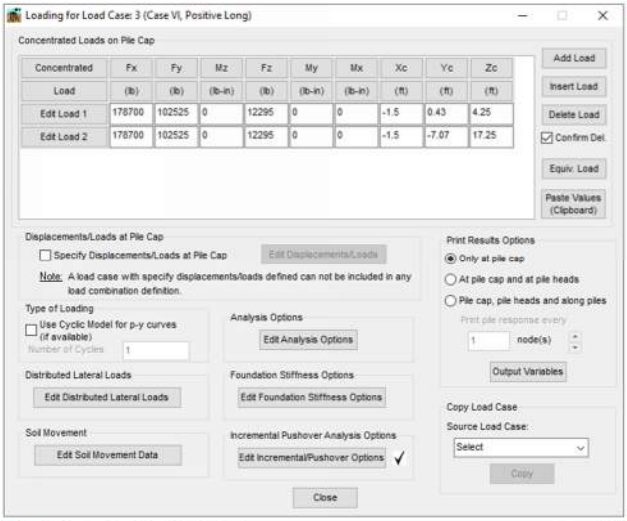


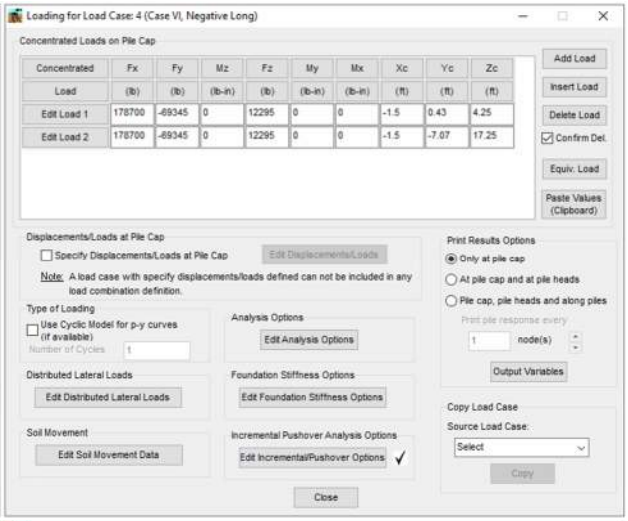
Fixed Condition

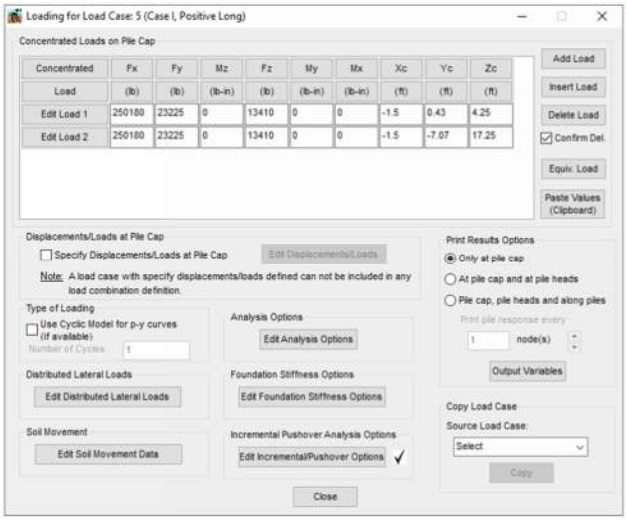


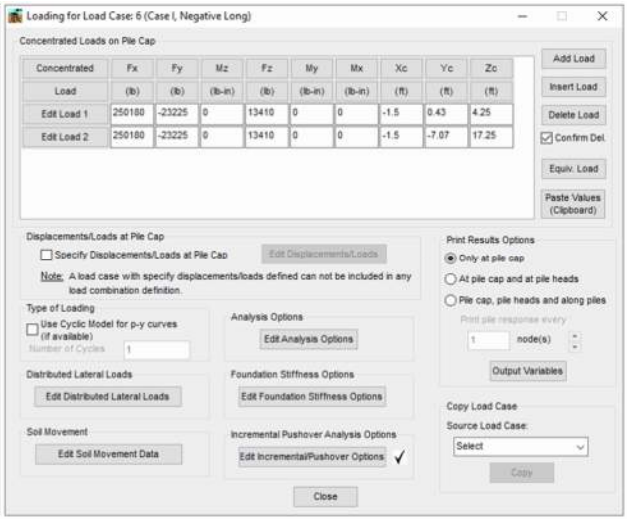
Loading Definitions




Loading for Load Case: 3 (Case VI, Positive Long)
Concentrated Loads on Pile Cap
Concentrated | Fx | Fy | Mz | Fz | My | Mx | Xc | Yc | Zc
Load | (lb) | (lb) | (lb-in) | (lb) | (lb-in) | (lb-in) | (ft) | (ft) | (ft)
Edit Load 1 | 178700 | 102525 | 0 | 12295 | 0 | 0 | -1.5 | 0.43 | 4.25
Edit Load 2 | 178700 | 102525 | 0 | 12295 | 0 | 0 | -1.5 | -7.07 | 17.25
Add Load
Insert Load
Delete Load
Confirm Del.
Equiv. Load
Paste Values (Clipboard)
Displacements/Loads at Pile Cap
Specify Displacements/Loads at Pile Cap
Edit Displacements/Loads
Note: A load case with specify displacements/loads defined can not be included in any load combination definition.
Type of Loading
Use Cyclic Model for p-y curves (if available)
Number of Cycles
Analysis Options
Edit Analysis Options
Distributed Lateral Loads
Edit Distributed Lateral Loads
Foundation Stiffness Options
Edit Foundation Stiffness Options
Soil Movement
Edit Soil Movement Data
Incremental Pushover Analysis Options
Edit Incremental/Pushover Options
Print Results Options
Only at pile cap
At pile cap and at pile heads
Pile cap, pile heads and along piles
Print pile response every
node(s)
Output Variables
Copy Load Case
Source Load Case:
Select
Copy
Close


Loading for Load Case: 4 (Case VI, Negative Long)
Concentrated Loads on Pile Cap
Concentrated | Fx | Fy | Mz | Fz | My | Mx | Xc | Yc | Zc
Load | (lb) | (lb) | (lb-in) | (lb) | (lb-in) | (lb-in) | (ft) | (ft) | (ft)
Edit Load 1 | 178700 | -69345 | 0 | 12295 | 0 | 0 | -1.5 | 0.43 | 4.25
Edit Load 2 | 178700 | -69345 | 0 | 12295 | 0 | 0 | -1.5 | -7.07 | 17.25
Add Load
Insert Load
Delete Load
Confirm Del.
Equiv. Load
Paste Values (Clipboard)
Displacements/Loads at Pile Cap
Specify Displacements/Loads at Pile Cap
Edit Displacements/Loads
Note: A load case with specify displacements/loads defined can not be included in any load combination definition.
Type of Loading
Use Cyclic Model for p-y curves (if available)
Number of Cycles
Analysis Options
Edit Analysis Options
Distributed Lateral Loads
Edit Distributed Lateral Loads
Foundation Stiffness Options
Edit Foundation Stiffness Options
Soil Movement
Edit Soil Movement Data
Incremental Pushover Analysis Options
Edit Incremental/Pushover Options
Print Results Options
Only at pile cap
At pile cap and at pile heads
Pile cap, pile heads and along piles
Print pile response every
node(s)
Output Variables
Copy Load Case
Source Load Case:
Select
Copy
Close


Loading for Load Case: 5 (Case I, Positive Long)
Concentrated Loads on Pile Cap
Concentrated | Fx | Fy | Mz | Fz | My | Mx | Xc | Yc | Zc
Load | (lb) | (lb) | (lb-in) | (lb) | (lb-in) | (lb-in) | (ft) | (ft) | (ft)
Edit Load 1 | 250180 | 23225 | 0 | 13410 | 0 | 0 | -1.5 | 0.43 | 4.25
Edit Load 2 | 250180 | 23225 | 0 | 13410 | 0 | 0 | -1.5 | -7.07 | 17.25
Add Load
Insert Load
Delete Load
Confirm Del.
Equiv. Load
Paste Values (Clipboard)
Displacements/Loads at Pile Cap
Specify Displacements/Loads at Pile Cap
Edit Displacements/Loads
Note: A load case with specify displacements/loads defined can not be included in any load combination definition.
Type of Loading
Use Cyclic Model for p-y curves (if available)
Number of Cycles
Analysis Options
Edit Analysis Options
Distributed Lateral Loads
Edit Distributed Lateral Loads
Foundation Stiffness Options
Edit Foundation Stiffness Options
Soil Movement
Edit Soil Movement Data
Incremental Pushover Analysis Options
Edit Incremental/Pushover Options
Print Results Options
Only at pile cap
At pile cap and at pile heads
Pile cap, pile heads and along piles
Print pile response every
node(s)
Output Variables
Copy Load Case
Source Load Case:
Select
Copy
Close


Loading for Load Case: 6 (Case I, Negative Long)
Concentrated Loads on Pile Cap
Concentrated | Fx | Fy | Mz | Fz | My | Mx | Xc | Yc | Zc
Load | (lb) | (lb) | (lb-in) | (lb) | (lb-in) | (lb-in) | (ft) | (ft) | (ft)
Edit Load 1 | 250180 | -23225 | 0 | 13410 | 0 | 0 | -1.5 | 0.43 | 4.25
Edit Load 2 | 250180 | -23225 | 0 | 13410 | 0 | 0 | -1.5 | -7.07 | 17.25
Add Load
Insert Load
Delete Load
Confirm Del.
Equiv. Load
Paste Values (Clipboard)
Displacements/Loads at Pile Cap
Specify Displacements/Loads at Pile Cap
Edit Displacements/Loads
Note: A load case with specify displacements/loads defined can not be included in any load combination definition.
Type of Loading
Use Cyclic Model for p-y curves (if available)
Number of Cycles
Analysis Options
Edit Analysis Options
Distributed Lateral Loads
Edit Distributed Lateral Loads
Foundation Stiffness Options
Edit Foundation Stiffness Options
Soil Movement
Edit Soil Movement Data
Incremental Pushover Analysis Options
Edit Incremental/Pushover Options
Print Results Options
Only at pile cap
At pile cap and at pile heads
Pile cap, pile heads and along piles
Print pile response every
node(s)
Output Variables
Copy Load Case
Source Load Case:
Select
Copy
Close

Soil Properties

Soil Layers

Layer	Soil Type	Depth for Top of Soil Layer (ft)	Depth for Bottom of Soil Layer (ft)	Properties of Layer
1	Sand (Reese)	0	15	1: Sand (Reese, et al.)
2	Weak Rock (Reese)	15	45	2: Weak Rock

Add Row | Insert Row | Delete Row

Sand (Reese, et al.) 1

1=Top, 2=Bottom	Effective Unit Weight (lbs/ft^3)	Friction Angle, (DEG.)	p-y Modulus, k (lbs/in^3)	Ultimate Unit Side Friction (lbs/ft^2)	Ultimate Unit Tip Resistance (lbs/ft^2)
1	125	34	175	0	0
2	125	34	175	0	0

A linear interpolation with depth will be used to compute values between the top and bottom of the layer.
p-y Modulus, k:
- Always check recommended value in Geotechnical Investigation Reports.
- Program will help to estimate value for p-y Modulus, k, if zero input value is entered.

Ultimate Unit Side Friction and Ultimate Unit Tip Resistance:
- The program uses Ultimate Unit Side Friction to generate t-z curves.
- The program uses Ultimate Unit Tip Resistance to generate q-w curves.
- Always check recommended values in Geotechnical Investigation Reports.
- Program will help to estimate values for Ultimate Unit Side Friction and Ultimate Unit Tip Resistance if zero input values are entered.

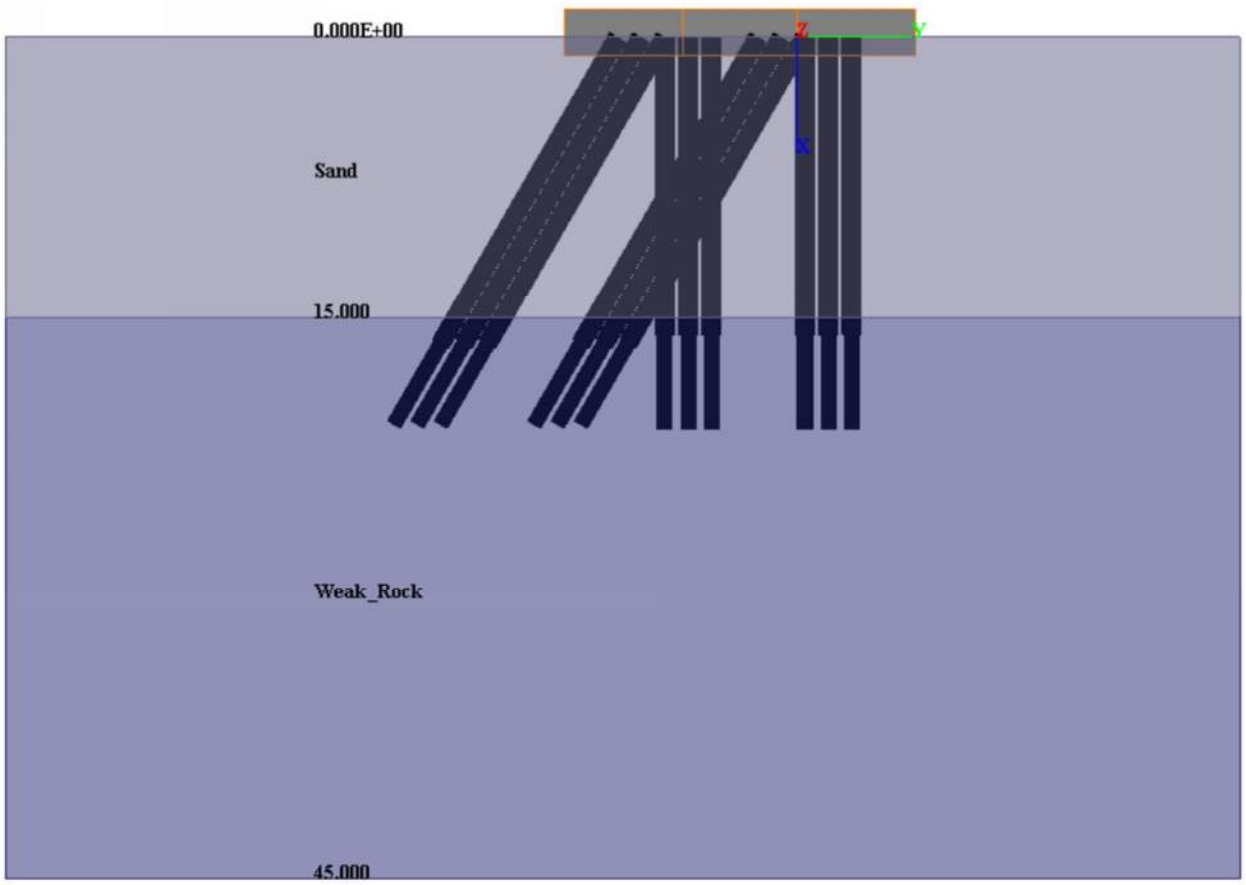
Weak Rock 2

1=Top, 2=Bottom	Effective Unit Weight (lbs/ft^3)	Uniaxial Compressive Strength, qu, (lbs/in^2)	Initial Modulus of Rock Mass, (lbs/in^2)	Strain Factor, k_rm	RQD, (%)	Ultimate Unit Side Friction (lbs/ft^2)	Ultimate Unit Tip Resistance (lbs/ft^2)
1	77.6	13000	5700000	0.0005	45	0	0
2	77.6	13000	5700000	0.0005	45	0	0

A linear interpolation with depth will be used to compute values between the top and bottom of the layer.
This p-y model is best used for cohesive intermediate geomaterials like claystones and silstones with uniaxial compressive strengths ranging from 500 kPa to 5000 kPa (75 to 750 psi).
Ultimate Unit Side Friction and Ultimate Unit Tip Resistance:
- The program uses Ultimate Unit Side Friction to generate t-z curves.
- The program uses Ultimate Unit Tip Resistance to generate q-w curves.
- Always check recommended values in Geotechnical Investigation Reports.
- Program will help to estimate values for Ultimate Unit Side Friction and Ultimate Unit Tip Resistance if zero input values are entered.

*For the GROUP analyses, lateral analyses were examined only

Soil Layering



*Units are in feet

GROUP RESULTS

ALL RESULTS

Load Case	Pile Head Condition	Longitudinal Load Direction	Pile Number	Pile Head Conditions*			GROUP Pile Results		
				Axial Load (kips)**	Lateral Load (kips)	Bending Moment (in-kips)	Max Deflection (in)	Max Bending Moment (in-kips)	Max Resultant Shear (kips)
Group III	Pinned	Positive	1	7.49	17.4	0	0.5	797	37.8
			2	51.4	17.2	0	0.4	772	47.1
			3	6.79	17.4	0	0.5	797	37.8
			4	50.9	17.2	0	0.4	772	47.1
			5	6.09	17.4	0	0.5	797	37.8
			6	50.3	17.2	0	0.4	772	47.1
			7	7.67	17.4	0	0.5	799	37.9
			8	53.9	17.2	0	0.4	773	47.1
			9	6.97	17.4	0	0.5	799	37.9
			10	53.3	17.2	0	0.4	773	47.2
			11	6.27	17.5	0	0.5	799	37.9
			12	52.8	17.2	0	0.4	773	47.2
Group III	Pinned	Negative	1	45.8	4.37	0	0.0	142	4.37
			2	24.0	4.08	0	0.0	124	6.23
			3	45.7	4.38	0	0.0	142	4.38
			4	24.2	4.09	0	0.0	124	6.24
			5	45.6	4.39	0	0.0	142	4.39
			6	24.4	4.10	0	0.0	124	6.26
			7	45.8	4.42	0	0.1	143	4.42
			8	26.0	4.13	0	0.0	125	6.34
			9	45.7	4.42	0	0.1	144	4.42
			10	26.2	4.14	0	0.0	126	6.36
			11	45.6	4.43	0	0.1	144	4.43
			12	26.5	4.15	0	0.0	126	6.38
Group III	Fixed	Positive	1	-23.7	9.55	395	0.0	395	9.55
			2	78.4	9.70	392	0.0	392	9.70
			3	-23.3	9.56	395	0.0	395	9.56
			4	79.1	9.71	392	0.0	392	9.71
			5	-22.9	9.58	396	0.0	396	9.58
			6	79.8	9.72	392	0.0	392	9.72
			7	-21.3	9.64	399	0.0	399	9.64
			8	82.6	9.76	394	0.0	394	9.76
			9	-20.9	9.66	400	0.0	400	9.66
			10	83.3	9.77	395	0.0	395	9.77
			11	-20.5	9.67	400	0.0	400	9.67
			12	84.0	9.78	395	0.0	395	9.78
Group III	Fixed	Negative	1	35.8	2.84	125	0.0	125	2.84
			2	30.7	2.51	107	0.0	107	2.51
			3	36.2	2.87	126	0.0	126	2.87
			4	31.3	2.52	108	0.0	108	2.52
			5	36.6	2.89	126	0.0	126	2.89
			6	32.0	2.53	108	0.0	108	2.53
			7	38.3	2.97	130	0.0	130	2.97
			8	34.6	2.57	110	0.0	110	2.57
			9	38.7	3.00	131	0.0	131	3.00
			10	35.3	2.58	110	0.0	110	2.58
			11	39.1	3.02	132	0.0	132	3.02
			12	35.9	2.59	110	0.0	110	2.59

* Pile Head Conditions reflect the micropile orientation. For example, Axial Load is always normal to the top of the pile. The axial load is vertically oriented for vertical piles, and at an angle for battered piles.

** Positive values indicate compression; Negative values indicate tension

Load Case	Pile Head Condition	Longitudinal Load Direction	Pile Number	Pile Head Conditions*			GROUP Pile Results		
				Axial Load (kips)	Lateral Load (kips)	Bending Moment (in-kips)	Max Deflection (in)	Max Bending Moment (in-kips)	Max Resultant Shear (kips)
Group VI	Pinned	Positive	1	-0.73	18.2	0	0.5	836	40.1
			2	51.2	17.9	0	0.5	811	49.4
			3	-1.48	18.2	0	0.5	836	40.1
			4	50.6	17.9	0	0.5	811	49.4
			5	-2.24	18.2	0	0.5	836	40.1
			6	49.9	18.0	0	0.5	811	49.4
			7	-0.50	18.2	0	0.5	837	40.1
			8	53.5	18.0	0	0.5	812	49.5
			9	-1.26	18.2	0	0.5	837	40.1
			10	52.8	18.0	0	0.5	812	49.5
			11	-2.02	18.2	0	0.5	837	40.1
			12	52.2	18.0	0	0.5	812	49.5
Group VI	Pinned	Negative	1	48.2	2.11	0	0.0	65.2	2.11
			2	16.3	2.13	0	0.0	63.8	3.09
			3	48.2	2.12	0	0.0	65.4	2.12
			4	16.5	2.14	0	0.0	64.0	3.10
			5	48.2	2.13	0	0.0	65.7	2.13
			6	16.7	2.14	0	0.0	64.1	3.10
			7	48.3	2.16	0	0.0	66.6	2.16
			8	17.9	2.17	0	0.0	64.8	3.14
			9	48.3	2.17	0	0.0	66.9	2.17
			10	18.2	2.17	0	0.0	65.0	3.15
			11	48.3	2.17	0	0.0	67.1	2.17
			12	18.4	2.18	0	0.0	65.2	3.16
Group VI	Fixed	Positive	1	-32.9	9.9	412	0.0	412	9.9
			2	79.3	10.2	413	0.0	413	10.2
			3	-32.5	9.9	412	0.0	412	9.9
			4	80.0	10.2	413	0.0	413	10.2
			5	-32.2	10.0	413	0.0	413	10.0
			6	80.6	10.2	413	0.0	413	10.2
			7	-30.7	10.0	415	0.0	415	10.0
			8	83.2	10.2	415	0.0	415	10.2
			9	-30.3	10.0	416	0.0	416	10.0
			10	83.8	10.2	415	0.0	415	10.2
			11	-30.0	10.0	417	0.0	417	10.0
			12	84.4	10.2	416	0.0	416	10.2
Group VI	Fixed	Negative	1	43.1	1.92	84.5	0.0	84.5	1.92
			2	18.5	2.39	89.3	0.0	89.3	2.39
			3	43.4	1.93	85.0	0.0	85.0	1.93
			4	19.1	2.39	89.5	0.0	89.5	2.39
			5	43.8	1.94	85.5	0.0	85.5	1.94
			6	19.7	2.39	89.6	0.0	89.6	2.39
			7	45.3	1.97	87.4	0.0	87.4	1.97
			8	22.1	2.39	90.2	0.0	90.2	2.39
			9	45.7	1.98	87.9	0.0	87.9	1.98
			10	22.7	2.39	90.4	0.0	90.4	2.39
			11	46.0	1.99	88.4	0.0	88.4	1.99
			12	23.3	2.40	90.6	0.0	90.6	2.40

* Pile Head Conditions reflect the micropile orientation. For example, Axial Load is always normal to the top of the pile. The axial load is vertically oriented for vertical piles, and at an angle for battered piles.

** Positive values indicate compression; Negative values indicate tension

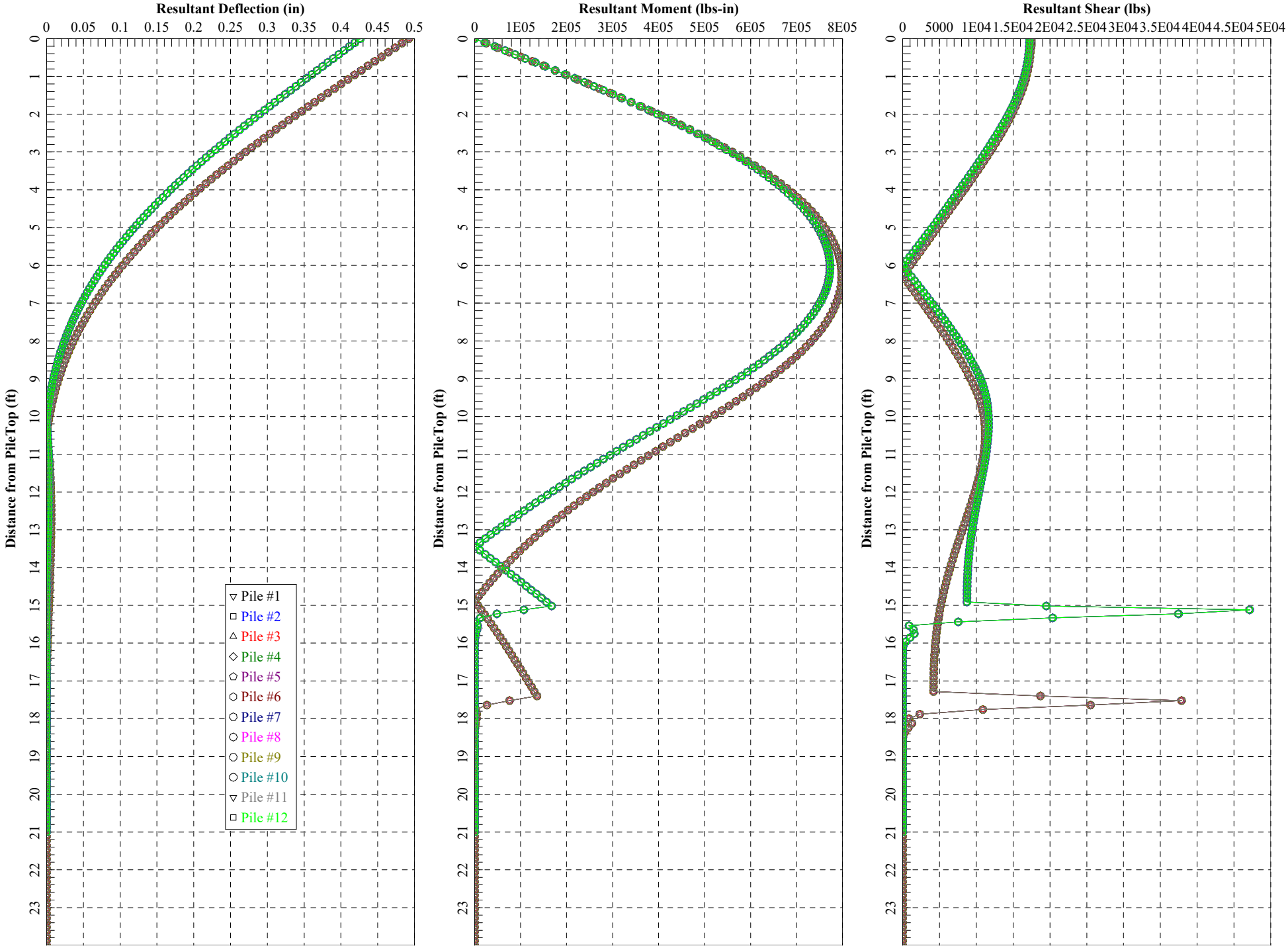
Load Case	Pile Head Condition	Longitudinal Load Direction	Pile Number	Pile Head Conditions*			GROUP Pile Results		
				Axial Load (kips)	Lateral Load (kips)	Bending Moment (in-kips)	Max Deflection (in)	Max Bending Moment (in-kips)	Max Resultant Shear (kips)
Group I	Pinned	Positive	1	33.8	13.4	0	0.3	582	25.8
			2	47.0	13.2	0	0.3	557	33.9
			3	33.3	13.4	0	0.3	582	25.8
			4	46.8	13.2	0	0.3	557	33.9
			5	32.9	13.4	0	0.3	582	25.9
			6	46.5	13.2	0	0.3	557	33.9
			7	33.9	13.4	0	0.3	583	25.9
			8	49.3	13.2	0	0.3	558	33.9
			9	33.4	13.4	0	0.3	583	25.9
			10	49.0	13.2	0	0.3	558	34.0
			11	32.9	13.4	0	0.3	584	25.9
			12	48.8	13.2	0	0.3	558	34.0
Group I	Pinned	Negative	1	47.0	8.79	0	0.2	347	13.5
			2	37.5	8.56	0	0.1	324	19.2
			3	46.8	8.79	0	0.2	347	13.5
			4	37.5	8.57	0	0.1	324	19.3
			5	46.5	8.80	0	0.2	347	13.5
			6	37.6	8.57	0	0.1	324	19.3
			7	47.0	8.81	0	0.2	348	13.5
			8	39.6	8.59	0	0.1	325	19.3
			9	46.8	8.82	0	0.2	348	13.6
			10	39.7	8.59	0	0.1	325	19.3
			11	46.6	8.82	0	0.2	348	13.6
			12	39.7	8.60	0	0.1	326	19.4
Group I	Fixed	Positive	1	9.5	7.61	307	0.0	307	7.61
			2	67.4	7.22	285	0.0	285	7.22
			3	9.9	7.63	308	0.0	308	7.63
			4	68.1	7.23	285	0.0	285	7.23
			5	10.3	7.64	308	0.0	308	7.64
			6	68.8	7.25	286	0.0	286	7.25
			7	11.8	7.71	312	0.0	312	7.71
			8	71.5	7.30	288	0.0	288	7.30
			9	12.2	7.73	312	0.0	312	7.73
			10	72.1	7.31	288	0.0	288	7.31
			11	12.6	7.74	313	0.0	313	7.74
			12	72.8	7.33	289	0.0	289	7.33
Group I	Fixed	Negative	1	29.7	5.16	215	0.0	215	5.16
			2	51.3	4.37	183	0.0	183	4.37
			3	30.1	5.18	216	0.0	216	5.18
			4	51.9	4.39	184	0.0	184	4.39
			5	30.5	5.20	217	0.0	217	5.20
			6	52.5	4.40	184	0.0	184	4.40
			7	32.1	5.30	221	0.0	221	5.30
			8	55.2	4.45	186	0.0	186	4.45
			9	32.5	5.32	221	0.0	221	5.33
			10	55.9	4.47	187	0.0	187	4.47
			11	32.9	5.35	222	0.0	222	5.35
			12	56.5	4.48	187	0.0	187	4.48

* Pile Head Conditions reflect the micropile orientation. For example, Axial Load is always normal to the top of the pile. The axial load is vertically oriented for vertical piles, and at an angle for battered piles.

** Positive values indicate compression; Negative values indicate tension

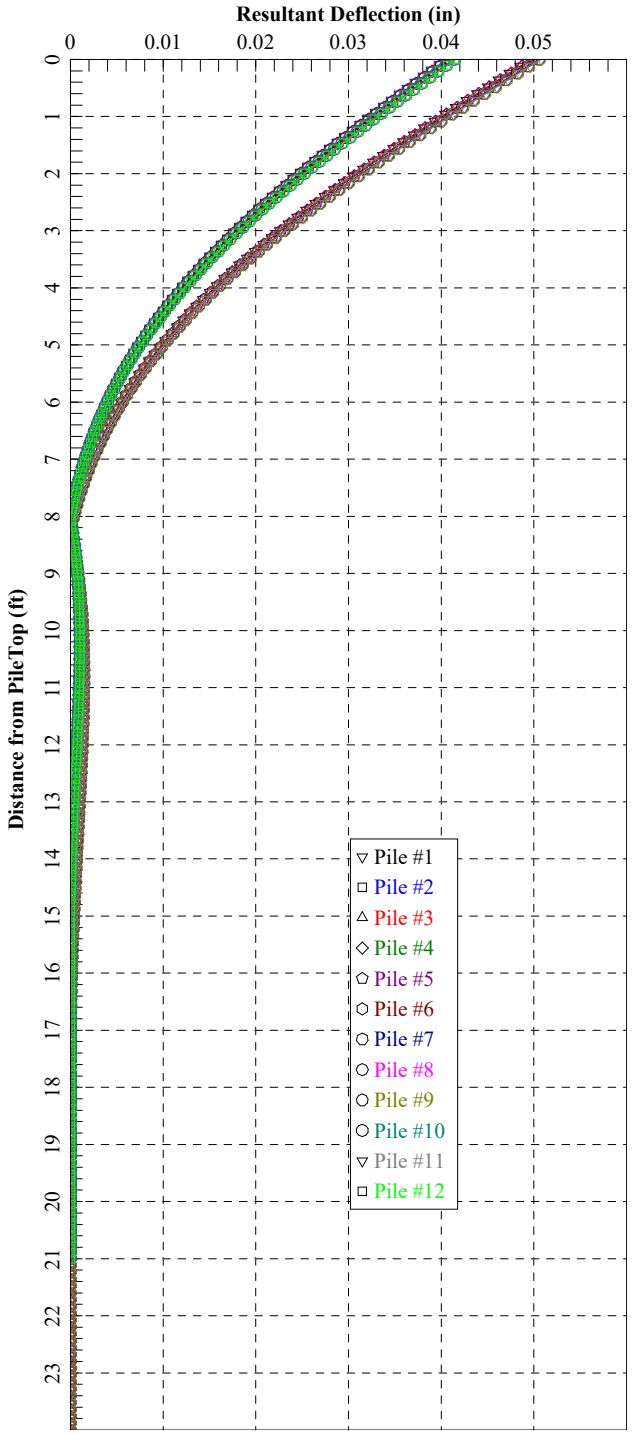
GROUP RESULTS

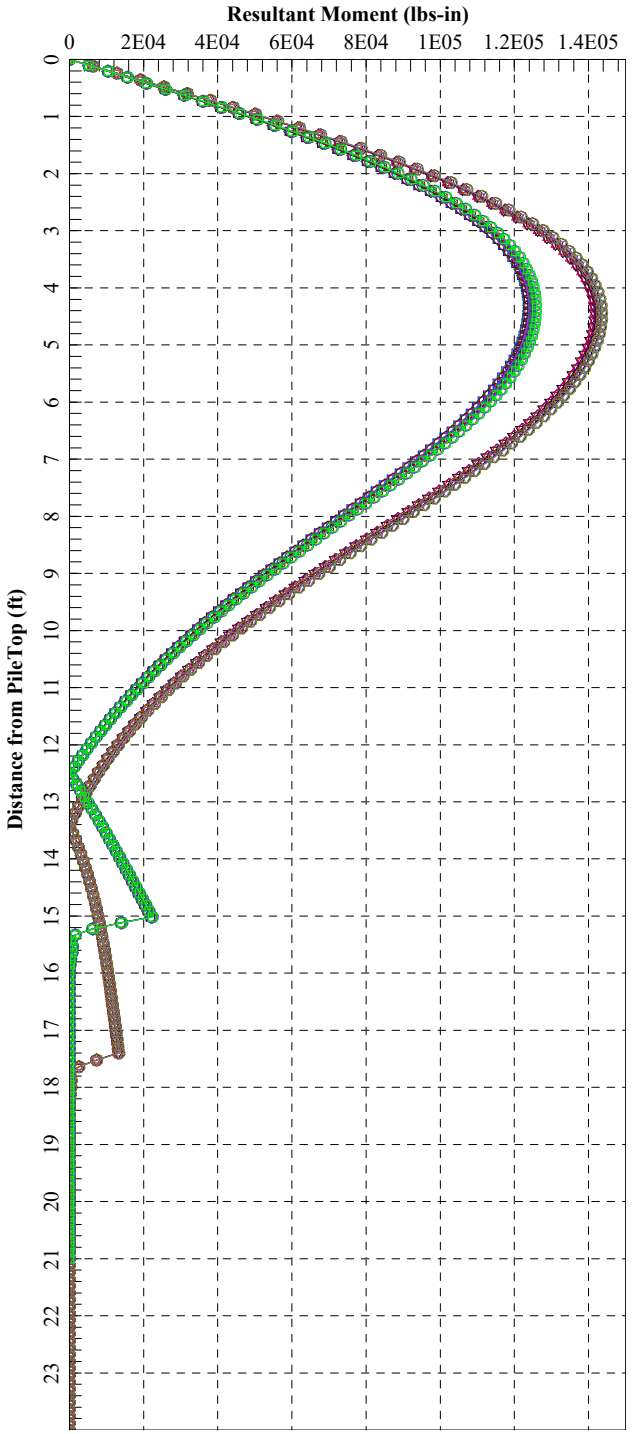
GROUP III, PINNED HEAD, POSITIVE LONGITUDINAL

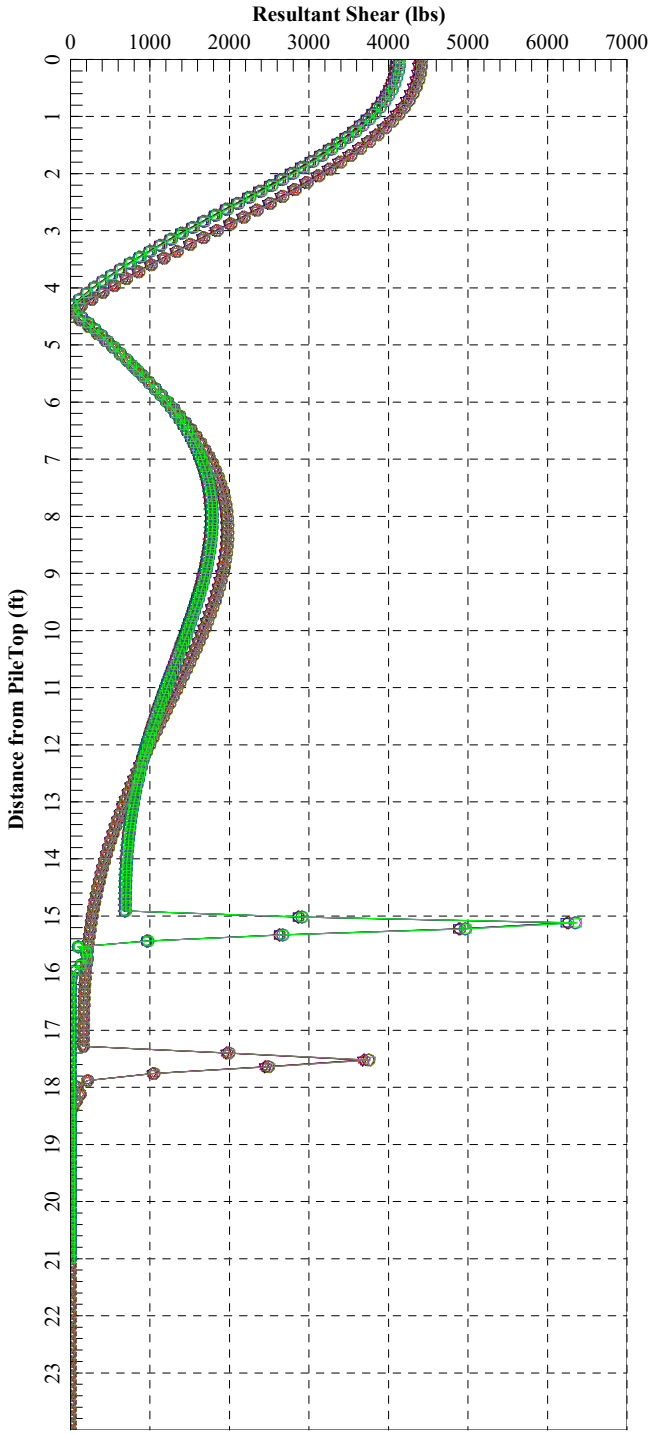

Resultant Deflection (in)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12
Resultant Moment (lbs-in)
0 1E05 2E05 3E05 4E05 5E05 6E05 7E05 8E05
Distance from PileTop (ft)
Resultant Shear (lbs)
0 5000 1E04 1.5E04 2E04 2.5E04 3E04 3.5E04 4E04 4.5E04 5E04
Distance from PileTop (ft)

GROUP RESULTS

GROUP III, PINNED HEAD, NEGATIVE LONGITUDINAL

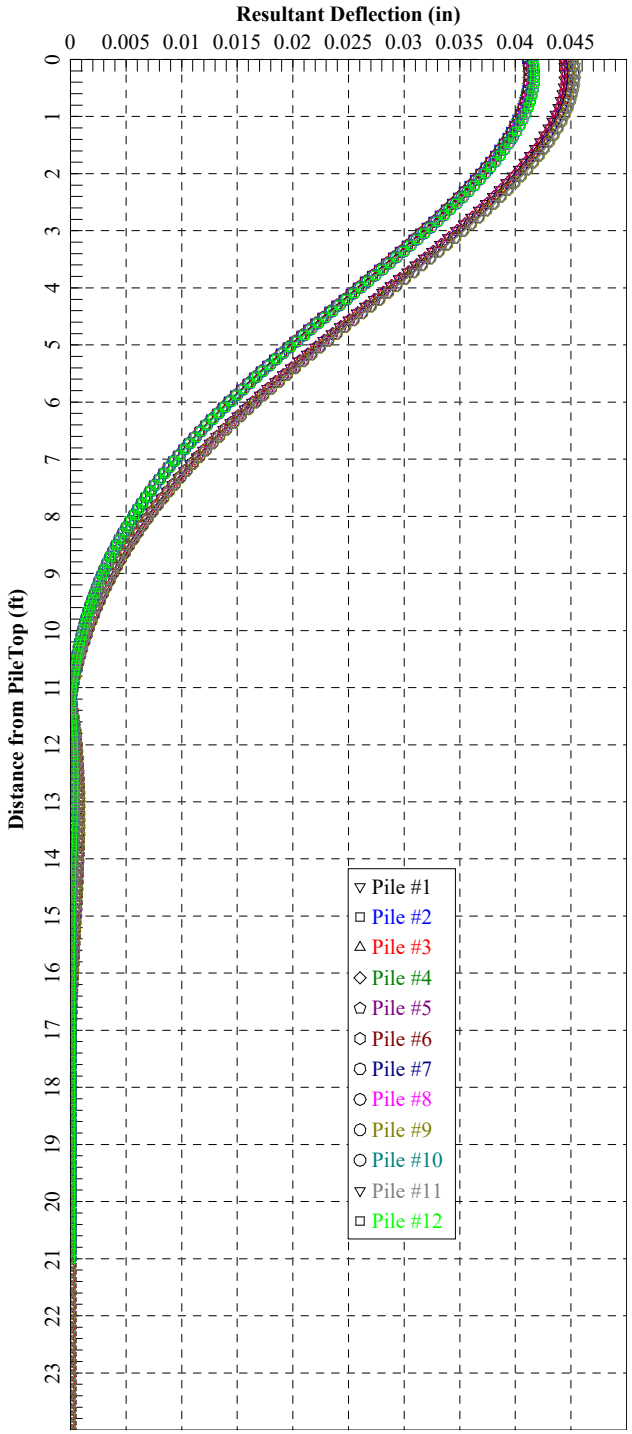

Resultant Deflection (in)
0
0.01
0.02
0.03
0.04
0.05
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12

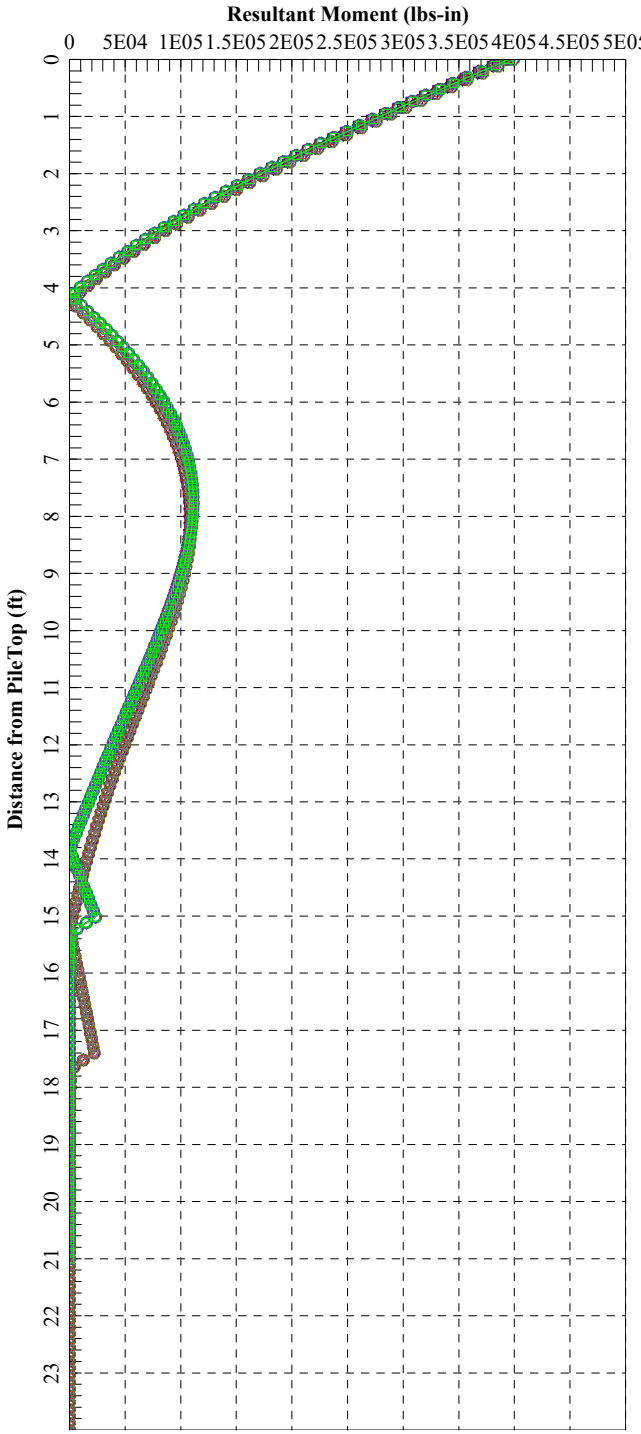

Resultant Moment (lbs-in)
0
2E04
4E04
6E04
8E04
1E05
1.2E05
1.4E05
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

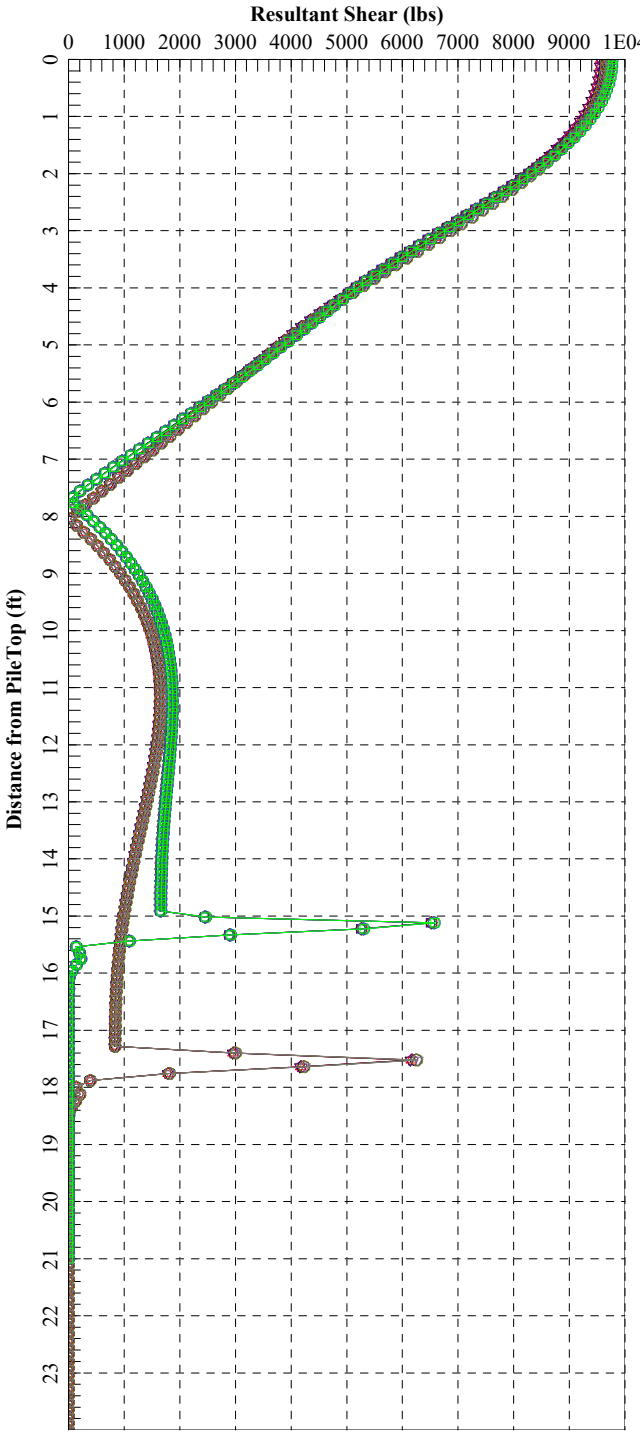

Resultant Shear (lbs)
0
1000
2000
3000
4000
5000
6000
7000
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

GROUP RESULTS

GROUP III, FIXED HEAD, POSITIVE LONGITUDINAL

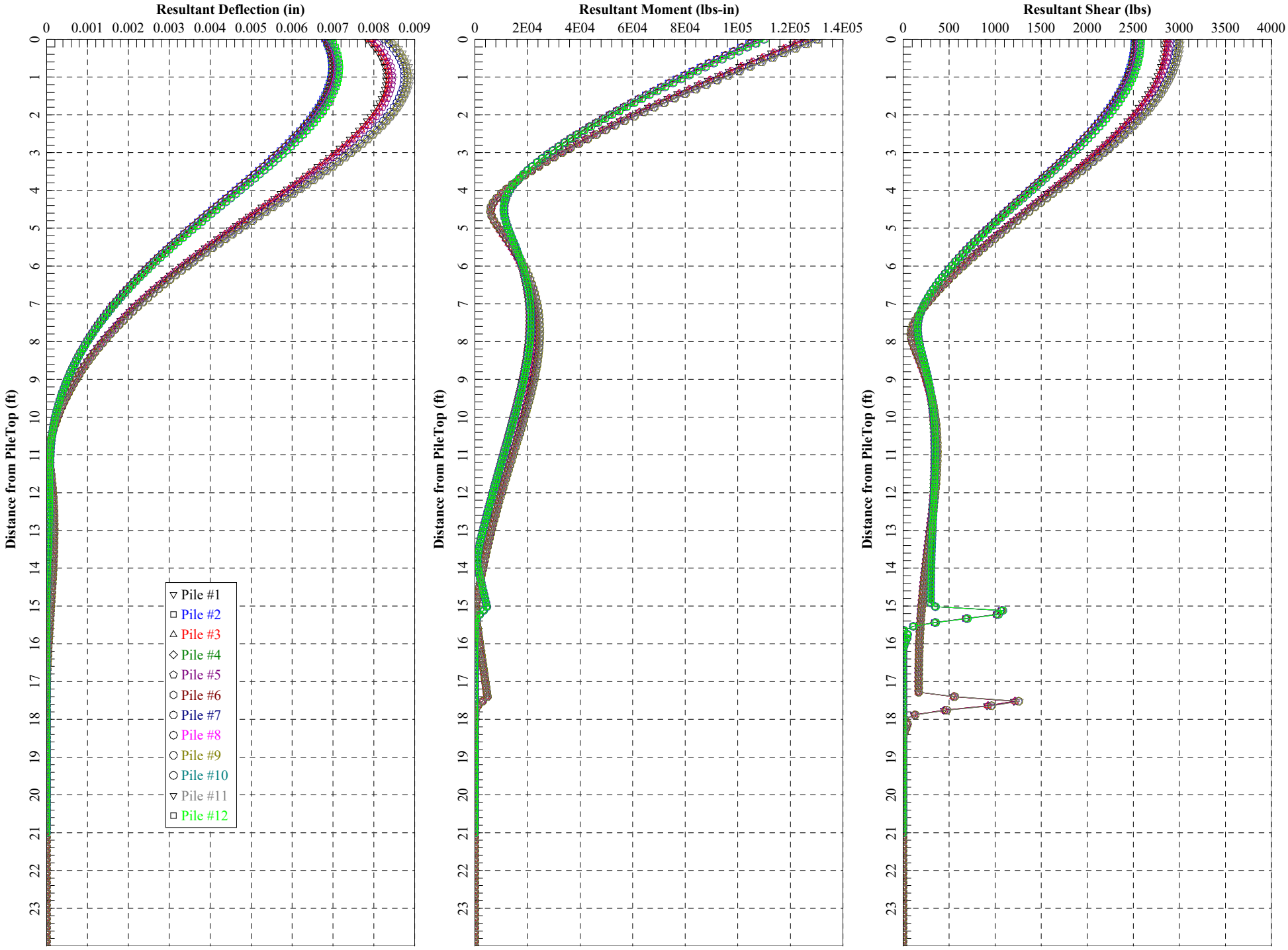

Resultant Deflection (in)
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12


Resultant Moment (lbs-in)
0 5E04 1E05 1.5E05 2E05 2.5E05 3E05 3.5E05 4E05 4.5E05 5E05
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23


Resultant Shear (lbs)
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 1E04
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

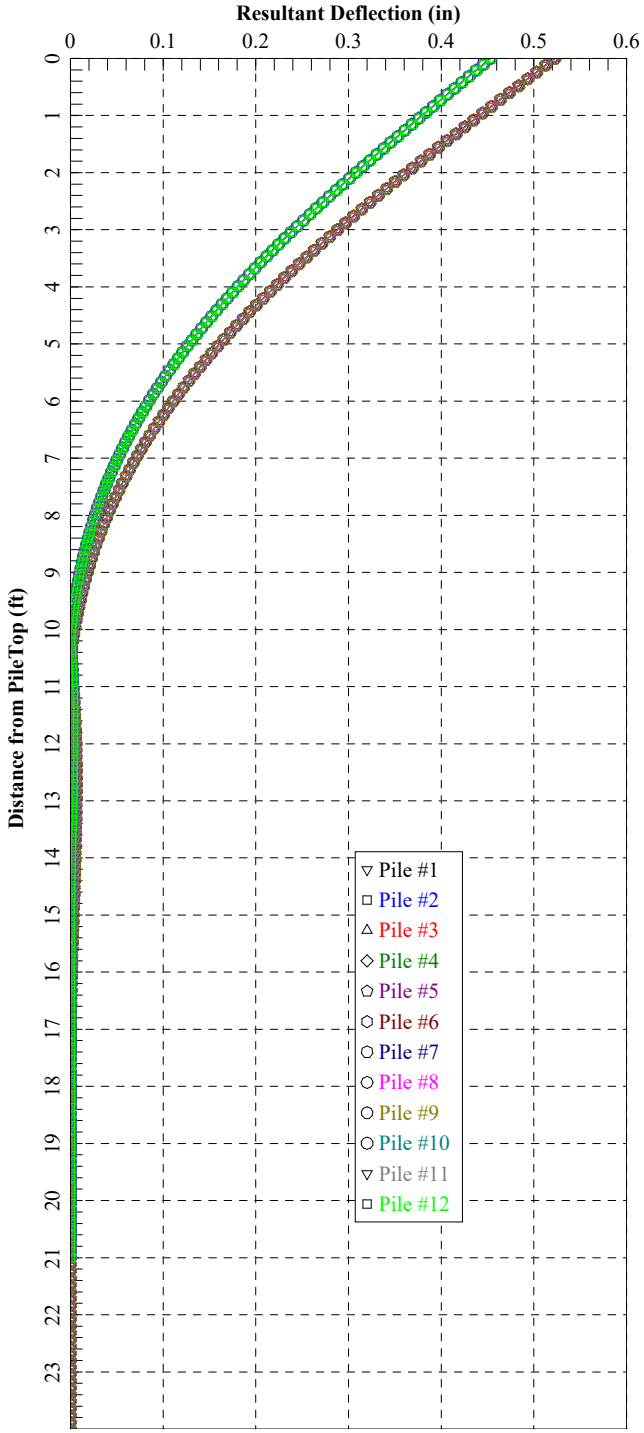
GROUP RESULTS

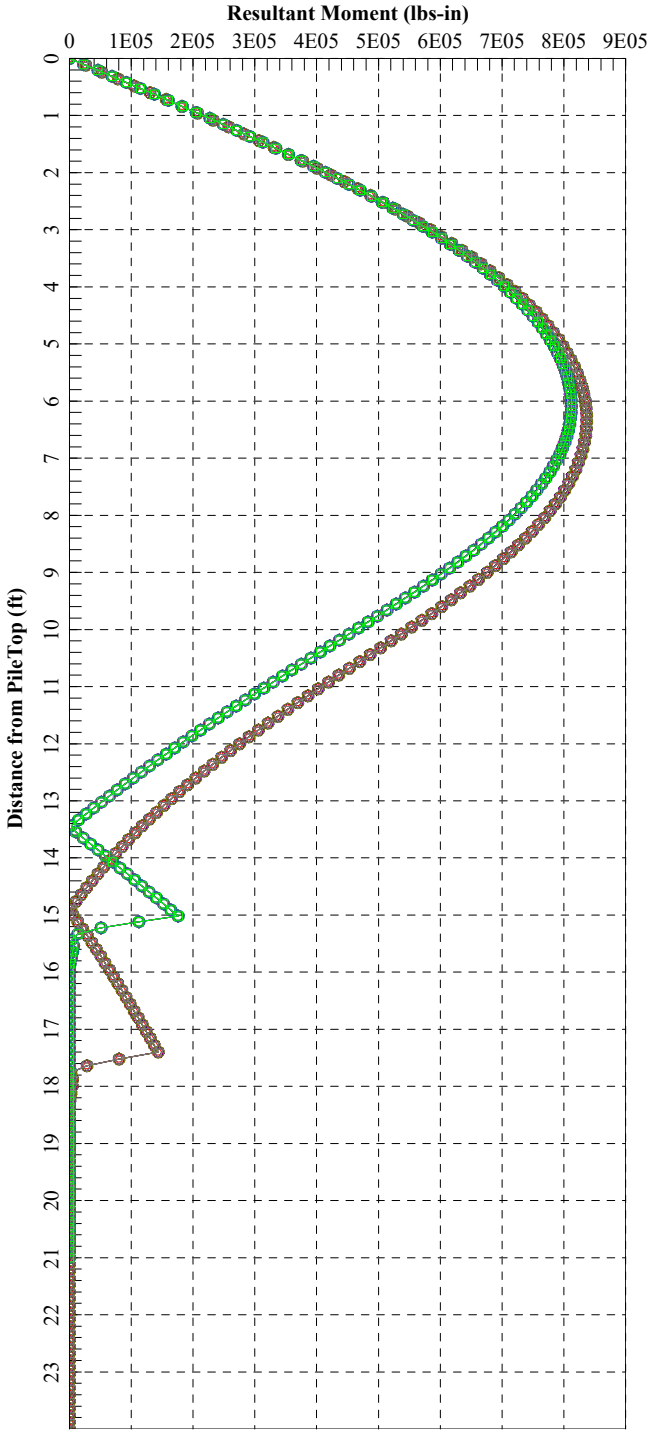
GROUP III, FIXED HEAD, NEGATIVE LONGITUDINAL

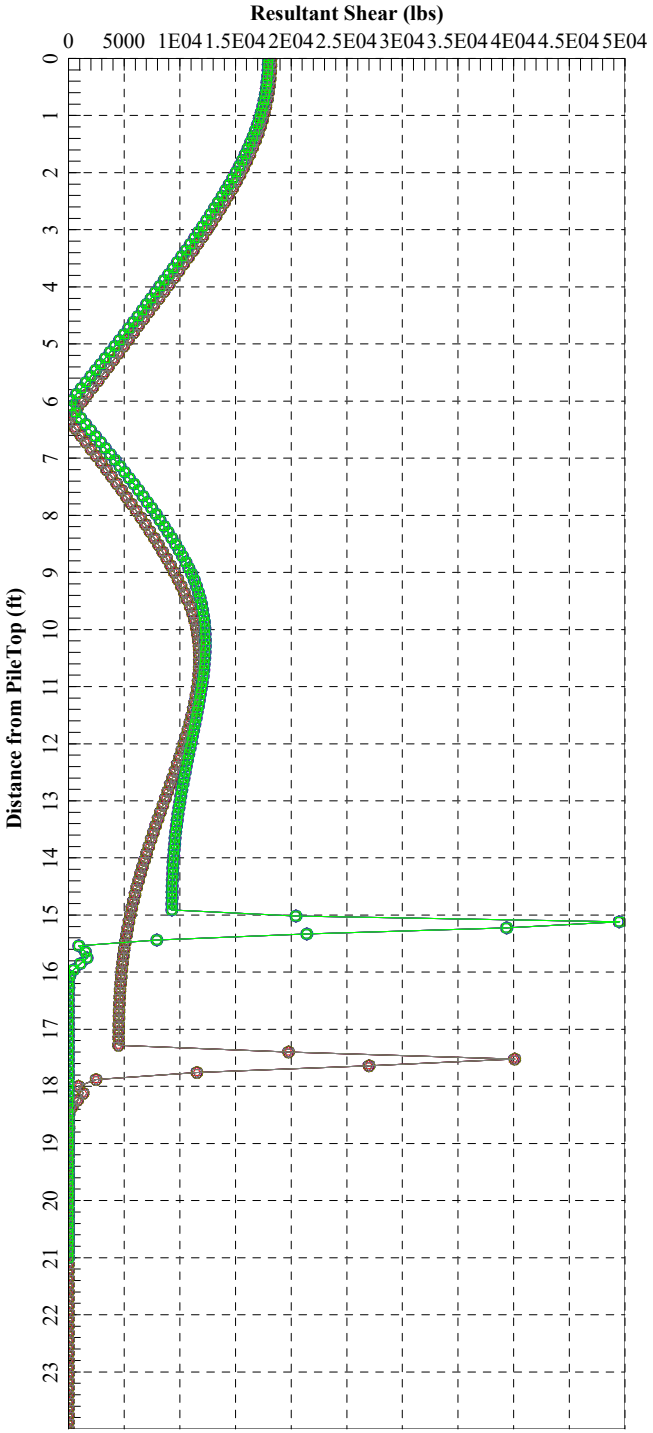

Resultant Deflection (in)
0 0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12
Resultant Moment (lbs-in)
0 2E04 4E04 6E04 8E04 1E05 1.2E05 1.4E05
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Resultant Shear (lbs)
0 500 1000 1500 2000 2500 3000 3500 4000
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

GROUP RESULTS

GROUP VI, PINNED HEAD, POSITIVE LONGITUDINAL

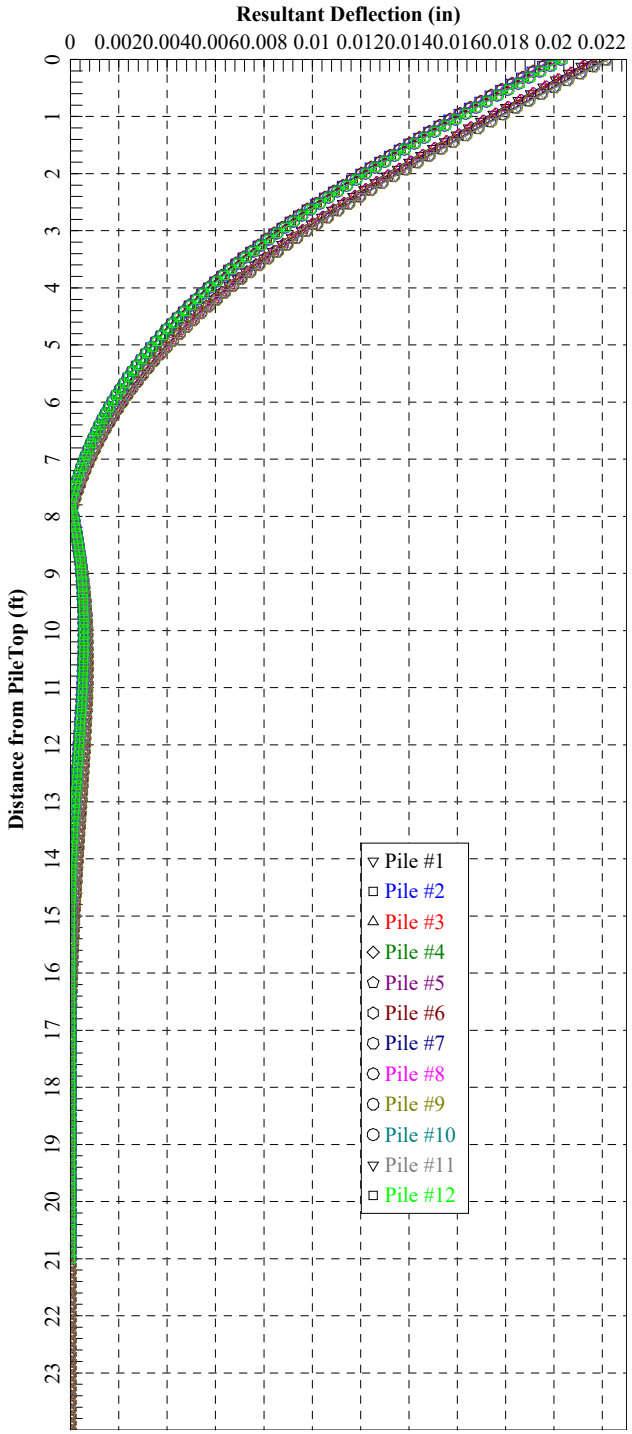

Resultant Deflection (in)
0
0.1
0.2
0.3
0.4
0.5
0.6
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12

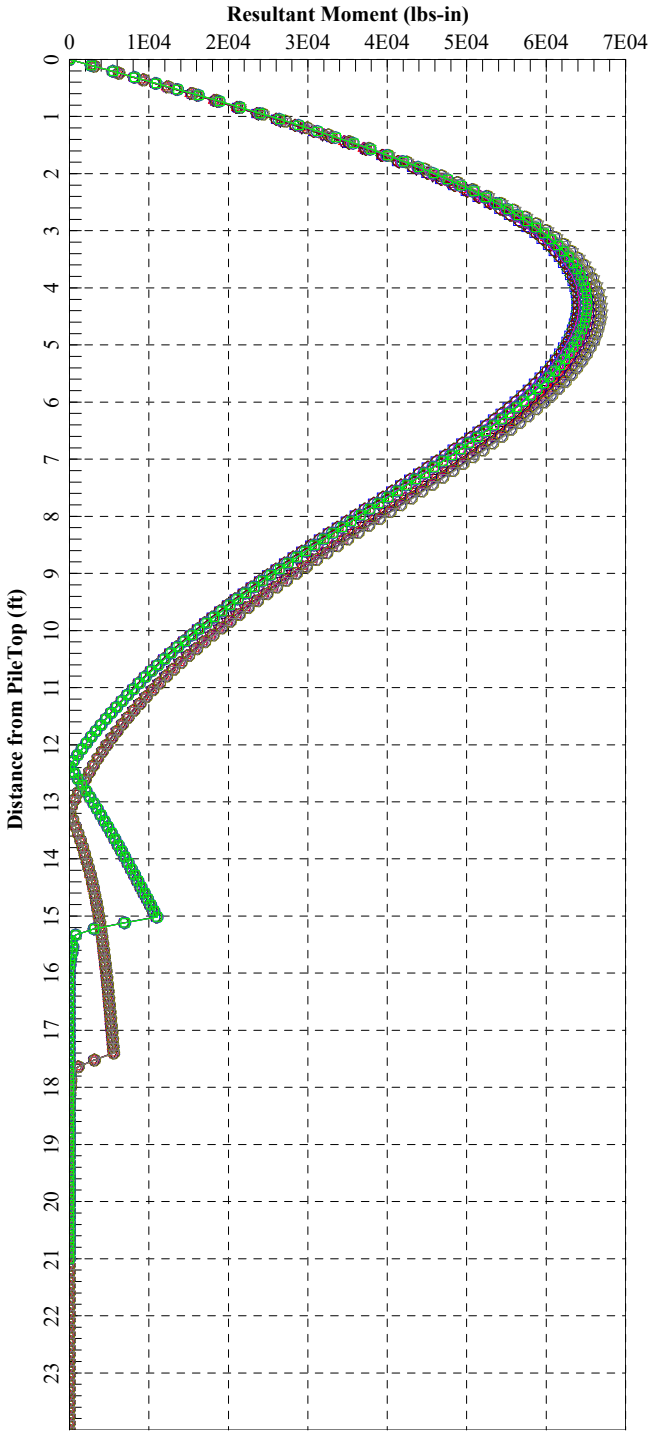

Resultant Moment (lbs-in)
0
1E05
2E05
3E05
4E05
5E05
6E05
7E05
8E05
9E05
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

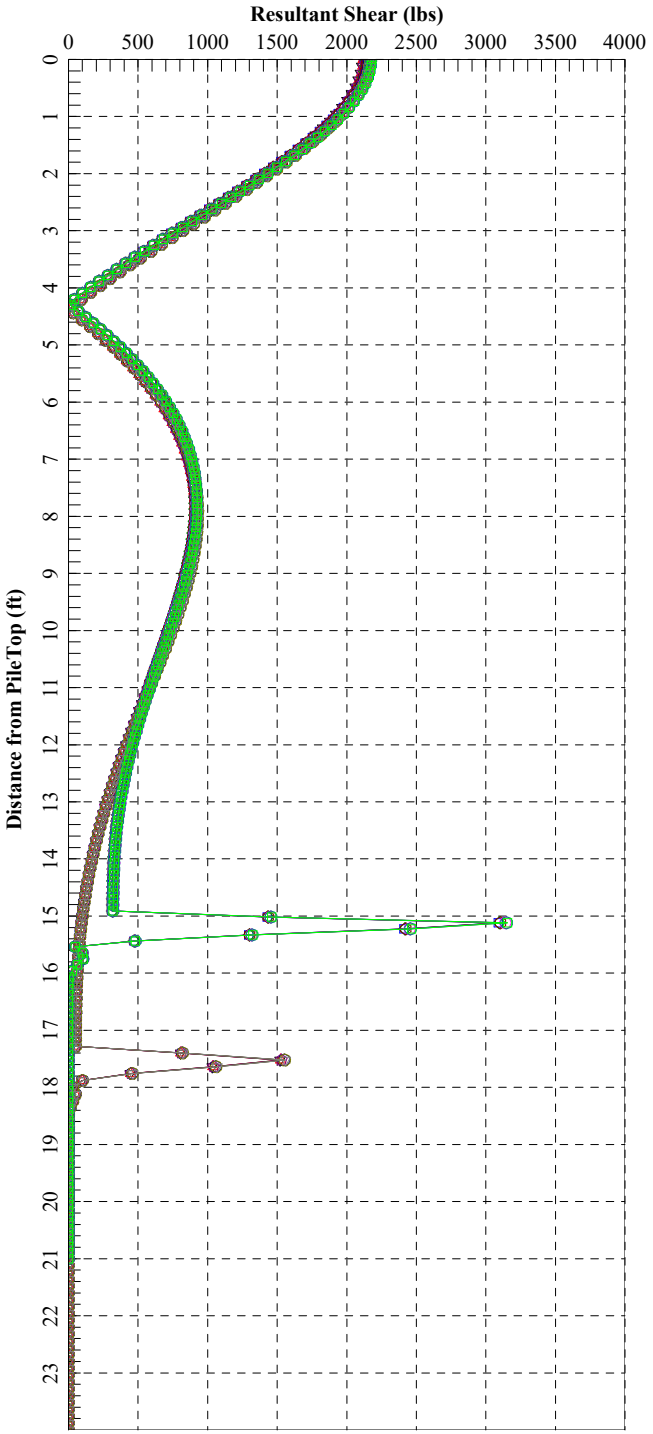

Resultant Shear (lbs)
0
5000
1E04
1.5E04
2E04
2.5E04
3E04
3.5E04
4E04
4.5E04
5E04
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

GROUP RESULTS

GROUP VI, PINNED HEAD, NEGATIVE LONGITUDINAL

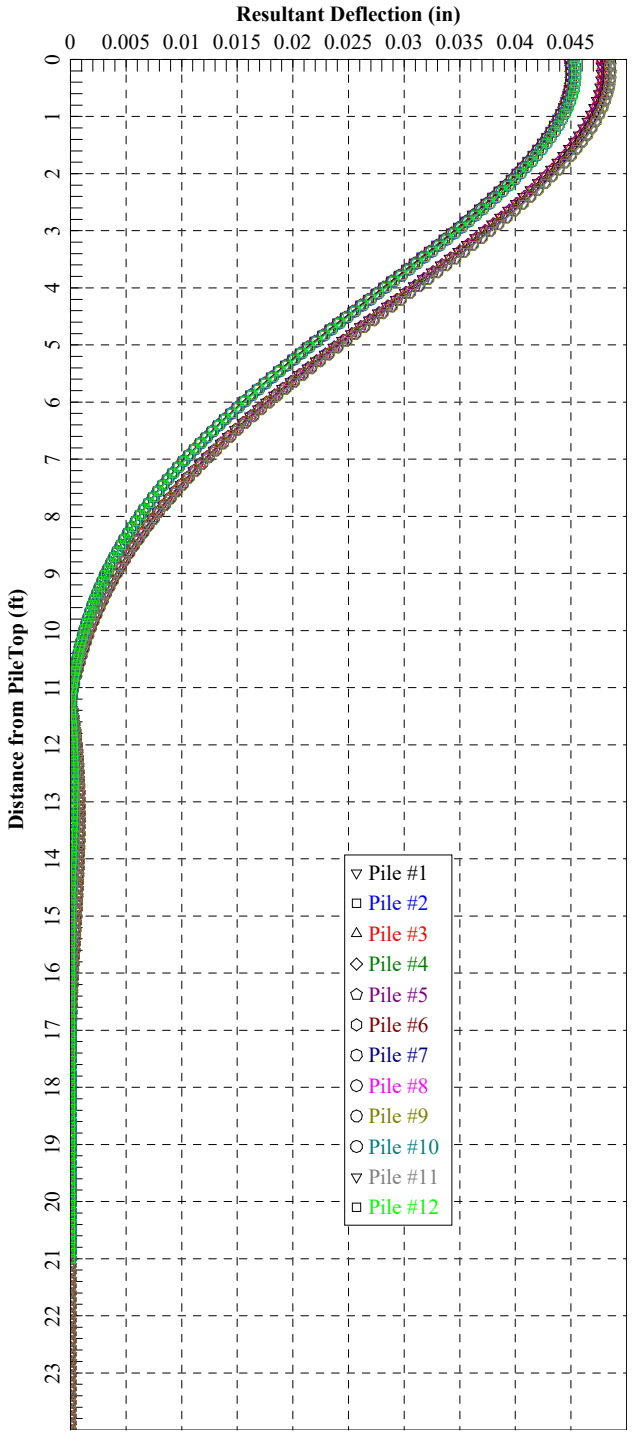

Resultant Deflection (in)
0 0.002 0.004 0.006 0.008 0.01 0.012 0.014 0.016 0.018 0.02 0.022
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12

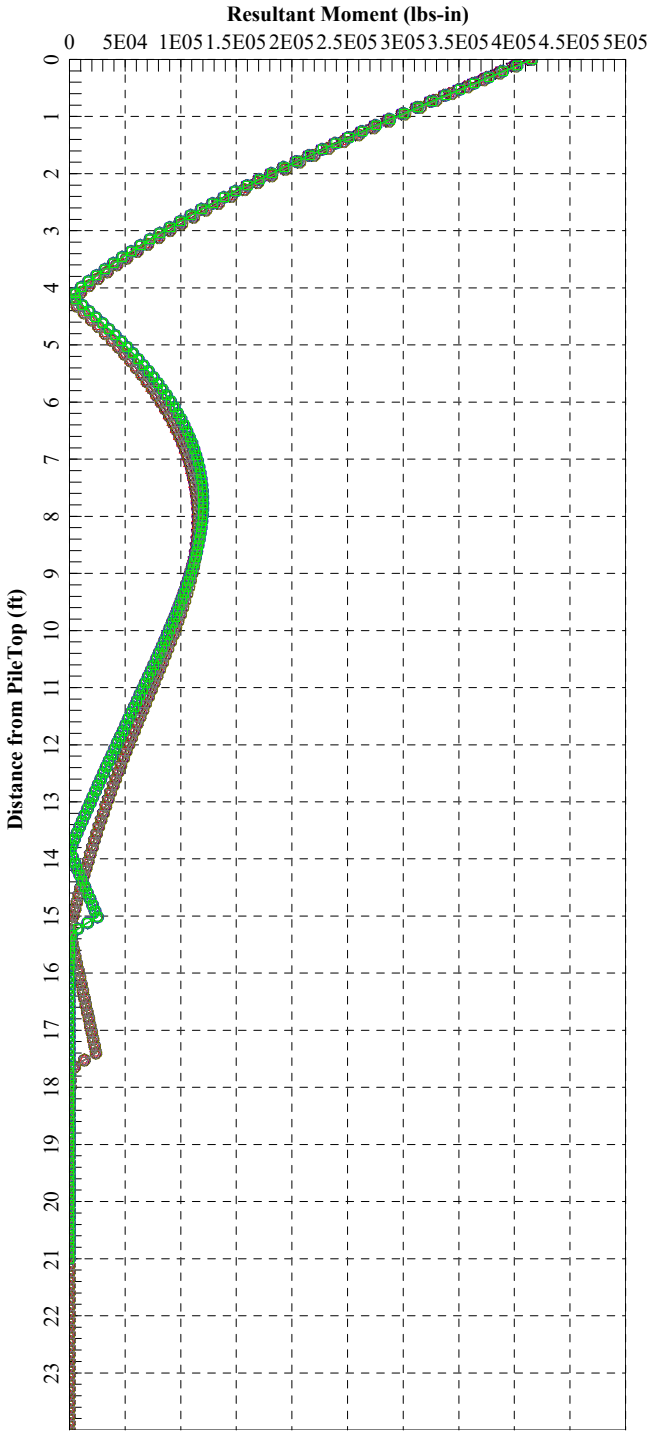

Resultant Moment (lbs-in)
0 1E04 2E04 3E04 4E04 5E04 6E04 7E04
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

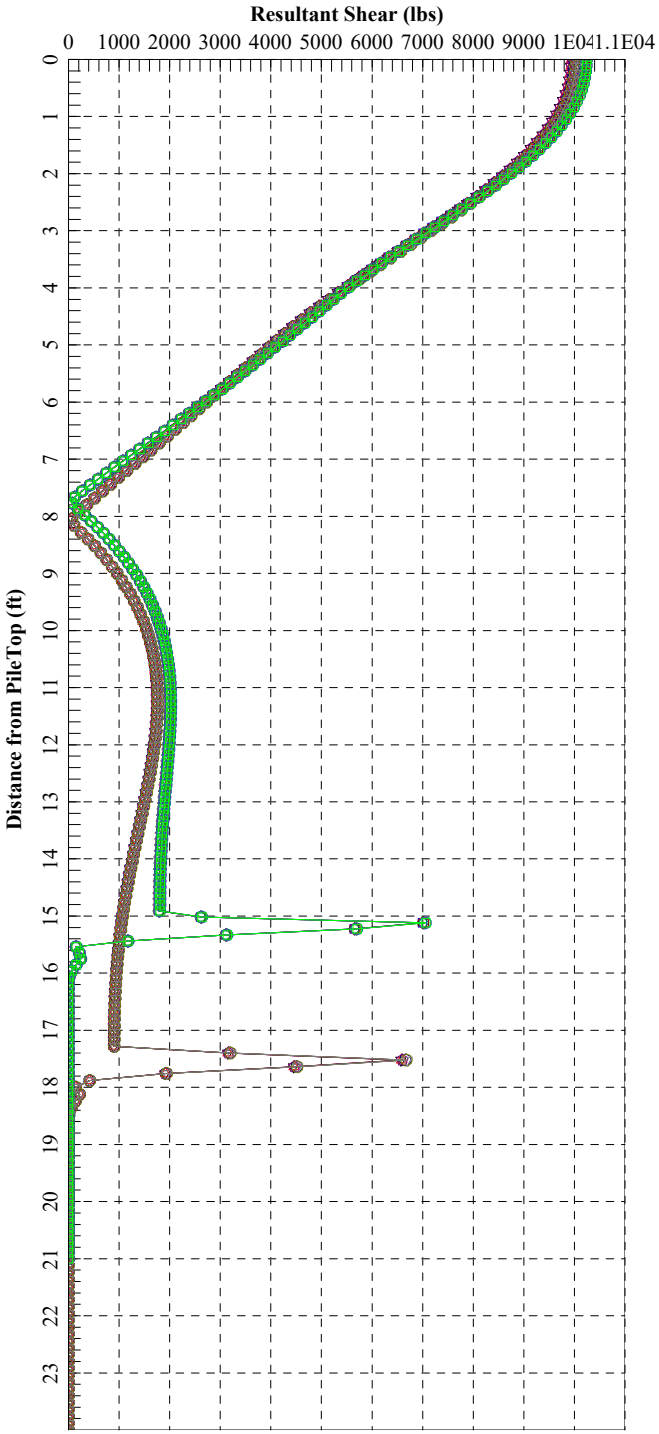

Resultant Shear (lbs)
0 500 1000 1500 2000 2500 3000 3500 4000
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

GROUP RESULTS

GROUP VI, FIXED HEAD, POSITIVE LONGITUDINAL

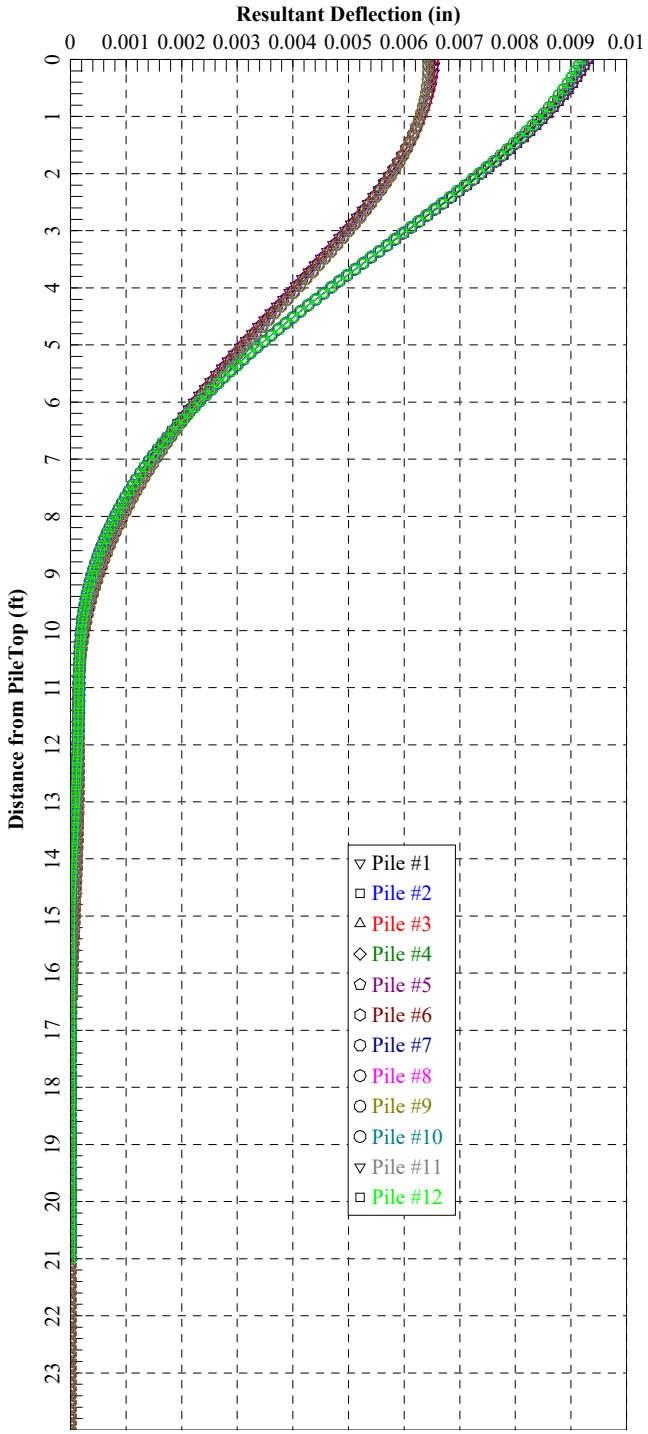

Resultant Deflection (in)
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12

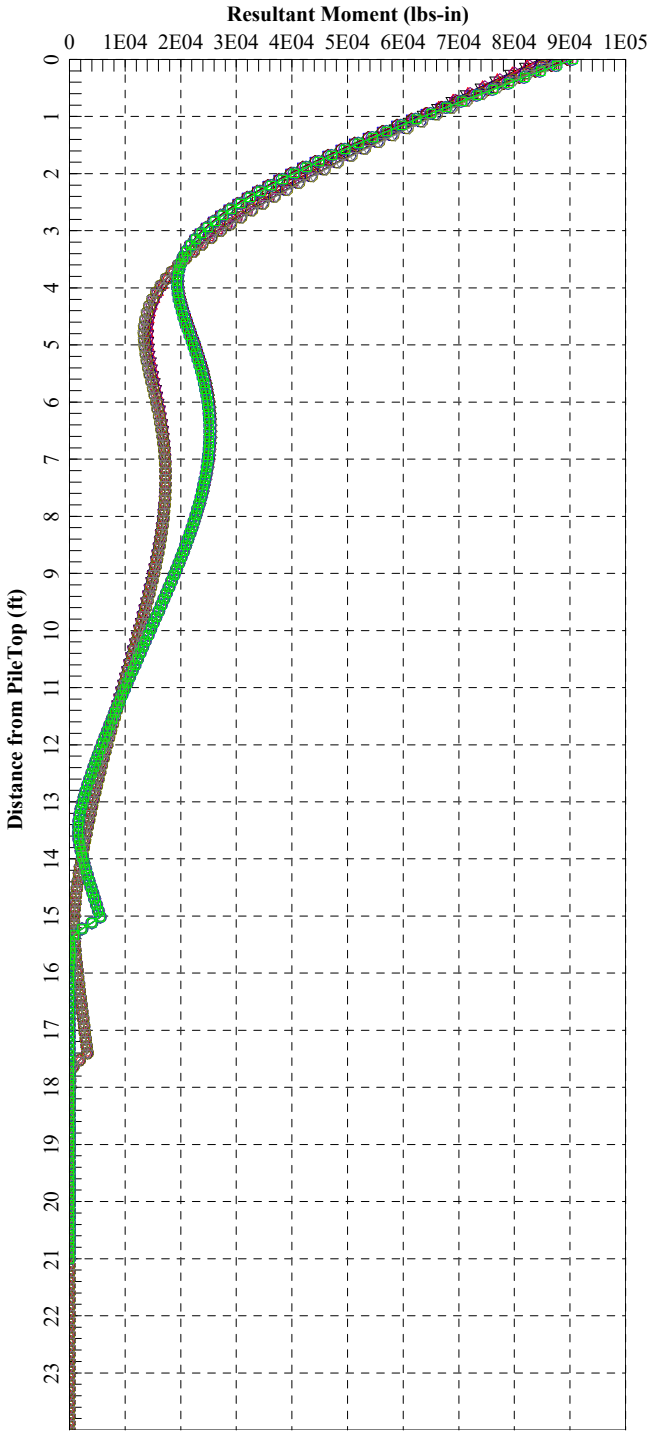

Resultant Moment (lbs-in)
0 5E04 1E05 1.5E05 2E05 2.5E05 3E05 3.5E05 4E05 4.5E05 5E05
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

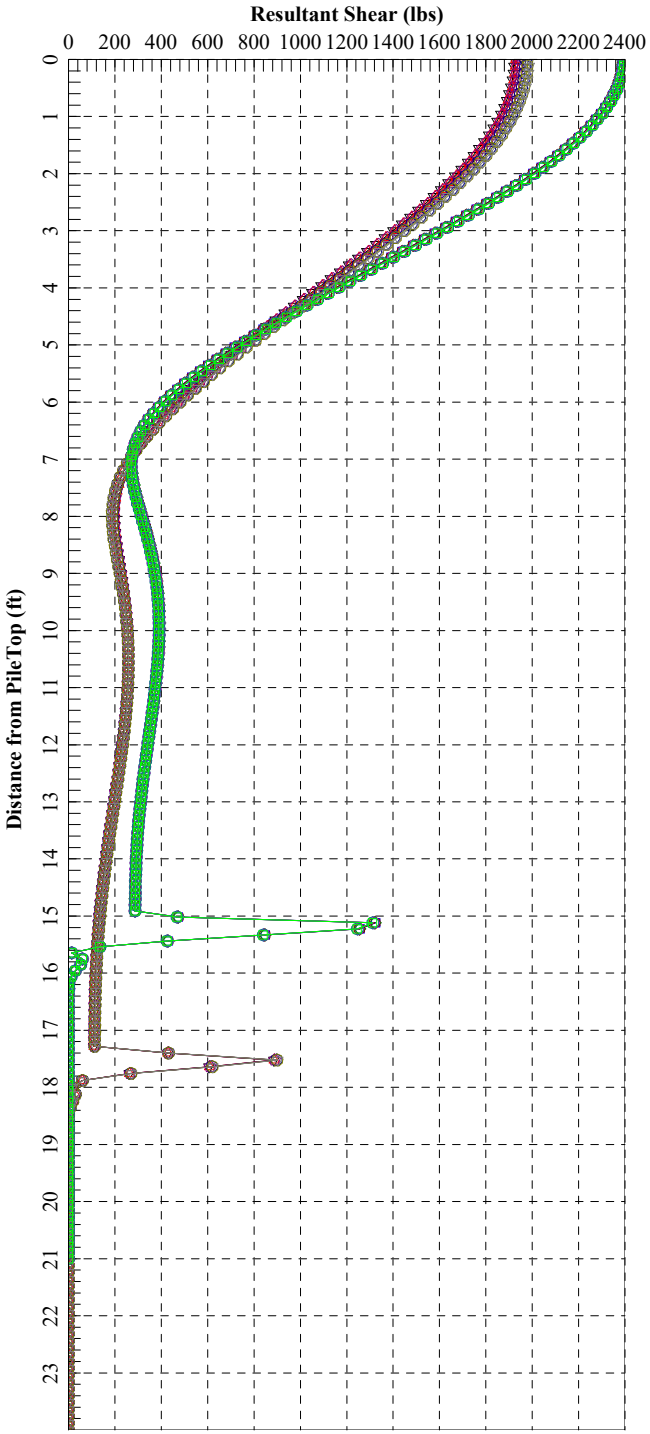

Resultant Shear (lbs)
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 1E04 1.1E04
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

GROUP RESULTS

GROUP VI, FIXED HEAD, NEGATIVE LONGITUDINAL

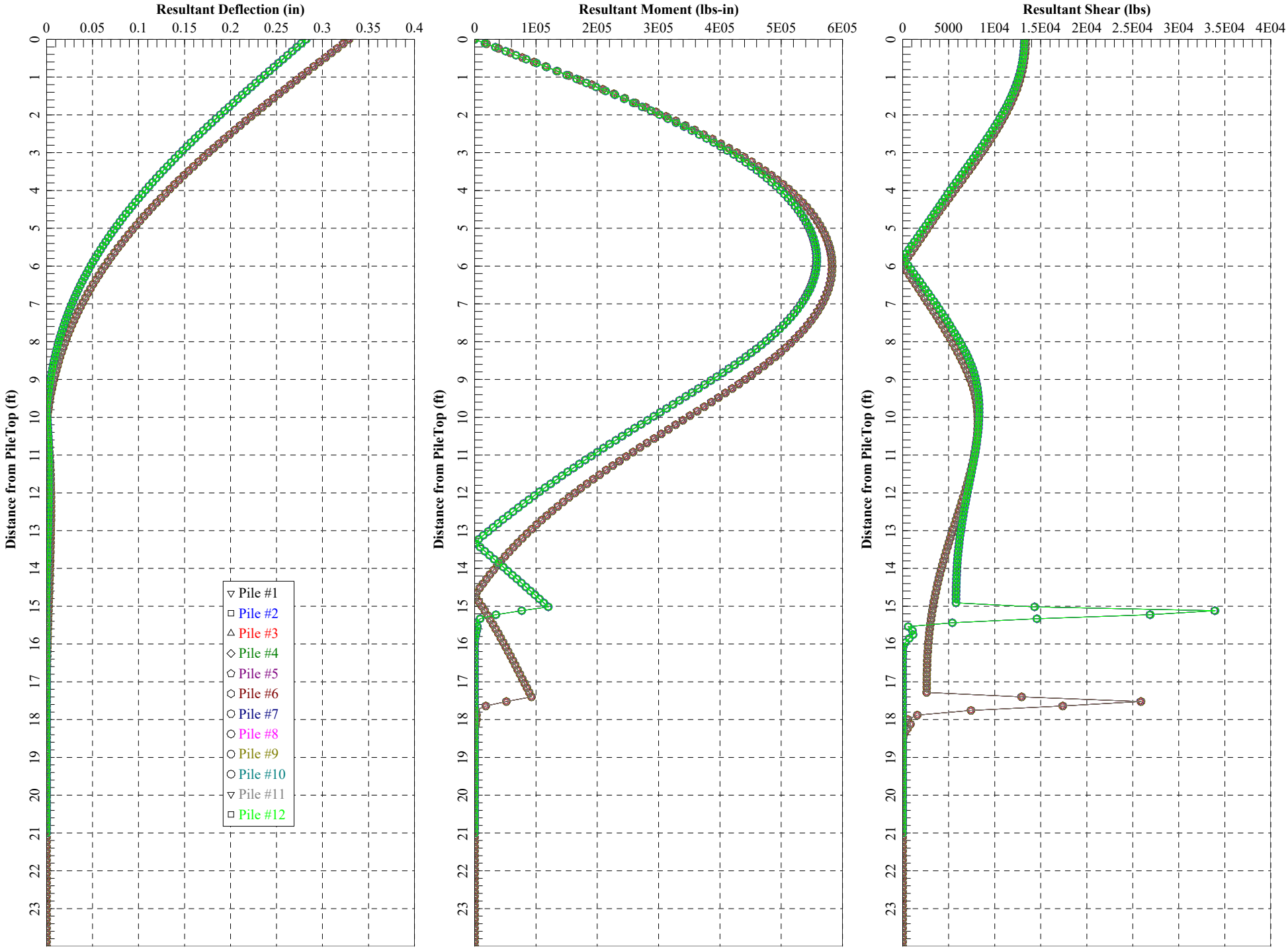

Resultant Deflection (in)
0 0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.01
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12


Resultant Moment (lbs-in)
0 1E04 2E04 3E04 4E04 5E04 6E04 7E04 8E04 9E04 1E05
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23


Resultant Shear (lbs)
0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

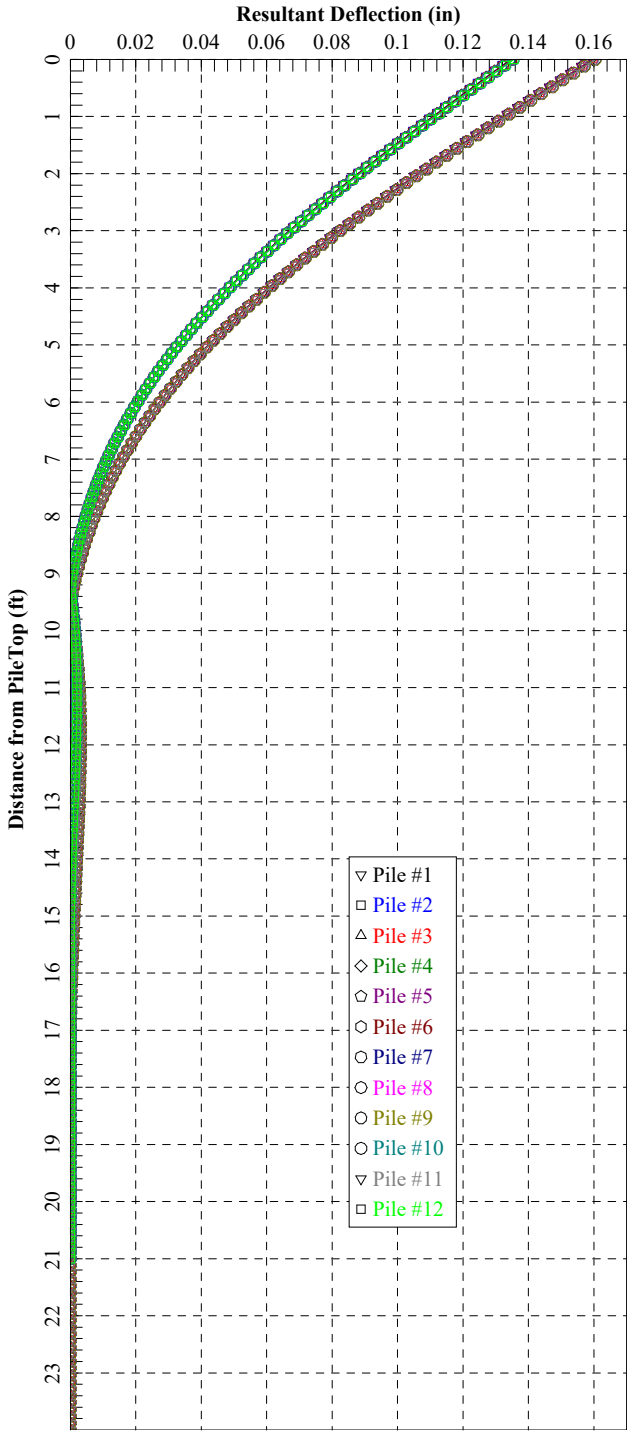
GROUP RESULTS

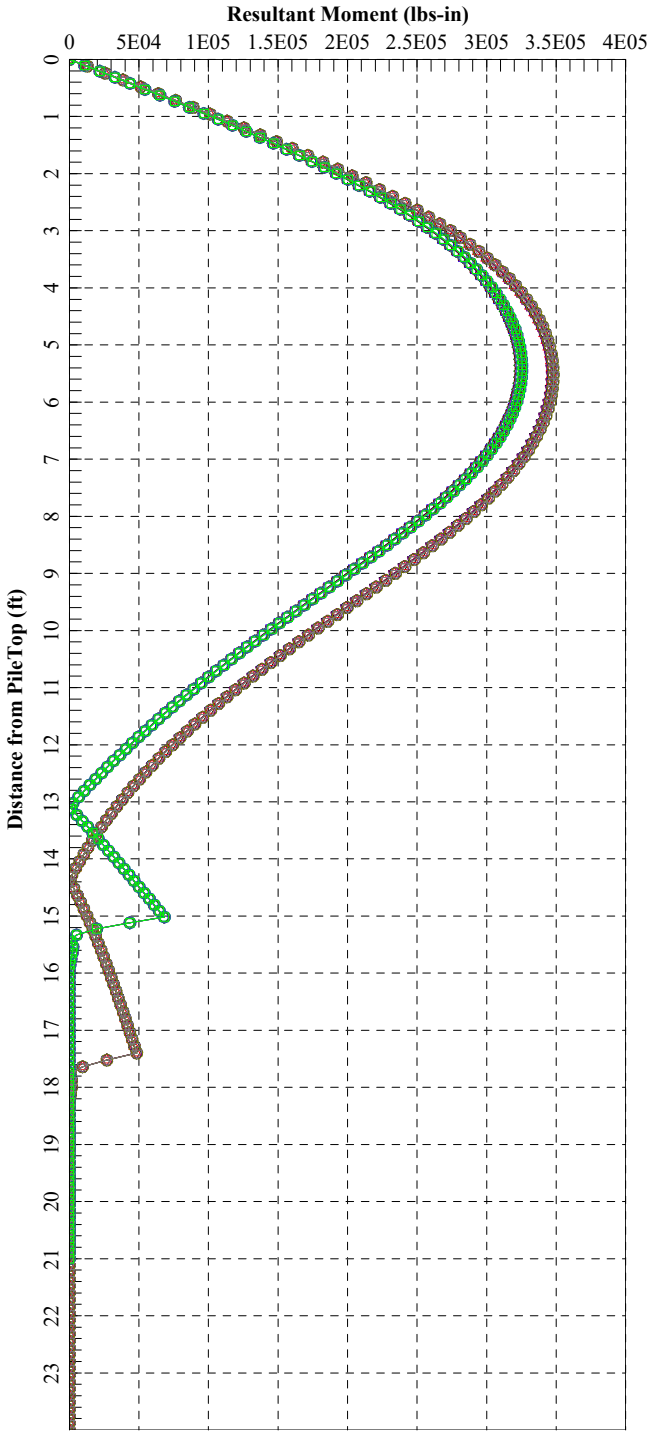
GROUP I, PINNED HEAD, POSITIVE LONGITUDINAL

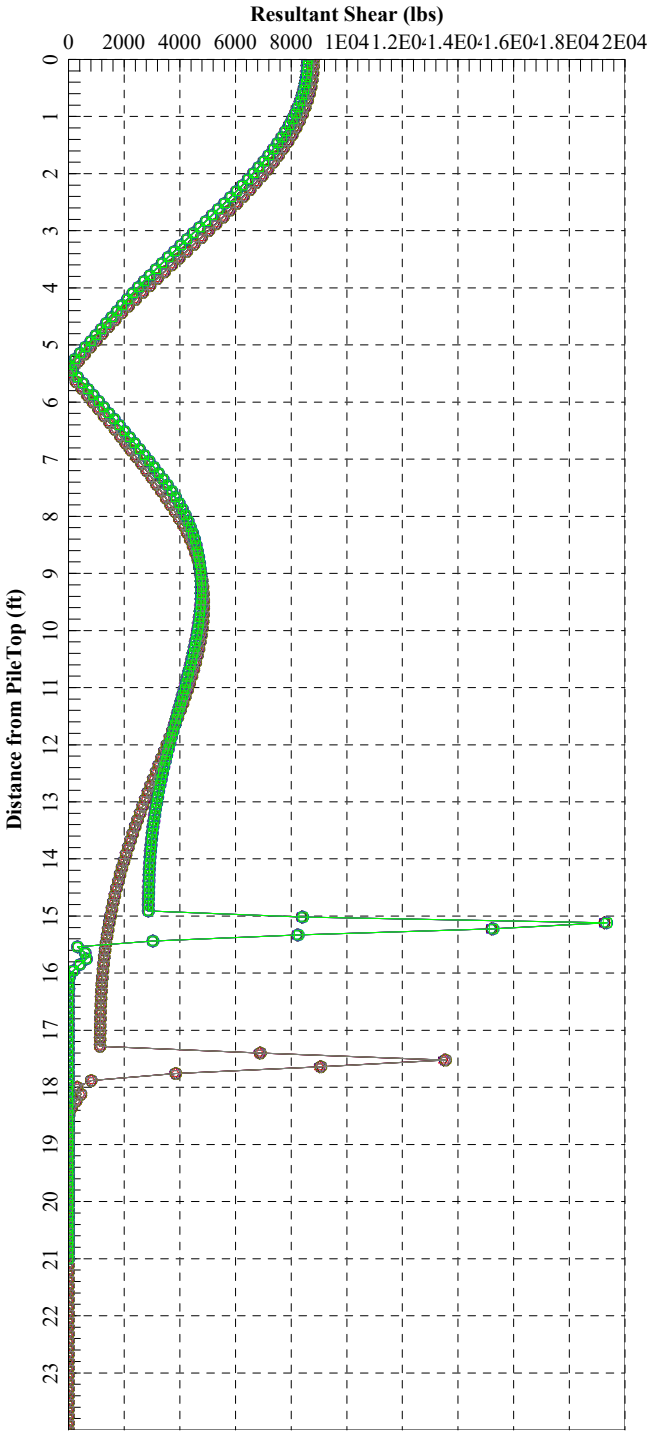

Resultant Deflection (in)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Distance from PileTop (ft)
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12
Resultant Moment (lbs-in)
0
1E05
2E05
3E05
4E05
5E05
6E05
Distance from PileTop (ft)
Resultant Shear (lbs)
0
5000
1E04
1.5E04
2E04
2.5E04
3E04
3.5E04
4E04
Distance from PileTop (ft)

GROUP RESULTS

GROUP I, PINNED HEAD, NEGATIVE LONGITUDINAL

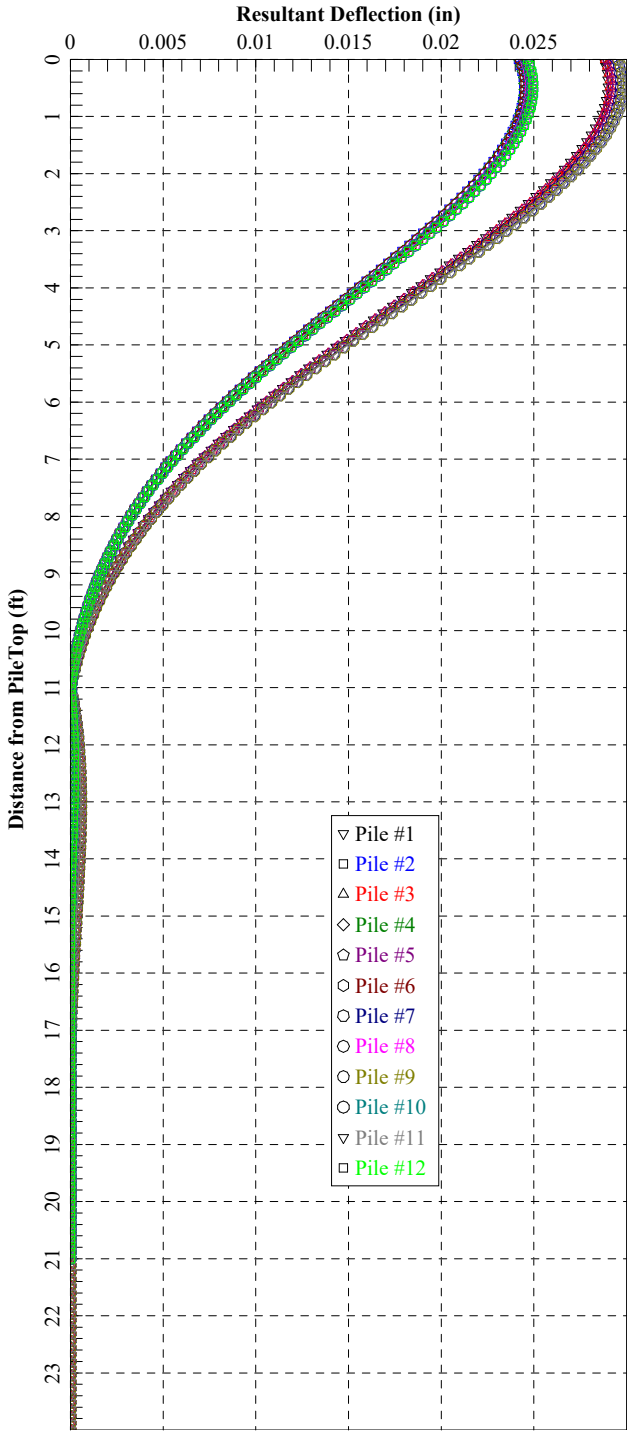

Resultant Deflection (in)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12

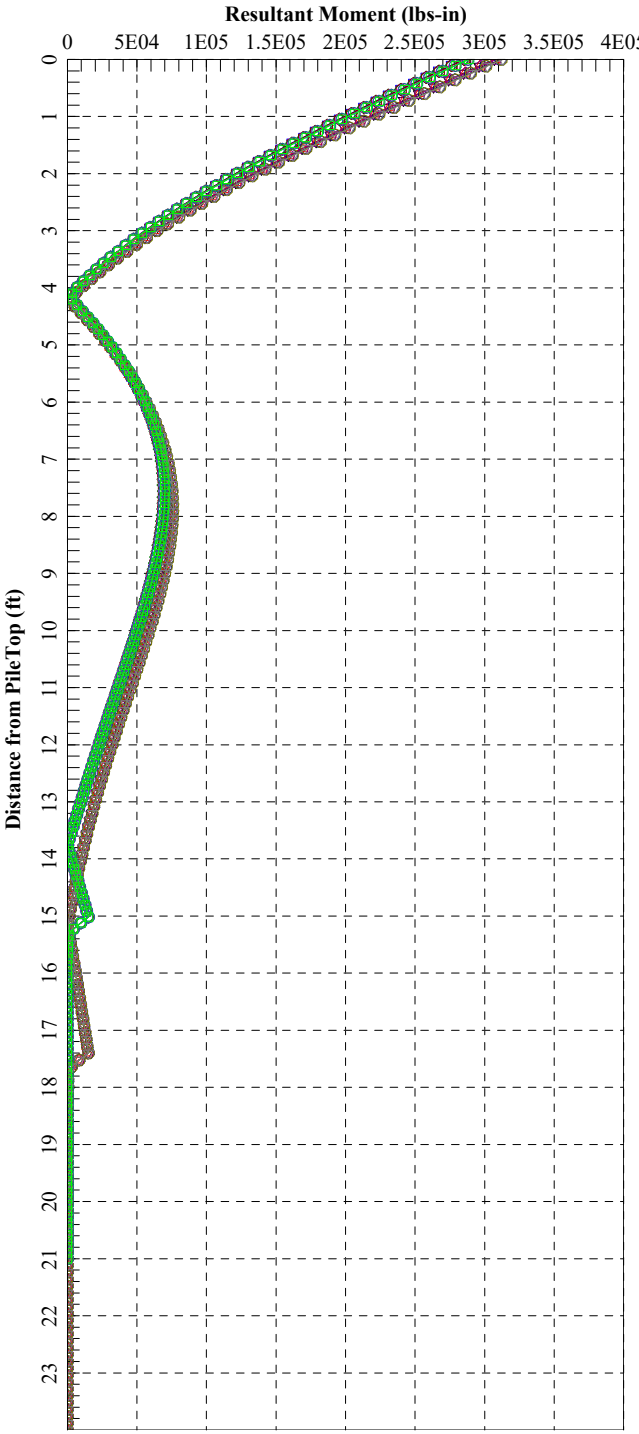

Resultant Moment (lbs-in)
0
5E04
1E05
1.5E05
2E05
2.5E05
3E05
3.5E05
4E05
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

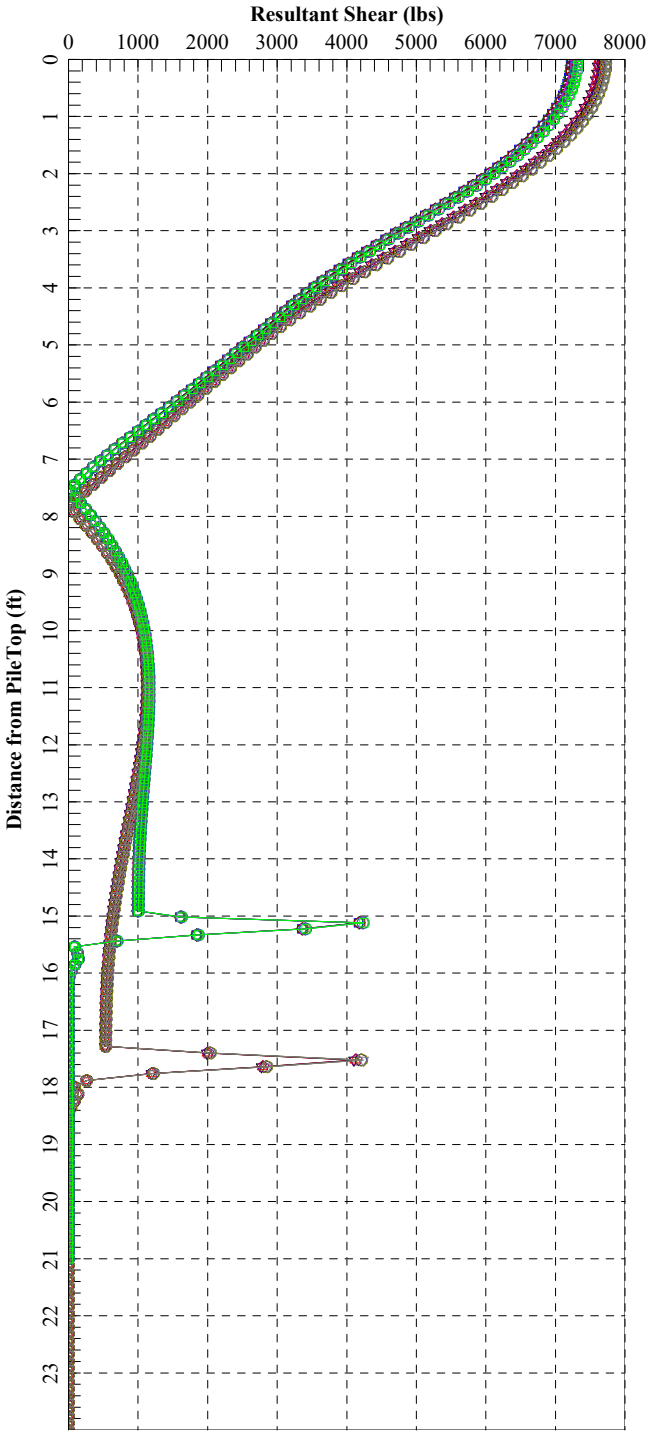

Resultant Shear (lbs)
0
2000
4000
6000
8000
1E04
1.2E04
1.4E04
1.6E04
1.8E04
2E04
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

GROUP RESULTS

GROUP I, FIXED HEAD, POSITIVE LONGITUDINAL

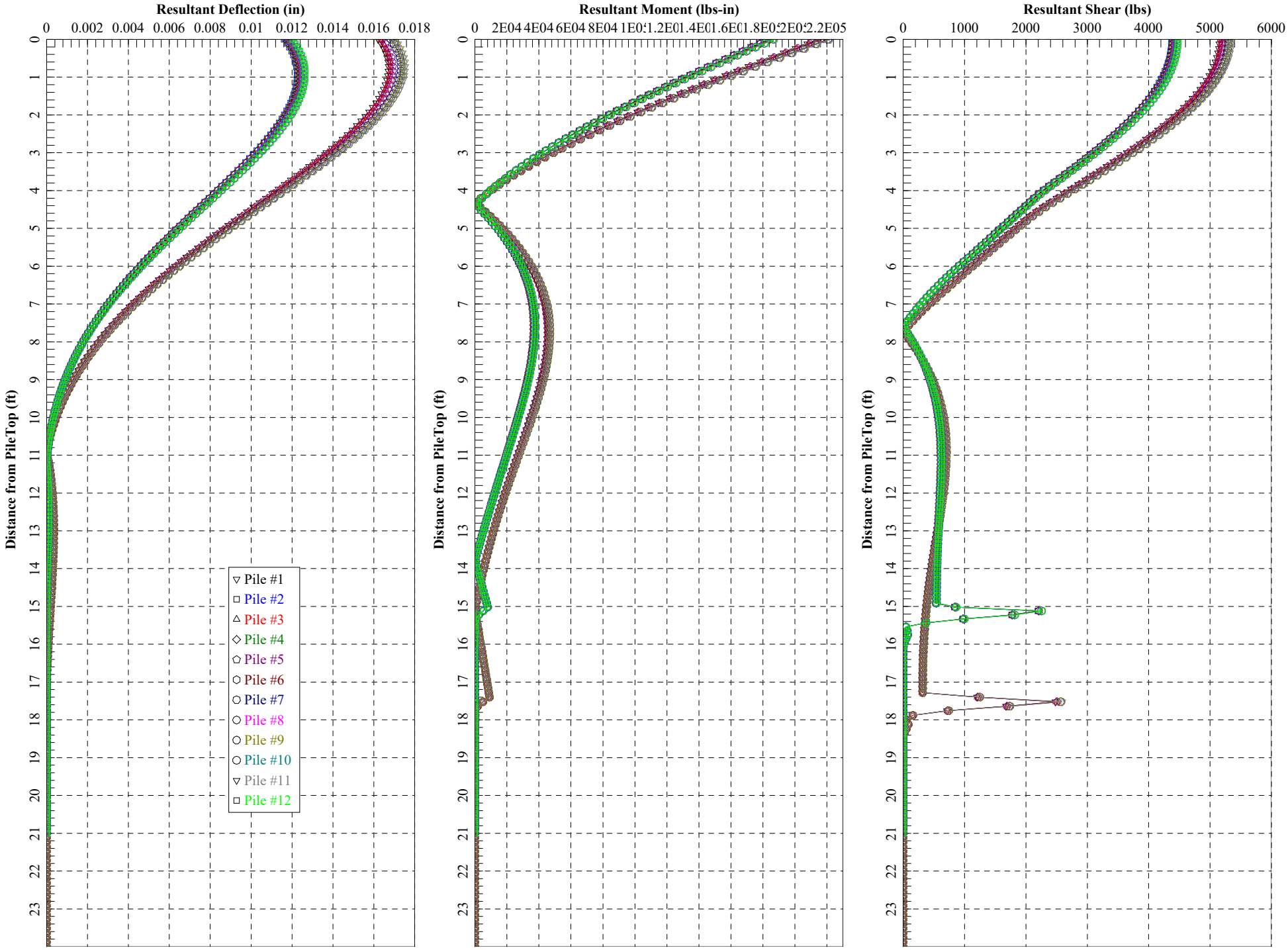

Resultant Deflection (in)
0
0.005
0.01
0.015
0.02
0.025
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12


Resultant Moment (lbs-in)
0
5E04
1E05
1.5E05
2E05
2.5E05
3E05
3.5E05
4E05
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23


Resultant Shear (lbs)
0
1000
2000
3000
4000
5000
6000
7000
8000
Distance from PileTop (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

GROUP RESULTS

GROUP I, FIXED HEAD, NEGATIVE LONGITUDINAL


Resultant Deflection (in)
0 0.002 0.004 0.006 0.008 0.01 0.012 0.014 0.016 0.018
Distance from PileTop (ft)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Pile #1
Pile #2
Pile #3
Pile #4
Pile #5
Pile #6
Pile #7
Pile #8
Pile #9
Pile #10
Pile #11
Pile #12
Resultant Moment (lbs-in)
0 2E04 4E04 6E04 8E04 1E05 1.2E01 1.4E01 1.6E01 1.8E05 2E05 2.2E05
Distance from PileTop (ft)
Resultant Shear (lbs)
0 1000 2000 3000 4000 5000 6000
Distance from PileTop (ft)

SETTLEMENT OF MICROPILES

Client:	**MassDOT**
Project:	**Housatonic Railroad**
Project Number:	**10370244**
Project Mgr:	**June Wu**
QC Reviewers:	**Max Rolandi**
Deliverable Reviewed:	**Ryan Lavorati**
Date Transmitted:	**2/20/2025**
Review Deadline:	
Actual Review Date:	

Calculation Title :	**Micropile Settlement Calculation Package**
Calculation Number:	1
Supersedes:	NA
Superseded By:	NA

Micropile calculation package covers the design aspects of the proposed deep foundation elements for Bridge 76.23. The pile cap geometry and loading on the pile cap are provided by HDR structural team. The pile type, diameter, length, reinforcement, and casing are based on calculations and the boring logs provided herein by the HDR geotechnical team. The results of these settlement analyses can be found at the end of this package

Names / Signatures:

Name	Ryan Lavorati	
Signature RTL		2/12/2025
	Calculated by	
Name	Max Rolandi	
Signature MR		2/17/2025
	Checked by	
Name	Ryan Lavorati	
Signature RTL		2/18/2025
	Updated by	
Name	Max Rolandi	
Signature MR		2/19/2025
	Back Checked by	

Design Manager Approval: MR	2/25/2025
Name	
Signature	Date
Design, Responsible Engineer or Project Manager	

Elastic and Consolidation Settlement Evaluation

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

PURPOSE:

Evaluate the elastic settlement (S_E) of elastic soil layers (sand) using the modified Hough (1959) Method (after Chenney and Chassie (2000)). Evaluate the consolidation settlement S_C of compressible soil layers (clay) using consolidation theory.

REFERENCES:

- Elastic Settlement: Modified Hough Method, as described in AASHTO LRFD Bridge Design Specifications, Chapter 10.6.2.4
- Terzaghi, Peck & Mesri - Soil Mechanics in Engineering Practice, 1996
- Borings performed by NEBC between 06-01-2025 and 07-01-2025
- The settlement analysis of the micropiles is based on the full pile cap, including 12 piles.
- The load case used in this evaluation is Group I, with the largest vertical load acting on the pile cap.

PROJECT ASSUMPTIONS

- Groundwater depth 18 ft bgs based on borings.
- Soil stratigraphy and soil properties based on boring 76-B-1 & 76-B-2 and on geotechnical laboratory testing. Refer to the attached logs for detailed subsurface conditions encountered in the borings.
- Refer to the attachment for formulae used to evaluate the influence factor Iz using elastic theory.

Settlement in granular, cohesionless soils (sand) is assumed to be elastic. Settlement in sand occurs as soon as the load is applied (short term). Settlement in cohesive soil (clay) is assumed to be plastic. Settlement in clay is delayed and continues to take place after the application of the load (long term). Consolidation settlement S_C evaluated in Clay. Elastic settlement S_E evaluated in the Sand layer.

PROCEDURE:

See attached calculation sheets for details on the procedures used for the evaluation of elastic and consolidation Settlement.
Total Settlement evaluated as:

$$S_T = S_E + S_C$$

SUMMARY OF RESULTS

Results are summarized below. See attached calculation sheets for detailed results

Elastic Settlement of Cohesionless Soils

Project: MassDOT Berkshire Line - Bridge 76.23
Location: Lee & Lenox, Massachusetts
Calculated By: RTL **Date:** 2/20/2025
Checked By: MR **Date:** 2/20/2025

METHOD ASSUMPTIONS

- Bearing capacity index C' based on corrected blow counts. Corrected blow counts based on N-values from the borings.
- Depth used to evaluate geostatic pressure and to correct SPT N-values for the overburden pressure is the depth to average SPT range.
- Elastic layer thickness extends 2*B below base (with B=base width of structure) or to depth of reference boring;
- Neglect time dependent deformations (creep)

PROCEDURE:

1 Based on the test boring logs, subdivide the soil profiles in sublayers. Each sublayer arroximately includes one SPT N-Value. The soil profile is subdivided in sublayers with center of sublayer approximately equal to the center of N-value from SPT.

2 Estimate soil unit weight and evaluate the geostatic total vertical stress; evaluate hydrostatic groundwater pressure based on the assumed groundwater elevation and calculate the geostatic vertical effective stress. Refer to the attachment for the calculated total and effective vertical stress.

3 Perform overburden stress and energy corrections of the N-values from borings to obtain N1,60 to be used as a basis for correlations. The corrected blow counts are evaluated as follows:

$N_{1,60} = C_R \times C_S \times C_B \times C_E \times C_N \times N$

where N - Uncorrected SPT blow count (see calculation sheets for delivered hammer energy) (bl/ft);
C_R -correction for rod length (from figure 9, from Seed et al., 2003)
C_S -correction for non-standardized sampler configuration (from table 1, from Seed et al., 2003)
C_B -correction for borehole diameter (form table 1, from Seed et al., 2003)
C_E -correction for hammer energy efficiency (from 10.4.6.2.4 of AASHTO LRFD)
C_N -correction for hammer energy efficiency (from 10.4.6.2.4 of AASHTO LRFD)

See the attached calculations for the corrected blow counts and for values of the correction coefficient used; see attached logs for uncorrected blow counts

4 Evaluate pressure change $\Delta\sigma v$ underneath footings assuming elastic theory

$\Delta\sigma v = qo_{net} \times Iz$

where: q_{onet} = load applied at the foundation subgrade (plus or minus load/unload from any soil fill/cut)
Iz=Influence factor evaluated by means of the attached figure as a function of B and L
m=B/Z; n=L/Z with B and L footing width and footing length, respectively, and Z depth below the footing.

5 Estimate C' value based on the modified Hough method chart (See attached Figure). See calculation sheets for the specific values of the constant C' selected

6 Estimate the settlement of each sublayer using the following equation:

$$\Delta H_i = H_c \frac{1}{C'} \log\left(\frac{\sigma'_o + \Delta\sigma_v}{\sigma'_o}\right)$$

(See 10.6.2.4 of AASHTO LRFD)

where: ΔHi = elastic settlement of sublayer (ft.)
Hc = initial thickness of sublayer (ft.)
C' = bearing capacity index from Figure 10.6.2.4.2-1 - Refer to the attachment
σ'_o = initial vertical effective stress at midpoint of sublayer (psf)
$\Delta\sigma_v$ = increase in vertical stress at midpoint of sublayer (psf)
Δσv = stress increase

7 Evaluate the elastic settlement (S_E) using the below equation:

$S_E = \Sigma\Delta Hi$

MassDOT Berkshire Line - Bridge 76.23
Lee & Lenox, Massachusetts
Summary of Soil Unit Weight

Layer No.	Layer ID	Density	γ_{dry} (kN/m^3)	γ_{dry} (pcf)	γ_{sat} (pcf)	γ_m (pcf)	ϕ (pcf)
1	Fill	Med. Dense	17.0	106.1	128	125	34
2	Wx Rock	Very Dense	20.0	124.8	140	140	36
	-			-	-		-
	-			-	-		-
	-			-	-		-
	-			-	-		-
	-			-	-		-
	-			-	-		-
	-			-	-		-
	-			-	-		-
	-			-	-		-

Table 21. Relationship among relative density, penetration resistance, dry unit weight, and angle of internal friction of cohesionless soils (after Duncan and Buchignani, 1976)

Descriptive Relative Density	Relative Density **	Standard Penetration Resistance N_1 (see Note) *	Static Cone Resistance q_c	Angle of Internal Friction ϕ	Dry Unit Weight
	%	blows/foot	tsf or kgf/cm^2	degrees	KN/m^3
Very Loose	< 15	< 4	< 50	< 30	< 14
Loose	15 - 35	4 - 10	50 - 100	30 - 32	14 - 16
Medium Dense	35 - 65	10 - 30	100 - 150	32 - 35	16 - 18
Dense	65 - 85	30 - 50	150 - 200	35 - 38	18 - 20
Very Dense	85 - 100	> 50	> 200	> 38	> 20

* N_1 = N -value corrected to an effective vertical overburden pressure of 1.0tsf or 100 kPa

** Freshly deposited, normally consolidated sand

Note: As originally proposed, this correlation used the uncorrected SPT blowcount, N_1. However, hammers delivering 60% of the theoretical energy have been the most commonly used hammers for SPT tests, and it seems likely that the data on which the correlation was based was obtained primarily from tests with such hammers. It therefore seems logical to use $N_{1,60}$ with this correlation, and it is the recommendation of this report that this be done.
1kN/cubic meter=6.24 pcf

$\gamma_m = [(G_s-1)/G_s) \times \gamma_{dry}] + \gamma_w$
γ_m = Moist unit weight (pcf)
γ_{dry} = Dry unit weight (pcf)
γ_w = Unit weight of water (pcf)
G_s = Soil specific gravity

Neglect N=100 bpf in Fill and N=2 bpf in S&G for the evaluation of the average N-value

Notes:
Assumed specific gravity Gs - 2.67 (silt/Organics), 2.7 (clay), 2.65 all other soils

MassDOT Berkshire Line - Bridge 76.23
Lee & Lenox, Massachusetts
Settlement Of Drilled Micropiles

6.3-foot wide equivalent footing; footing at approx. El.883.7 feet

Data:

Footing Width W (ft)	6.3	Structure Load (psf)	3675
Footing Length L (ft)	21.5		
		No. of DMPs B-direction	2
Ground Surface El. (ft)	901.3	Spaced DMP B (ft)	2.5
Finished Grade Elevation (ft)	901.3	No. of DMPs B-direction	6
Boring Ground Surface El. (ft)	901.3	Spaced DMP Z (ft)	3.5
GW Depth Below Existing Grade (ft)	18.0	Pile Penetration Depth (ft)	21
Pile Diameter (ft)	1.1	DMP Bond Length (ft)	10
		Equivalent Footing Depth (ft)	17.7
		GWT Elevation (ft)	883.3
		GW Elevation (ft)	883.3
		Bottom of Eq. Footing Elevation (ft)	883.6

Soil Properties (Includes all Soils Strata Encountered in all Borings):

Layer No.	Layer ID	Gamma Sat (pcf)	CR	RR	Drained/ Undrained
1	Fill	128	-	-	D
2	Wx Rock	140	-	-	D
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Notes:

1-Stratigraphy and N values based on existing borings drilled by NEBC
2-Energy ratio ER=80
3-Hammer type Automatic Hammer
4-N_{60} evaluate as C_E x N
5-$N_{1\text{-}60}$ evaluate as C_n x C_S x C_B x C_R x N_{60}
6 - From Figure 10.6.2.4.2-1 (Attached-AASHTO LRFD)
7 - Sublayer settlement evaluated as ε times the sublayer thickness
8 - If applicable, overexcavate unsuitable and replace with Backfill (assume N=40 for Backfill)
9-Load from raise in grade assume to be of broad lateral extent (edometric load)
10-Reference boring(s) 76-B-1 & 76-B-2
11-See attachment for evaluation of crep settlement in clay (if applicable)

Calculations:

Geostatic Pressure											Vertical Stress Change (Load Spread Method)					Consolid. Settlement Parameters				Elastic Settlement Parameters									Settlement		
Layer	**Drained/ Undrained**	**Layer Top (ft)**	**Layer Bottom (ft)**	**Layer Top Elevation (ft)**	**Layer Bottom Elevation (ft)**	**Layer Center Elevation (ft)**	**Layer Center Depth (ft)**	**Sat. Unit Weight (pcf)**	**Total Vertical Pressure (psf)**	**Effective Vertical Pressure (psf)**	**Layer Center Elevation Below Eq. ftg Base (ft)**	**Depth Below Footing Base z (ft)**	**Influence Factor**	**Delta Sigma FTGS (psf)**	**Final Effective Vertical Pressure (psf)**	**OC/NC**	**Preconsol (psf)**	**CR (-)**	**RR (-)**	**N (bl/ft)$^{(1,5)}$**	**C_E Energy ratio $^{(2,3)}$**	**N60 (bl/ft)$^{(4)}$**	**C_N (-)**	**Cs Sampler liner**	**C_B boring diameter**	**C_R rod length**	**N1,60 (bl/ft)$^{(5)}$**	**C' $^{(6)}$**	**Sublayer Thickness (ft)**	**Sublayer Strain ε (-)**	**Sublayer Settlement (in) $^{(4)}$**
Fill	D	0	3.0	901.3	898.3	899.8	1.5	125	188	188						-	-	-	-	16											
Fill	D	3.0	7.5	898.3	893.8	896.1	5.3	125	656	656						-	-	-	-	18											
Fill	D	7.5	16.0	893.8	885.3	889.6	11.8	125	1469	1469						-	-	-	-	21											
Wx Rock	D	16.0	22.7	885.3	878.6	882.0	19.4	140	2534	2449	882	1.7	0.733	2692	5142	-	-	-	-	50	1.33	**67**	0.93	1.0	1.0	0.88	**55**	285	6.7	0.0011	0.09
Wx Rock	D	22.7	25.0	878.6	876.3	877.5	23.9	140	3164	2799	877	6.2	0.393	1444	4243	-	-	-	-	50	1.33	**67**	0.89	1.0	1.0	0.92	**55**	282	2.3	0.0006	0.02
Wx Rock	D	25.0	30.0	876.3	871.3	873.8	27.5	140	3675	3083	874	9.8	0.269	988	4070	-	-	-	-	50	1.33	**67**	0.86	1.0	1.0	0.95	**54**	279	5	0.0004	0.03
Wx Rock	D	30.0	35.0	871.3	866.3	868.8	32.5	140	4376	3471	869	14.8	0.177	651	4122	-	-	-	-	50	1.33	**67**	0.82	1.0	1.0	1.00	**54**	281	5	0.0003	0.02
Wx Rock	D	35.0	40.0	866.3	861.3	863.8	37.5	140	5076	3860	864	19.8	0.126	463	4322	-	-	-	-	50	1.33	**67**	0.78	1.0	1.0	1.00	**52**	262	5	0.0002	0.01
Wx Rock	D	40.0	45.0	861.3	856.3	858.8	42.5	140	5777	4248	859	24.8	0.094	346	4595	-	-	-	-	50	1.33	**67**	0.75	1.0	1.0	1.00	**50**	246	5	0.0001	0.01
Wx Rock	D	45.0	50.0	856.3	851.3	853.8	47.5	140	6478	4637	854	29.8	0.073	270	4906	-	-	-	-	50	1.33	**67**	0.72	1.0	1.0	1.00	**48**	231	5	0.0001	0.01

Settlement (in) **0.2**

APPENDIX C.2

TIEBACK ANCHORS

Client:	**MassDOT**
Project:	**Housatonic Railroad Line Improvements - Bridge 76.23**
Project Number:	
Project Mgr:	**June Wu**
QC Reviewers:	**Max Rolandi**
Deliverable Reviewed:	**Ryan Lavorati**
Date Transmitted:	**2/6/2025**
Review Deadline:	**2/10/2025**
Actual Review Date:	

Calculation Title :	**Existing Bridge 76.23 Sliding Resistance and Anchor Load Evaluation**
Calculation Number:	1
Supersedes:	NA
Superseded By:	NA

Notes:	See notes throughout calculation (page 3)
For Design Basis, see page	1
For Analysis References, see page	1
For Analysis Assumptions, see page	1
Other:	

Names / Signatures:

Name	Max Rolandi	
Signature MR		2/5/2025
Calculated by		
Name	Ryan Lavorati	
Signature RTL		2/21/2025
Checked by		
Name	Max Rolandi	
Signature MR		2/21/2025
Updated by		
Name	Ryan Lavorati	
Signature RTL		2/21/2025
Back Checked by		

Design Manager Approval:

Name	Max Rolandi	
Signature		2/21/2025
Design, Responsible Engineer or Project Manager		

Existing Bridge 76.23 Sliding Resistance and Anchor Load Evaluation

Project: Housatonic Railroad Line Improvements - Bridge 76.23
Location: Lee, MA
Calculated By: MR **Date:** 2/5/2025
Checked By: TBD **Date:** 1/16/2025

Problem Description

The Existing bridge abutment wall will be retrofitted with a new breastwall and anchor. Geotechnical stability analyses are performed to evaluate the anchor loads necessary to provide the required FS=1.5 against wall sliding.
Geotechnical analyses include the evaluation of the factor of safety (FS) against sliding for the existing wall after breastwall and anchor construction. The evaluation is performed in general accordance with the AREMA Manual For Railroad Engineering using generally accepted geotechnical principal for lateral pressure evaluations and using spreadsheet calculations.

Assumptions

1 Active pressure coefficient evaluated based on Rankine Theory.
2 Geometry and measurements of surface, distance, elevations, etc., based on the cross section obtained from the results of field probes and field measurements (see attached).
3 A survey was not available at the time of this evaluation. Elevations are assumed to match depth/thickness measurements
4 Passive pressure coefficient evaluated based on Log Spiral (See note 5).
5 The passive pressure was neglected in the sliding evaluation

References

AREMA Manual For Railroad Engineering, 2023.
Soil Mechanics and Foundation Engineering, Third Edition, Vol 1, V.N.S. Murthy
Elastic Solutions for Soil and Rock Mechanics, HG Poulos & EH Davis
Recent draft boring logs performed by HDR

Procedure

Evaluate subsurface conditions based on the recent borings by HDR.
- See attached subsurface information.

Evaluate wall geometry based on the cross section obtained after probes and other measurements by HDR.
- See attached cross section from HDR.

Prepare a representative cross section for sliding analyses.
- Assign soil properties based on subsurface information and typical physical properties of site soils.
  - See attached table with summary of soil properties.
- Evaluate lateral pressure coefficients and earth pressure diagrams.
- Evaluate groundwater pressure based on measured groundwater depth.
- Evaluate lateral and vertical pressure diagrams based on LL provided by HDR Structural.
  - See attachment for formulae used to evaluate the lateral and vertical pressure from LL surcharge
- Evaluate resultant forces from pressure diagrams.
- Perform Sliding and Overturning calculations using excel spreadsheets.

Results

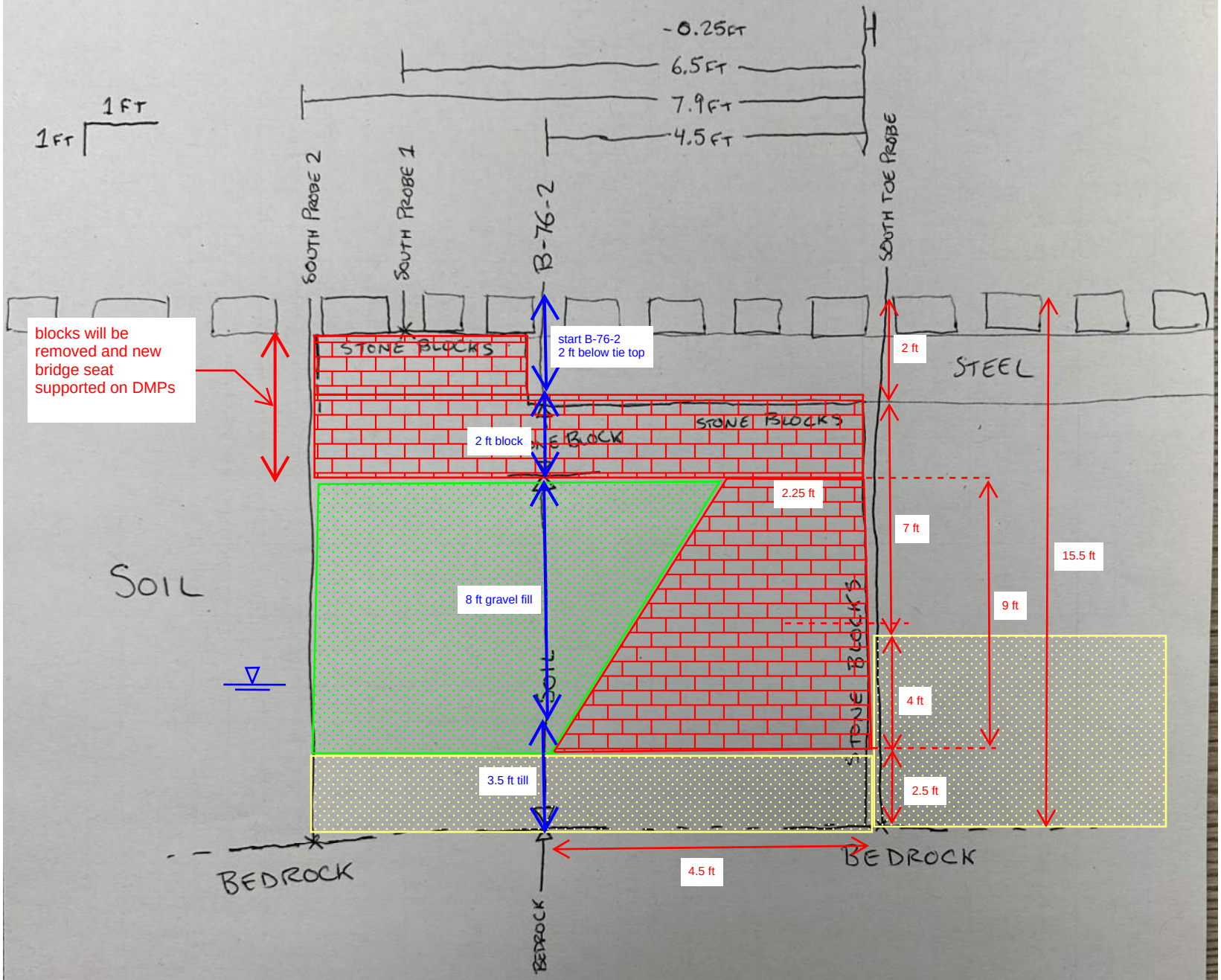
Total abutment load to be resisted by anchor (Kip)= 149.6
Total abutment load/unit width to be resisted by anchor (Kip/ft)= 9.4

Conclusions

HDR recommends the above performance criteria be provided to inform design of anchors by the Contractor.

Task: PROBES/BORINGS SKETCH Page: of:

Job #: No:



	DISTANCE ALONG RAIL CENTER LINE (FT)	REFUSAL / BEDROCK DEPTH (FT)
PROBE 1	6.5	1
PROBE 2	7.9	15.5

Housatonic Railroad Line Improvements - Bridge 76.23
Lee, MA
Table 1 - Summary of Soil Properties

Layer No.	Layer ID	Density	γ_{dry} (kN/m³)	γ_{dry} (pcf)	γ_{sat} (pcf)	γ_m (pcf)	ϕ (pcf)	ka	kp	kae	ko
1	avel & Sa	M. Dense	17.0	106	128	125	34	0.28	6.7	0.28	0.44
2	Till	Dense	18.0	112	132	128	34	0.28	6.7	0.28	0.44
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-

Descriptive Relative Density	Relative Density **	Standard Penetration Resistance N_1 (see Note) *	Static Cone Resistance q_c	Angle of Internal Friction ϕ	Dry Unit Weight
	%	blows/foot	tsf or kgf/cm²	degrees	KN/m³
Very Loose	< 15	< 4	< 50	< 30	< 14
Loose	15 - 35	4 - 10	50 - 100	30 - 32	14 - 16
Medium Dense	35 - 65	10 - 30	100 - 150	32 - 35	16 - 18
Dense	65 - 85	30 - 50	150 - 200	35 - 38	18 - 20
Very Dense	85 - 100	> 50	> 200	> 38	> 20

* N_1 = N -value corrected to an effective vertical overburden pressure of 1.0tsf or 100 kPa

** Freshly deposited, normally consolidated sand

Note: As originally proposed, this correlation used the uncorrected SPTblowcount, N_1. However, hammers delivering 60% of the theoretical energy have been the most commonly used hammers for SPT tests, and it seems likely that the data on which the correlation was based was obtained primarily from tests with such hammers. It therefore seems logical to use $N_{1,60}$ with this correlation, and it is the recommendation of this report that this be done.
1kN/cubic meter=6.24 pcf

$\gamma_m = [(G_s-1)/G_s) \times \gamma_{dry}] + \gamma_w$
γ_m = Moist unit weight (pcf)
γ_{dry} = Dry unit weight (pcf)
γ_w = Unit weight of water (pcf)
G_s = Soil specific gravity

Neglect N=100 bpf in Fill and N=2 bpf in S&G for the evaluation of the average N-value

Reference table after Mitchell and Katti, 1981

Notes:
Assumed specific gravity Gs - 2.67 (silt/Organics), 2.7 (clay), 2.65 all other soils
Ka evaluated using Rankine formula

Housatonic Railroad Line Improvements - Bridge 76.23
Lee, MA
Anchor Load Evaluation
Strength Limit State 1

Data:

Wall Top Elevation (ft)	20.0
Bottom of Wall Ftg Elevation (ft)	7.0
Wall Height H (ft)	13.0
GW Depth (wall top)-active (ft)	10.0
GW Elevation-active (ft)	10.0
Wall Base Width B (ft)	4.5
Wall stem slope θ (deg)	76
Wall backfill slope β (deg)	0
Interface friction angle δ (deg)	17

Anchor Load Evaluation (Based on Sliding Eq & FS=1.5)

Horizontal Force by anchors (lb/ft)=	9350
Wall Length L (ft)=	16.0
Tot Horizontal Load by anchors (kip)=	150
Number of anchors (-)	2

Soil Properties (Includes all Soils Strata Encountered in all Borings):

Layer No.	Layer ID	Gamma Sat (pcf)	Gamma m. (pcf)	ϕ (deg)	δ (deg)	ka	kp	kae	ko
1	Gravel & Sand	128	125	34	24	0.28	6.7	0.28	#REF!
2	Till	132	128	34	24	0.28	6.7	0.28	#REF!
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Notes

1) See attached Table 1 - summary of soil properties
2) Evaluated using equation A - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
3) Evaluated using equation E - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
4) Evaluated using equation B - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
5) See active earth pressure coefficient calculation sheet
6) Evaluated using equation C - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
7) See attached friction factors table
8) Evaluated using equation G - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
9) Evaluated using equations in the attached Strip Load Formulae for Vertical and Lateral Pressure from Live Load Surcharge

Calculations:

Geostatic Pressure											Active Earth Pressure (EP) & Force (Reference Bottom Layer Depth)						Surcharge (Y Direction) & Force			Surcharge (X Direction) & Force			Total
Layer	Layer Top Depth z (ft)	Layer Bottom Depth z (ft)	Layer Top El. (ft)	Layer Bottom El. (ft)	Sat (or Moist) Unit Weight γ_{sat} (γ_m) (pcf)[1]	Total Vertical Stress Top of Sublayer σv (psf)[2]	Total Vertical Stress Bottom of Sublayer σv (psf)[2]	GW Pressure σw (psf)[3]	Vertical Effective Stress Top of Sublayer σ'v (psf)[4]	Vertical Effective Stress Bottom of Sublayer σ'v (psf)[4]	ka[1][5]	Active EP Top of Layer σa (psf)[6]	Active EP Bottom Layer σa (psf)[6]	Average Active EP σa AV (psf)	Iinterface friction angle δ (deg)[7]	Horizontal Active Force from EP Pa (lb/ft)	Horizontal Pressure from Surcharge Top of Layer σy (psf)[9]	Horizontal Pressure from Surcharge Bot. of Layer σy (psf)[9]	Horizontal Force from Surcharge (Y-Direct) Psy (lb/ft)	Horizontal Pressure from Surcharge Top of Layer σx (psf)[9]	Horizontal Pressure from Surcharge Bot. of Layer σx (psf)[9]	Horizontal Force from Surcharge (X-Direct) Psx (lb/ft)	Total Horizontal Force-Active Side (Kip/ft) Ptot
Gravel & Sand		0.0														0		532.1	0	0.0		0	0.0
Gravel & Sand	0.0	2.0	20.0	18.0	125	0	250	0	0	250	0.28	0	71	35	24	63	532.1	532.1	1064	0.0		0	1.1
Gravel & Sand	2.0	4.0	18.0	16.0	125	250	500	0	250	500	0.28	71	141	106	24	251	532.1	532.1	2128	0.0		0	2.4
Gravel & Sand	4.0	6.0	16.0	14.0	125	500	750	0	500	750	0.28	141	212	177	24	564	532.1	532.1	3192	0.0		0	3.8
Gravel & Sand	6.0	8.0	14.0	12.0	125	750	1000	0	750	1000	0.28	212	283	247	24	1002	532.1	532.1	4257	0.0		0	5.3
Gravel & Sand	8.0	9.0	12.0	11.0	125	1000	1125	0	1000	1125	0.28	283	318	300	24	1269	532.1	532.1	4789	0.0		0	6.1
Gravel & Sand	9.0	12.0	11.0	8.0	128	1125	1510	125	1125	1386	0.28	318	392	355	24	2212	532.1	532.1	6385	0.0		0	8.6
Till	12.0	13.0	8.0	7.0	132	1510	1643	187	1386	1455	0.28	392	411	402	24	2568	532.1	532.1	6917	0.0		0	9.5
Till	13.0	15.5	7.0	4.5	132	1643	1974	343	1455	1630	0.28	411	461	436	24	3535	532.1	532.1	8247	0.0		0	11.8
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

Project: Housatonic Railroad Line Improvements - Bridge 76.23
Project Location: Lee, MA
Calculated by: MR | Checked by: TBD
Date: 2/5/2025 | Date: 1/16/2025
Detail: **EVALUATION OF FS AGAINST SLIDING**

Toe and Heel Backfill Conditions (Cantilev. Only)	
γ-m compacted heel backfill (pcf)	0
γ-tot compacted heel backfill (pcf)	0
Layer submerged	no
Submerged Height (ft)	0
interface friction delta at wall (-)	0
interface friction angle (deg)	0.0
γ-m compacted toe backfill (pcf)	0
γ-tot compacted toe backfill (pcf)	0
Layer submerged	no
Submerged Height (ft)	0
interface friction delta at wall (-)	0.5
interface friction angle (deg)	26.6

Wall Unit Weight and Friction Coefficient	
γ wall (pcf)	150
interface friction delta at base (-) MRE 5.4.2b	0.45

Relevant Wall Geometry	
Wall Type	Gravity
Wall Hight H (ft)	13.0
Wall base width B (ft)	4.5
Wall top width b (ft)	2.3
Wall base length L (ft)	16.0
Wall base thickness - t (ft) (Cantilev. Only)	NA
Stem height h (ft) (Cantilev. Only)	NA
Wall stem thick-base t1 (ft) (Cantilev. Only)	NA
Wall stem thick-top t2 (ft) (Cantilev. Only)	NA
toe length - lt (ft) (Cantilev. Only)	NA
heel length - lh (ft) (Cantilev. Only)	NA
Thickness of soil on toe (ft) (Cantilev. Only)	NA
depth of excavation (for SOE only) (ft)	NA
unit volume of heel b/f (cf/ft) (Cantilev. Only)	NA
unit volume of toe b/f (cf/ft) (Cantilev. Only)	NA
unit volume of wall (cf/ft)	43.9
Wall stem slope θ (deg)	76.0
Wall backfill slope β (deg)	0.0

Pressures from Pressure Diagrams - Active Side		
Top of Active pr. diag. (ft)	4	Depth to top of Active pressure diagram
Bottom of Active pr. diag. (ft)	13	Depth to bottom of Active pressure diagram
Top of YSurch. pr. diag. (ft)	4	Depth to top of Surcharge pressure diagram - Y direction (perpendicular to wall)
Bottom of YSurch. pr. diag. (ft)	13	Depth to bottom of Surcharge pressure diagram - Y direction (perpendicular to wall)
Top of XSurch. pr. diag. (ft)	4	Depth to top of Surcharge pressure diagram - X direction (parallel to wall)
Bottom of XSurch. pr. diag. (ft)	13	Depth to bottom of Surcharge pressure diagram - X direction (parallel to wall)
σs top-X (psf)	4	Depth to top of GW pressure diagram
σs bot-X (psf)	13	Depth to bottom of GW pressure diagram

Pressures from Pressure Diagrams - Passive Side		
σp (psf)		Neglect passive
Hp (ft)		Height of the passive pressure diagram

Acting Forces (A)		
Pa (lb/ft)	2498	Active Force from EP (lb/ft) - (incluned of d on the back of the wall)
Ph (lb/ft)	2318	Horizontal Active Force from EP (lb/ft) - accounts for wall interface friction and wall stem slope
Qy (lb/ft)	4789	Horizontal Force from Surcharge (perpendicular to wall) (lb/ft)
Qx (lb/ft)	0	Horizontal Force from Surcharge (parallel to wall) (lb/ft)
GWa (lb/ft)(#)	842	GW force on active side

Resisting Forces (R)		
Pp (lb/ft)		Neglect passive
GWp (lb/ft)(#)		GW force on passive side
T=N x tan δ (lb/ft)	2582	Summary of Friction force along the wall base (see below)
Ta (lb/ft)	9350	Total horizontal force from anchors to provide FS=1.5. This force is obtained by trial and error until a FS=1.5 is obtained in the equilinrium calculations.

Reaction under wall base - **perpendicular to wall base**		
Ww (lb/ft)	6581	Weight of wall
Wh (lb/ft)	0	Weight of heel backfill
Wt-n (lb/ft)	0	Weight of toe backfill
GWup (lb/ft)(#)	842	Uplift force from GW pressure below the base of the wall (up)
Nn (lb/ft)	5739	Resultant of normal reaction forces

Equilibrium		
ΣA (lb/ft)=	7949	
ΣR (lb/ft)=	11932	
FS Slide (-)=	1.50	Sliding FS - The passive pressure is neglected as prescribed by Section 5.4.2b of AREMA MRE Possible reaction of bridge superstructure on abutment was also neglected

Notes

(#) GW pressure is "all-around" and always acting perpendicular to wall surface

Active Earth Pressure Coefficient

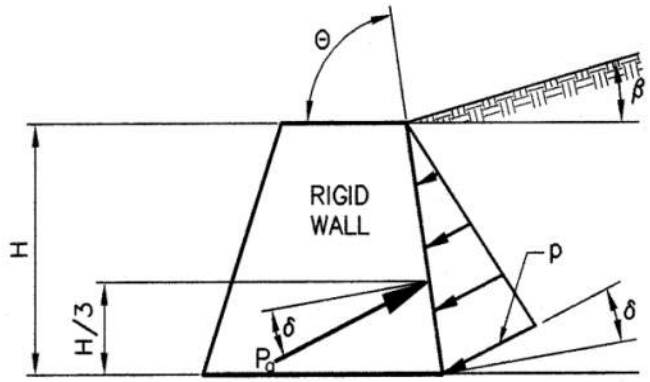
Project: Housatonic Railroad Line Improvements - Bridge 76.23
Location: Lee, MA
Calculated By: MR **Date:** 2/5/2025
Checked By: TBD **Date:** 1/16/2025

Objective: Evaluate the active earth pressure coefficient using Coulomb Equation.
References: 1) Soil Mechanics in Engineering Practice - Terzaghi, Peck and Mesri
2) AASHTO LRFD Bridge Specifications
Assumptions: Assume gravel Borrow backfill.

Layer No.	Layer ID	Phi (deg)	Phi (rad)	Interface friction δ (deg)	Interface friction δ (rad)	δ/ϕ	Ka (-) Coulomb	Ka (-) Rankine
1	Gravel & Sand	34	0.593	24	0.419	0.706	0.37	0.28
2	Till	34	0.593	24	0.419	0.706	0.37	0.28
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-

	Deg	Rad
β	0	0.00
θ	76	1.33

Coulomb Formula for Ka, coefficient of active pressure



$$k_a = \frac{\sin^2(\theta+\phi'_f)}{\Gamma[\sin^2\theta\sin(\theta-\delta)]}$$

in which:

$$\Gamma = \left[1+\sqrt{\frac{\sin(\phi'_f+\delta)\sin(\phi'_f-\beta)}{\sin(\theta-\delta)\sin(\theta+\beta)}}\right]^2$$

Rankine Formula for Ka, coefficient of active pressure

$k_a = \tan^2(45 + \phi'/2)$

Housatonic Railroad Line Improvements - Bridge 76.23
Lee, MA
Log Spiral Plot and Coulomb Equation

Kp - Log Spiral Plot

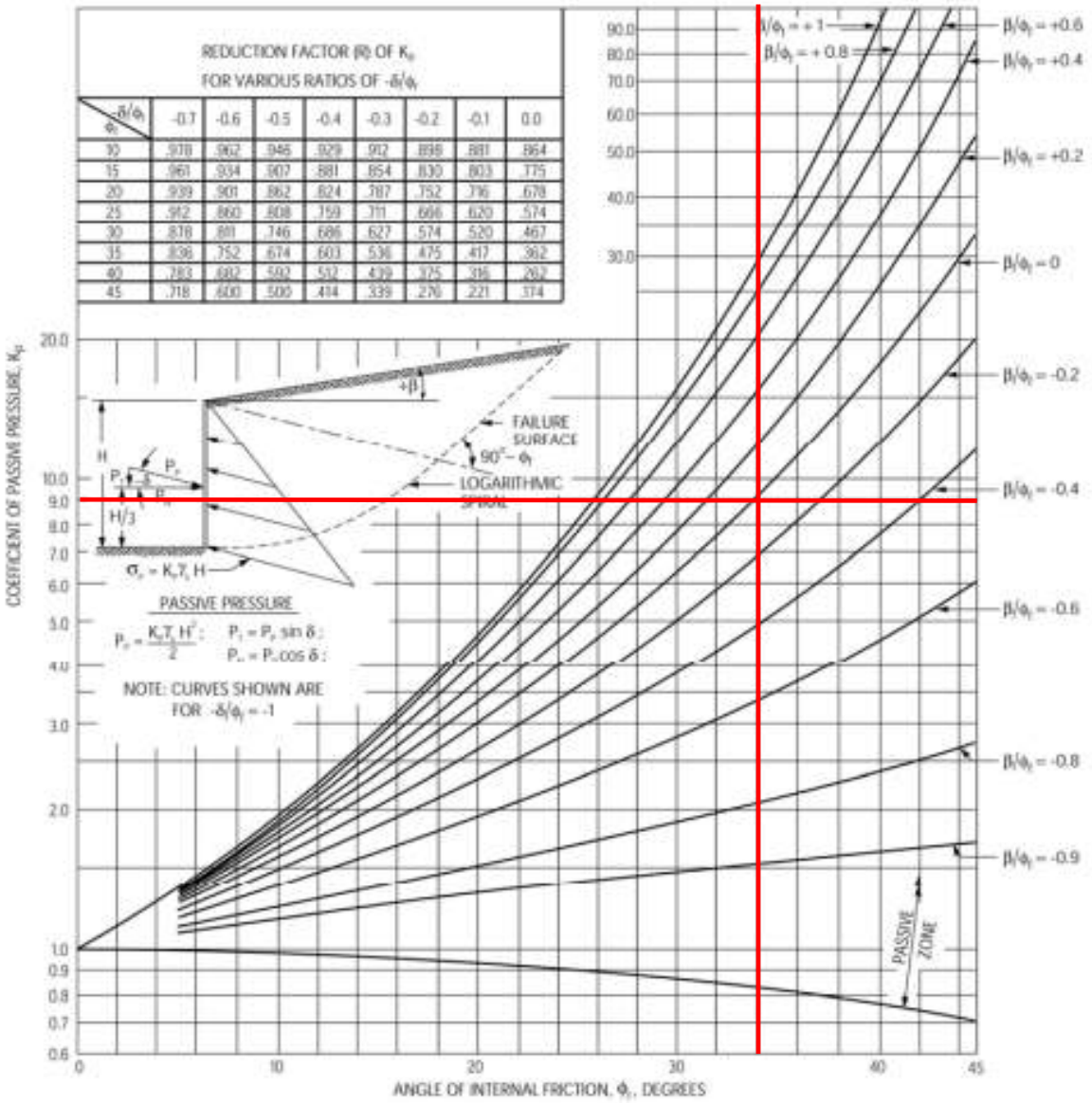


Figure 2.3. Coefficients for active and passive earth pressure using log spiral method (Caquot and Kerisel 1948)

Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces

Project: Housatonic Railroad Line Improvements - Bridge 76.23
Location: Lee, MA
Calculated By: MR **Date:** 2/5/2025
Checked By: TBD **Date:** 1/16/2025

Formulae used to evaluate the geostatic pressure and resultant forces are as follows:

$\sigma_v = \gamma z$ σ_v = Total Vertical stress — Equation (A)
z = depth below the footing
γ = total unit weight

$\sigma'_v = \gamma' z$ σ'_v =Effective Vertical pressure — Equation (B)
z = depth below the footing
γ' = effective unit weight

$\sigma_a = \sigma'_v K_a$ σ'_a =Active pressure — Equation (C)
k_a = active pressure coefficient
$k_a = \tan^2(45 + \phi'/2)$ - Rankine Theory

$\sigma_p = \sigma'_v K_p$ σ'_p =Passive pressure — Equation (D)
k_p = passive pressure coefficient
k_p = obtained from log spiral - see plot

$\sigma_W = \gamma_w H$ σ_{GW} = Groundwater pressure — Equation (E)
H=Groundwater depth
γ_w = Weight of water=62.43 pcf

GW= 1/2 σ_{GW} H — Equation (F)
GW= groundwater force
Pa = 1/2 σa Ha — Equation (G)
Pa = Active force
Ha = Height of active pressure diagram
Pp = 1/2 σp Hp — Equation (H)
Pp = Passive force
Hp = Height of passive pressure diagram

Psy = 1/2 (σy-top + σy-bott) x Hsy — Equation (I)
Psy = Resultant force from surcharge y-direction
Hsy = Height of surcharge pressure diagram

Psx = 1/2 (σx-top + σx-bott) x Hsx — Equation (J)
Psx = Resultant force from surcharge y-direction
Hsx = Height of surcharge pressure diagram

Ptot = Sum of all active, passive and surcharge resultant forces — Equation (K)

Strip Load Formulae for Vertical and Lateral Pressure from Live Load Surcharge

Project: Housatonic Railroad Line Improvements - Bridge 76.23
Location: Lee, MA
Calculated By: MR Date: 2/5/2025
Checked By: TBD Date: 1/16/2025

Formulae used to evaluate the vertical and lateral pressure from live load surcharge onto the existing wall are as follows:

3.1.1 UNIFORM VERTICAL LOADING (Fig.3.1)

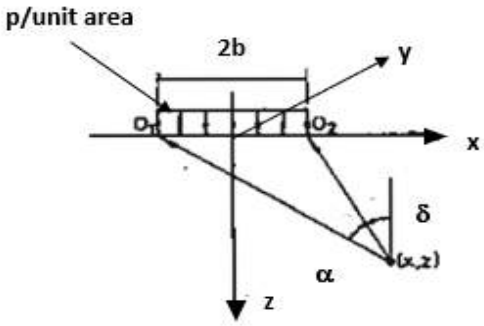
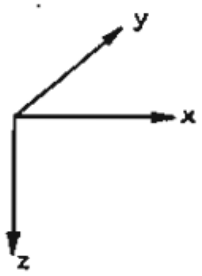


FIG. 3.1



$$\sigma_z = \frac{p}{\pi}[\alpha + \sin\alpha \cos(\alpha+2\delta)] \quad \ldots (3.1a)$$

$$\sigma_x = \frac{p}{\pi}[\alpha - \sin\alpha \cos(\alpha+2\delta)] \quad \ldots (3.1b)$$

$$\sigma_y = \frac{2p}{\pi}\nu\alpha \quad \ldots (3.1c)$$

$$\tau_{xz} = \frac{p}{\pi}\sin\alpha \sin(\alpha+2\delta) \quad \ldots (3.1d)$$

$$\sigma_1 = \frac{p}{\pi}[\alpha + \sin\alpha] \quad \ldots (3.1e)$$

$$\sigma_3 = \frac{p}{\pi}[\alpha - \sin\alpha] \quad \ldots (3.1f)$$

$$\tau_{max} = \frac{p}{\pi}\sin\alpha \quad \ldots (3.1g)$$

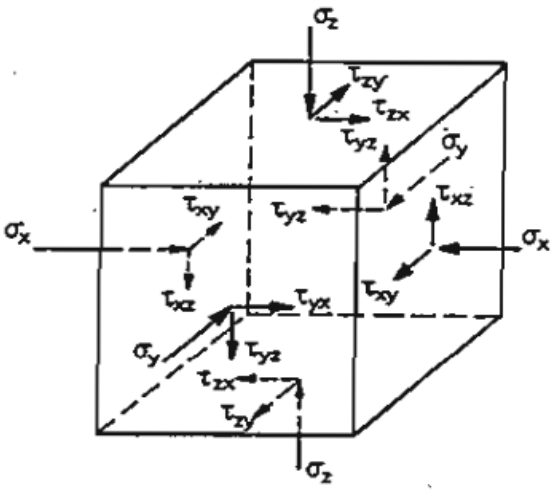


FIG. 1.1

Housatonic Railroad Line Improvements - Bridge 76.23
Lee, MA
FRICTION FACTORS TABLE - NAVFAC 1982

Table C3.11.5.3-1—Friction Angle for Dissimilar Materials (U.S. Department of the Navy, 1982a)

Interface Materials	Friction Angle, δ (degrees)	Coefficient of Friction, tan δ (dim.)
Mass concrete on the following foundation materials:		
• Clean sound rock	35	0.70
• Clean gravel, gravel-sand mixtures, coarse sand	29 to 31	0.55 to 0.60
• Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	24 to 29	0.45 to 0.55
• Clean fine sand, silty or clayey fine to medium sand	19 to 24	0.34 to 0.45
• Fine sandy silt, nonplastic silt	17 to 19	0.31 to 0.34
• Very stiff and hard residual or preconsolidated clay	22 to 26	0.40 to 0.49
• Medium stiff and stiff clay and silty clay	17 to 19	0.31 to 0.34
Masonry on foundation materials has same friction factors.		
Steel sheet piles against the following soils:		
• Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	22	0.40
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17	0.31
• Silty sand, gravel or sand mixed with silt or clay	14	0.25
• Fine sandy silt, nonplastic silt	11	0.19
Formed or precast concrete or concrete sheet piling against the following soils:		
• Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	22 to 26	0.40 to 0.49
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17 to 22	0.31 to 0.40
• Silty sand, gravel or sand mixed with silt or clay	17	0.31
• Fine sandy silt, nonplastic silt	14	0.25
Various structural materials:		
• Masonry on masonry, igneous and metamorphic rocks:		
○ dressed soft rock on dressed soft rock	35	0.70
○ dressed hard rock on dressed soft rock	33	0.65
○ dressed hard rock on dressed hard rock	29	0.55
• Masonry on wood in direction of cross grain	26	0.49
• Steel on steel at sheet pile interlocks	17	0.31

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-76-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2944296 **EAST** 183810
DATE STARTED 1/2/25 **COMPLETED** 1/3/25
STATION --- **OFFSET** ---
GROUND ELEVATION _____ **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** M. Pham
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 10.0 ft measured with casing to 14 ft
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Behind bridge 76.23 north abutment. Top sample frozen due to freezing temperatures
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, dry [Ballast]	SPT 1	29	6-7-9-11 (16)		Ground surface elevation defined as the top of the railroad tie.
5			Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, wet	SPT 2	33	10-9-9-16 (18)		
10			▽ Dark brown fine to coarse SAND and GRAVEL, some Silt, medium dense, wet	SPT 3	42	6-9-12-20 (21)		
15			Gray, hard, slightly weathered, moderately fractured, medium grained DOLOMITE MARBLE	RC 1	58 (0)			Top of rock at 14 ft below ground surface. Drill into rock 1 ft to start coring. Rock cores C-1 and C-2 stopped after only 1 ft with core barrel jams likely due to natural rock fractures. No water return while rock coring deeper than 18 feet
			Gray, hard, slightly weathered, extremely fractured, medium grained DOLOMITE MARBLE	RC 2	67 (0)			
			Gray, hard, slightly weathered, slightly fractured, medium grained DOLOMITE MARBLE	RC 3	81 (67)			
20			Gray, hard, slightly weathered, slightly fractured, medium grained DOLOMITE MARBLE	RC 4	65 (57)			
25								Borehole backfilled with grout and bentonite at the end of drilling.

Bottom of borehole at 26.0 feet.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 1/22/25 09:25 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-76-2

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2944243 **EAST** 183821 **DATE STARTED** 1/6/25 **COMPLETED** 1/8/25
STATION --- **OFFSET** --- **GROUND ELEVATION** _____ **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman **GROUND WATER LEVELS:**
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety **AT TIME OF DRILLING** ---
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE **AT END OF DRILLING** ---
NOTES Through bridge 76.23 south abutment. **AFTER DRILLING** ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Bridge includes a 2 ft void between the top of tie and the top of the bridge seat where this boring was drilled.					Ground surface elevation defined as the top of the railroad tie.
			Stone abutment blocks					
5			Gray GRAVEL, little fine to coarse Sand, trace Silt, dense, moist	SPT 1	42	4-27-20-18 (47)		Drilled 2 ft beyond abutment block to confirm not just a joint in the masonry stones.
10			Gray GRAVEL, little fine to coarse Sand, trace Silt, dense, wet	SPT 2	33	21-14-17-16 (31)		
15			Brown GRAEL and fine to coarse Sand, little Silt, very dense, wet	SPT 3	71	39-50/1 (50/1)		Rock fragments in tip of sample S-3.
			Gray, hard, slightly weathered, moderately fractured, medium grained DOLOMITE MARBLE	RC 1	61 (31)			Rock core C-1 stopped after 3 ft with core barrel jams likely due to natural rock fractures.
20			Bottom of borehole at 20.0 feet.					Boring stopped at 20 ft due to equipment failure in freezing conditions. Borehole backfilled with bentonite and grout at the end of drilling.

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 1/22/25 09:25 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

Client:	**MassDOT**
Project:	**Housatonic Railroad Line Improvements - Bridge 77.28**
Project Number:	
Project Mgr:	**June Wu**
QC Reviewers:	**Max Rolandi**
Deliverable Reviewed:	**Ryan Lavorati**
Date Transmitted:	**2/6/2025**
Review Deadline:	**2/20/2025**
Actual Review Date:	

Calculation Title :	**Existing Bridge 77.28 Sliding Resistance and Anchor Load Evaluation**
Calculation Number:	1
Supersedes:	NA
Superseded By:	NA

Notes:	See notes throughout calculation (page 3)
For Design Basis, see page	1
For Analysis References, see page	1
For Analysis Assumptions, see page	1
Other:	

Names / Signatures:

Name	Max Rolandi	
Signature MR		2/6/2025
Calculated by		
Name	Ryan Lavorati	
Signature RTL		2/19/2025
Checked by		
Name	Max Rolandi	
Signature MR		2/20/2025
Updated by		
Name RTL	Ryan Lavorati	
Signature		2/21/2025
Back Checked by		

Design Manager Approval:

Name	Max Rolandi	
Signature MR		2/21/2025
Design, Responsible Engineer or Project Manager		

Existing Bridge 77.28 Sliding Resistance and Anchor Load Evaluation

Project: Housatonic Railroad Line Improvements - Bridge 77.28
Location: Lee, MA
Calculated By: MR **Date:** 2/6/2025
Checked By: RTL **Date:** 2/19/2025

Problem Description

The Existing bridge abutment wall will be retrofitted with a new breastwall and anchor. Geotechnical stability analyses are performed to evaluate the anchor loads necessary to provide the required FS=1.5 against wall sliding.
Geotechnical analyses include the evaluation of the factor of safety (FS) against sliding for the existing wall after breastwall and anchor construction. The evaluation is performed in general accordance with the AREMA Manual For Railroad Engineering using generally accepted geotechnical principal for lateral pressure evaluations and using spreadsheet calculations.

Assumptions

1 Active pressure coefficient evaluated based on Rankine Theory.
2 Geometry and measurements of surface, distance, elevations, etc., based on the cross section obtained from the results of field probes and field measurements (see attached).
3 A survey was not available at the time of this evaluation. Elevations are assumed to match depth/thickness measurements
4 Passive pressure coefficient evaluated based on Log Spiral (See note 5).
5 The passive pressure was neglected in the sliding evaluation

References

AREMA Manual For Railroad Engineering, 2023.
Soil Mechanics and Foundation Engineering, Third Edition, Vol 1, V.N.S. Murthy
Elastic Solutions for Soil and Rock Mechanics, HG Poulos & EH Davis
Recent draft boring logs performed by HDR

Procedure

Evaluate subsurface conditions based on the recent borings by HDR.
- See attached subsurface information.

Evaluate wall geometry based on the cross section obtained after probes and other measurements by HDR.
- See attached cross section from HDR.

Prepare a representative cross section for sliding analyses.
- Assign soil properties based on subsurface information and typical physical properties of site soils.
  - See attached table with summary of soil properties.
- Evaluate lateral pressure coefficients and earth pressure diagrams.
- Evaluate groundwater pressure based on measured groundwater depth.
- Evaluate lateral and vertical pressure diagrams based on LL provided by HDR Structural.
  - See attachment for formulae used to evaluate the lateral and vertical pressure from LL surcharge
- Evaluate resultant forces from pressure diagrams.
- Perform Sliding and Overturning calculations using excel spreadsheets.

Results

Total abutment load to be resisted by anchor (Kip)= 490.8
Total abutment load/unit width to be resisted by anchor (Kip/ft)= 15.1

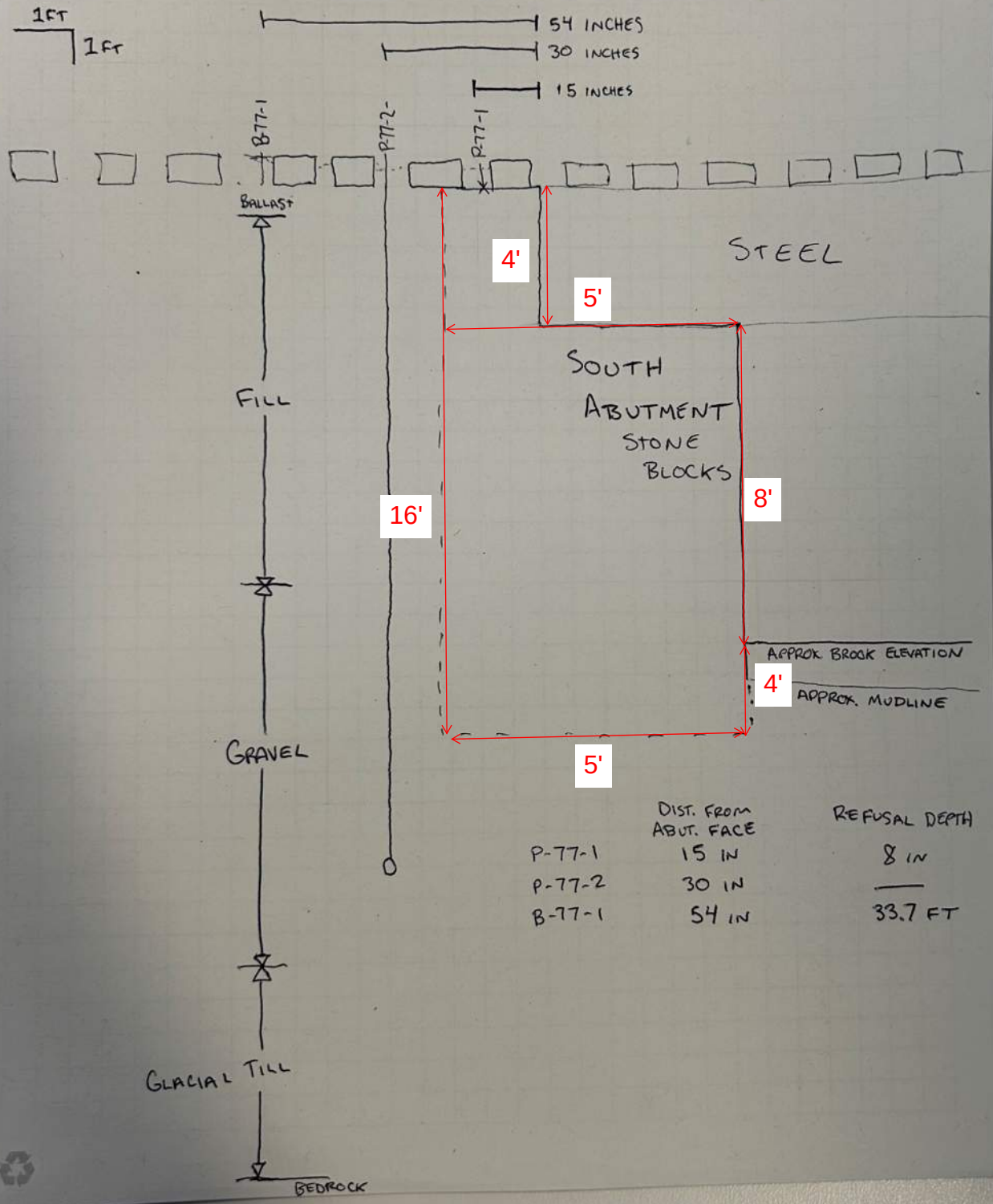
Conclusions

HDR recommends the above performance criteria be provided to inform design of anchors by the Contractor.

Subject: BRIDGE 77.28 SOUTH ABUTMENT

Task: PROBES/BORINGS SKETCH Page: of:

Job #: No:



	DIST. FROM ABUT. FACE	REFUSAL DEPTH
P-77-1	15 IN	8 IN
P-77-2	30 IN	—
B-77-1	54 IN	33.7 FT

Housatonic Railroad Line Improvements - Bridge 77.28
Lee, MA
Table 1 - Summary of Soil Properties

Layer No.	Layer ID	Density	γ_{dry} (kN/m^3)	γ_{dry} (pcf)	γ_{sat} (pcf)	γ_m (pcf)	ϕ (pcf)	ka	kp	kae	ko
1	Fill	M. Dense	17.0	106	128	125	32	0.31	7.0	0.29	0.47
2	Gravel	Dense	18.0	112	132	128	34	0.28	7.7	0.27	0.44
3	Till	Dense	18.0	112	132	128	34	0.28	7.7	0.27	0.44
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-
	-			-	-		-	-	-	-	-

Descriptive Relative Density	Relative Density **	Standard Penetration Resistance N_1 (see Note) *	Static Cone Resistance q_c	Angle of Internal Friction ϕ	Dry Unit Weight
	%	blows/foot	tsf or kgf/cm^2	degrees	KN/m^3
Very Loose	< 15	< 4	< 50	< 30	< 14
Loose	15 - 35	4 - 10	50 - 100	30 - 32	14 - 16
Medium Dense	35 - 65	10 - 30	100 - 150	32 - 35	16 - 18
Dense	65 - 85	30 - 50	150 - 200	35 - 38	18 - 20
Very Dense	85 - 100	> 50	> 200	> 38	> 20

* N_1 = N -value corrected to an effective vertical overburden pressure of 1.0tsf or 100 kPa

** Freshly deposited, normally consolidated sand

Note: As originally proposed, this correlation used the uncorrected SPTblowcount, N_1. However, hammers delivering 60% of the theoretical energy have been the most commonly used hammers for SPT tests, and it seems likely that the data on which the correlation was based was obtained primarily from tests with such hammers. It therefore seems logical to use $N_{1,60}$ with this correlation, and it is the recommendation of this report that this be done.
1kN/cubic meter=6.24 pcf

$\gamma_m = [(G_s-1)/G_s) \times \gamma_{dry}] + \gamma_w$
γ_m = Moist unit weight (pcf)
γ_{dry} = Dry unit weight (pcf)
γ_w = Unit weight of water (pcf)
G_s = Soil specific gravity

Neglect N=100 bpf in Fill and N=2 bpf in S&G for the evaluation of the average N-value

Reference table after Mitchell and Katti, 1981

Notes:
Assumed specific gravity Gs - 2.67 (silt/Organics), 2.7 (clay), 2.65 all other soils
Ka evaluated using Rankine formula

Housatonic Railroad Line Improvements - Bridge 77.28
Lee, MA
Anchor Load Evaluation
Strength Limit State 1

Data:

Wall Top Elevation (ft)	20.0
Bottom of Wall Ftg Elevation (ft)	4.0
Wall Height H (ft)	16.0
GW Depth (wall top)-active (ft)	15.0
GW Elevation-active (ft)	5.0
Wall Base Width B (ft)	5.0
Wall stem slope θ (deg)	90
Wall backfill slope β (deg)	0
Interface friction angle δ (deg)	17

Anchor Load Evaluation (Based on Sliding Eq & FS=1.5)

Horizontal Force by anchors (lb/ft)=	15100
Wall Length L (ft)=	32.5
Tot Horizontal Load by anchors (kip)=	491
Number of anchors (-)	5

Indicates horizontal load on anchor #5

Soil Properties (Includes all Soils Strata Encountered in all Borings):

Layer No.	Layer ID	Gamma Sat (pcf)	Gamma m. (pcf)	ϕ (deg)	δ (deg)	ka	kp	kae	ko
1	Fill	128	125	32	24	0.31	7.0	0.29	#REF!
2	Gravel	132	128	34	24	0.28	7.7	0.27	#REF!
3	Till	132	128	34	24	0.28	7.7	0.27	#REF!
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Notes

1) See attached Table 1 - summary of soil properties
2) Evaluated using equation A - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
3) Evaluated using equation E - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
4) Evaluated using equation B - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
5) See active earth pressure coefficient calculation sheet
6) Evaluated using equation C - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
7) See attached friction factors table
8) Evaluated using equation G - See Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces
9) Evaluated using equations in the attached Strip Load Formulae for Vertical and Lateral Pressure from Live Load Surcharge

Calculations:

Geostatic Pressure											Active Earth Pressure (EP) & Force (Reference Bottom Layer Depth)						Surcharge (Y Direction) & Force			Surcharge (X Direction) & Force			Total
Layer	Layer Top Depth z (ft)	Layer Bottom Depth z (ft)	Layer Top El. (ft)	Layer Bottom El. (ft)	Sat (or Moist) Unit Weight γ_{sat} (γ_m) (pcf)[1]	Total Vertical Stress Top of Sublayer σv (psf)[2]	Total Vertical Stress Bottom of Sublayer σv (psf)[2]	GW Pressure σw (psf)[3]	Vertical Effective Stress Top of Sublayer σ'v (psf)[4]	Vertical Effective Stress Bottom of Sublayer σ'v (psf)[4]	ka[1][5]	Active EP Top of Layer σa (psf)[6]	Active EP Bottom Layer σa (psf)[6]	Average Active EP σa AV (psf)	Iinterface friction angle δ (deg)[7]	Horizontal Active Force from EP Pa (lb/ft)	Horizontal Pressure from Surcharge Top of Layer σy (psf)[9]	Horizontal Pressure from Surcharge Bot. of Layer σy (psf)[9]	Horizontal Force from Surcharge (Y-Direct) Psy (lb/ft)	Horizontal Pressure from Surcharge Top of Layer σx (psf)[9]	Horizontal Pressure from Surcharge Bot. of Layer σx (psf)[9]	Horizontal Force from Surcharge (X-Direct) Psx (lb/ft)	Total Horizontal Force-Active Side (Kip/ft) Ptot
Fill		0.0														0		578.3	0	0.0		0	0.0
Fill	0.0	2.0	20.0	18.0	125	0	250	0	0	250	0.31	0	77	38	24	70	578.3	578.3	1157	0.0		0	1.2
Fill	2.0	4.0	18.0	16.0	125	250	500	0	250	500	0.31	77	154	115	24	281	578.3	578.3	2313	0.0		0	2.6
Fill	4.0	6.0	16.0	14.0	125	500	750	0	500	750	0.31	154	230	192	24	632	578.3	578.3	3470	0.0		0	4.1
Fill	6.0	8.0	14.0	12.0	125	750	1000	0	750	1000	0.31	230	307	269	24	1123	578.3	578.3	4626	0.0		0	5.7
Fill	8.0	10.0	12.0	10.0	125	1000	1250	0	1000	1250	0.31	307	384	346	24	1754	578.3	578.3	5783	0.0		0	7.5
Fill	10.0	12.0	10.0	8.0	125	1250	1500	0	1250	1500	0.31	384	461	422	24	2526	578.3	578.3	6939	0.0		0	9.5
Fill	12.0	14.0	8.0	6.0	125	1500	1750	0	1500	1750	0.31	461	538	499	24	3439	578.3	578.3	8096	0.0		0	11.5
Gravel	14.0	15.0	6.0	5.0	132	1750	1882	0	1750	1882	0.28	495	532	513	24	3908	532.1	532.1	8628	0.0		0	12.5
Gravel	15.0	16.0	5.0	4.0	132	1882	2015	62	1882	1952	0.28	532	552	542	24	4403	532.1	532.1	9160	0.0		0	13.6
Gravel	16.0	28	4.0	-8.0	132	2015	3603	811	1952	2791	0.28	552	789	671	24	11754	532.1	532.1	15545	0.0		0	27.3
Till	28.0	33	-8.0	-13.0	132	3603	4264	1123	2791	3141	0.28	789	888	839	24	15584	532.1	532.1	18205	0.0		0	33.8
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

Project: Housatonic Railroad Line Improvements - Bridge 77.28
Project Location: Lee, MA
Calculated by: MR Checked by: RTL
Date 2/6/2025 Date: 2/19/2025
Detail **EVALUATION OF FS AGAINST SLIDING**

Toe and Heel Backfill Conditions (Cantilev. Only)	
γ-m compacted heel backfill (pcf)	0
γ-tot compacted heel backfill (pcf)	0
Layer submerged	no
Submerged Height (ft)	0
interface friction delta at wall (-)	0
interface friction angle (deg)	0.0
γ-m compacted toe backfill (pcf)	0
γ-tot compacted toe backfill (pcf)	0
Layer submerged	no
Submerged Height (ft)	0
interface friction delta at wall (-)	0.5
interface friction angle (deg)	26.6

Wall Unit Weight and Friction Coefficient	
γ wall (pcf)	150
interface friction delta at base (-) MRE 5.4.2b	0.45

Relevant Wall Geometry	
Wall Type	Gravity
Wall Hight H (ft)	16.0
Wall base width B (ft)	5.0
Wall top width b (ft)	5.0
Wall base length L (ft)	32.5
Wall base thickness - t (ft) (Cantilev. Only)	NA
Stem height h (ft) (Cantilev. Only)	NA
Wall stem thick-base t1 (ft) (Cantilev. Only)	NA
Wall stem thick-top t2 (ft) (Cantilev. Only)	NA
toe length - lt (ft) (Cantilev. Only)	NA
heel length - lh (ft) (Cantilev. Only)	NA
Thickness of soil on toe (ft) (Cantilev. Only)	NA
depth of excavation (for SOE only) (ft)	NA
unit volume of heel b/f (cf/ft) (Cantilev. Only)	NA
unit volume of toe b/f (cf/ft) (Cantilev. Only)	NA
unit volume of wall (cf/ft)	80.0
Wall stem slope θ (deg)	90.0
Wall backfill slope β (deg)	0.0

Pressures from Pressure Diagrams - Active Side		
Top of Active pr. diag. (ft)	0	Depth to top of Active pressure diagram
Bottom of Active pr. diag. (ft)	16	Depth to bottom of Active pressure diagram
Top of YSurch. pr. diag. (ft)	0	Depth to top of Surcharge pressure diagram - Y direction (perpendicular to wall)
Bottom of YSurch. pr. diag. (ft)	16	Depth to bottom of Surcharge pressure diagram - Y direction (perpendicular to wall)
Top of XSurch. pr. diag. (ft)	0	Depth to top of Surcharge pressure diagram - X direction (parallel to wall)
Bottom of XSurch. pr. diag. (ft)	16	Depth to bottom of Surcharge pressure diagram - X direction (parallel to wall)
σs top-X (psf)	15	Depth to top of GW pressure diagram
σs bot-X (psf)	16	Depth to bottom of GW pressure diagram

Pressures from Pressure Diagrams - Passive Side		
σp (psf)	0	Neglect passive
Hp (ft)	0	Height of the passive pressure diagram

Acting Forces (A)		
Pa (lb/ft)	4604	Active Force from EP (lb/ft) - (incluned of d on the back of the wall)
Ph (lb/ft)	4403	Horizontal Active Force from EP (lb/ft) - accounts for wall interface friction and wall stem slope
Qy (lb/ft)	9160	Horizontal Force from Surcharge (perpendicular to wall) (lb/ft)
Qx (lb/ft)	0	Horizontal Force from Surcharge (parallel to wall) (lb/ft)
GWa (lb/ft)(#)	31	GW force on active side

Resisting Forces (R)		
Pp (lb/ft)		Neglect passive
GWp (lb/ft)(#)		GW force on passive side
T=N x tan δ (lb/ft)	5260	Summary of Friction force along the wall base (see below)
Ta (lb/ft)	15100	Total horizontal force from anchors to provide FS=1.5

Reaction under wall base - **perpendicular to wall base**		
Ww (lb/ft)	12000	Weight of wall
Wh (lb/ft)	0	Weight of heel backfill
Wt-n (lb/ft)	0	Weight of toe backfill
GWup (lb/ft)(#)	312	Uplift force from GW pressure below the base of the wall (up)
Nn (lb/ft)	11688	Total horizontal force from anchors to provide FS=1.5. This force is obtained by trial and error until a FS=1.5 is obtained in the equilinrium calculations.

Equilibrium		
ΣA (lb/ft)=	13594	
ΣR (lb/ft)=	20360	
FS Slide (-)=	1.50	Sliding FS - The passive pressure is neglected as prescribed by Section 5.4.2b of AREMA MRE
		Any possible bridge superstructure reaction also neglected in calculations

Notes

(#) GW pressure is "all-around" and always acting perpendicular to wall surface

Housatonic Railroad Line Improvements - Bridge 77.28
Lee, MA
Log Spiral Plot and Coulomb Equation

Kp - Log Spiral Plot

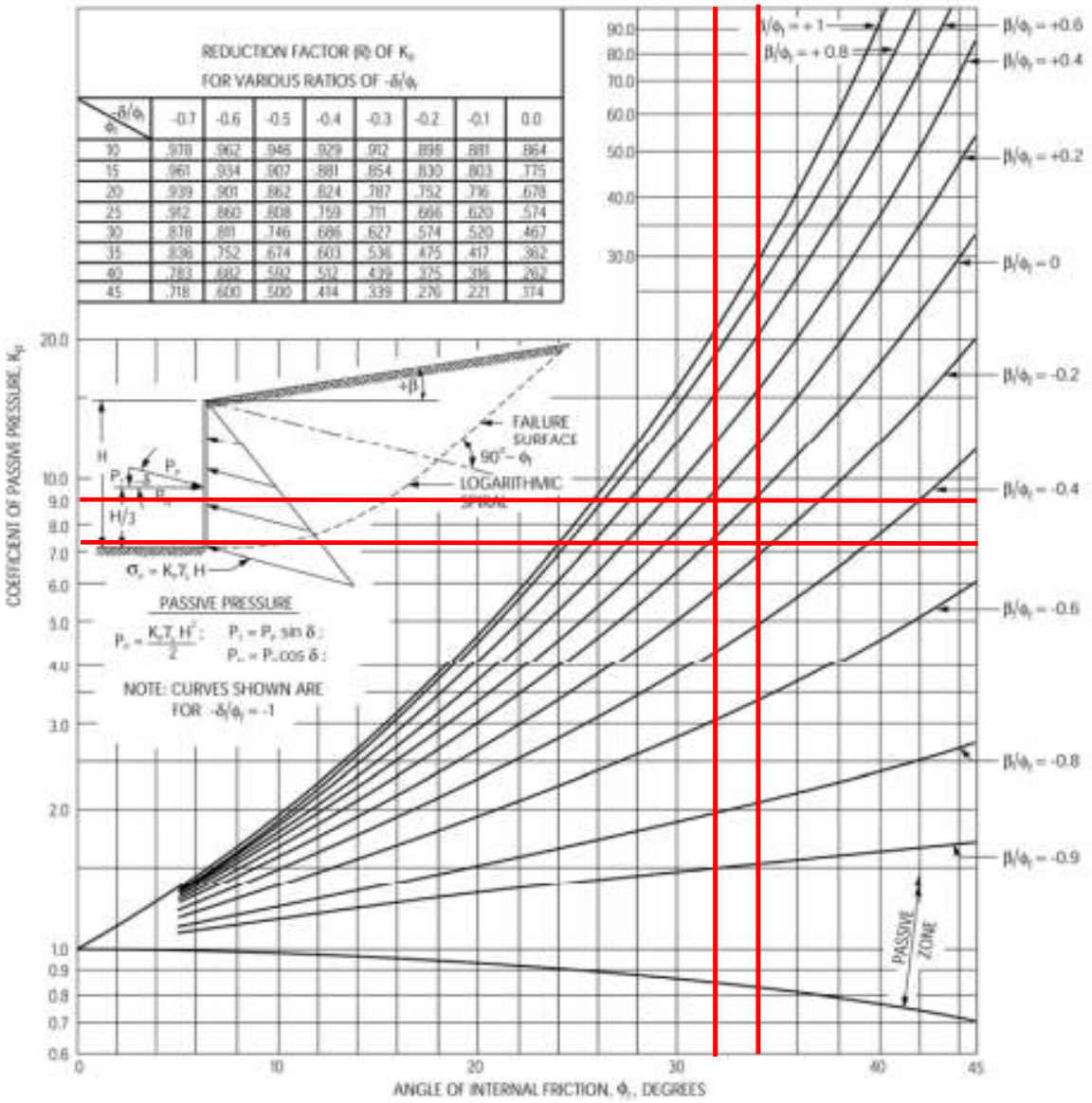


Figure 2.3. Coefficients for active and passive earth pressure using log spiral method (Caquot and Kerisel 1948)

Summary of Geostatic Pressure Formulae and Pressures and Lateral Forces

Project: Housatonic Railroad Line Improvements - Bridge 77.28
Location: Lee, MA
Calculated By: MR **Date:** 2/6/2025
Checked By: RTL **Date:** 2/19/2025

Formulae used to evaluate the geostatic pressure and resultant forces are as follows:

$\sigma_v = \gamma z$ σ_v = Total Vertical stress — Equation (A)
z = depth below the footing
γ = total unit weight

$\sigma'_v = \gamma' z$ σ'_v =Effective Vertical pressure — Equation (B)
z = depth below the footing
γ' = effective unit weight

$\sigma_a = \sigma'_v K_a$ σ'_a =Active pressure — Equation (C)
k_a = active pressure coefficient
$k_a = \tan^2(45 + \phi'/2)$ - Rankine Theory

$\sigma_p = \sigma'_v K_p$ σ'_p =Passive pressure — Equation (D)
k_p = passive pressure coefficient
k_p = obtained from log spiral - see plot

$\sigma_W = \gamma_w H$ σ_{GW} = Groundwater pressure — Equation (E)
H=Groundwater depth
γ_w = Weight of water=62.43 pcf

GW= 1/2 σ_{GW} H — Equation (F)
GW= groundwater force
Pa = 1/2 σa Ha — Equation (G)
Pa = Active force
Ha = Height of active pressure diagram
Pp = 1/2 σp Hp — Equation (H)
Pp = Passive force
Hp = Height of passive pressure diagram

Psy = 1/2 (σy-top + σy-bott) x Hsy — Equation (I)
Psy = Resultant force from surcharge y-direction
Hsy = Height of surcharge pressure diagram

Psx = 1/2 (σx-top + σx-bott) x Hsx — Equation (J)
Psx = Resultant force from surcharge y-direction
Hsx = Height of surcharge pressure diagram

Ptot = Sum of all active, passive and surcharge resultant forces — Equation (K)

Strip Load Formulae for Vertical and Lateral Pressure from Live Load Surcharge

Project: Housatonic Railroad Line Improvements - Bridge 77.28
Location: Lee, MA
Calculated By: MR Date: 2/6/2025
Checked By: RTL Date: 2/19/2025

Formulae used to evaluate the vertical and lateral pressure from live load surcharge onto the existing wall are as follows:

3.1.1 UNIFORM VERTICAL LOADING (Fig.3.1)

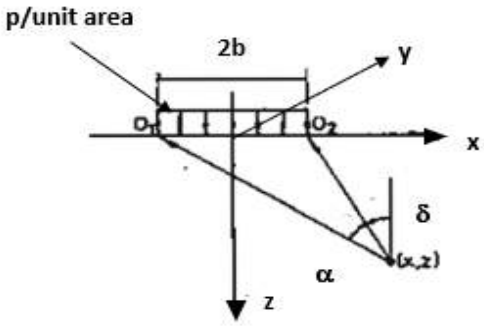
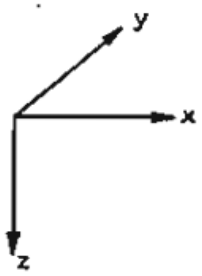


FIG. 3.1



$$\sigma_z = \frac{p}{\pi}[\alpha + \sin\alpha \cos(\alpha+2\delta)] \quad \ldots (3.1a)$$

$$\sigma_x = \frac{p}{\pi}[\alpha - \sin\alpha \cos(\alpha+2\delta)] \quad \ldots (3.1b)$$

$$\sigma_y = \frac{2p}{\pi}\nu\alpha \quad \ldots (3.1c)$$

$$\tau_{xz} = \frac{p}{\pi}\sin\alpha \sin(\alpha+2\delta) \quad \ldots (3.1d)$$

$$\sigma_1 = \frac{p}{\pi}[\alpha + \sin\alpha] \quad \ldots (3.1e)$$

$$\sigma_3 = \frac{p}{\pi}[\alpha - \sin\alpha] \quad \ldots (3.1f)$$

$$\tau_{max} = \frac{p}{\pi}\sin\alpha \quad \ldots (3.1g)$$

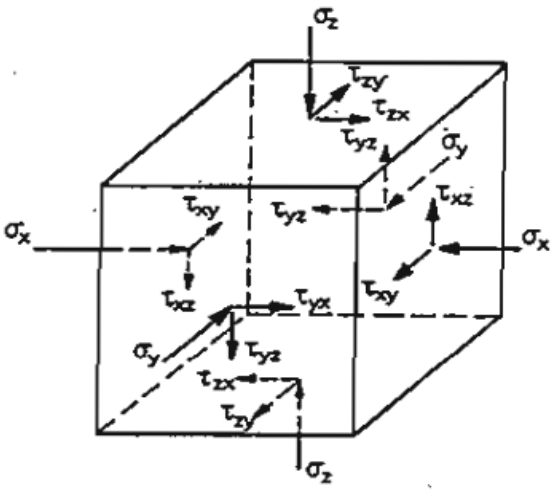


FIG. 1.1

Active Earth Pressure Coefficient

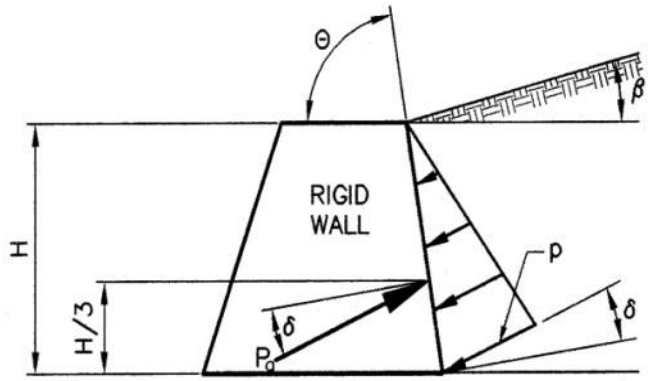
Project: Housatonic Railroad Line Improvements - Bridge 77.28
Location: Lee, MA
Calculated By: MR **Date:** 2/6/2025
Checked By: RTL **Date:** 2/19/2025

Objective: Evaluate the active earth pressure coefficient using Coulomb Equation.
References: 1) Soil Mechanics in Engineering Practice - Terzaghi, Peck and Mesri
2) AASHTO LRFD Bridge Specifications
Assumptions: Assume gravel Borrow backfill.

Layer No.	Layer ID	Phi (deg)	Phi (rad)	Interface friction δ (deg)	Interface friction δ (rad)	δ/ϕ	Ka (-) Coulomb	Ka (-) Rankine
1	Fill	32	0.559	24	0.419	0.750	0.27	0.31
2	Gravel	34	0.593	24	0.419	0.706	0.25	0.28
3	Till	34	0.593	24	0.419	0.706	0.25	0.28
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-

	Deg	Rad
β	0	0.00
θ	90	1.57

Coulomb Formula for Ka, coefficient of active pressure



$$k_a = \frac{\sin^2(\theta+\phi'_f)}{\Gamma[\sin^2\theta\sin(\theta-\delta)]}$$

in which:

$$\Gamma = \left[1+\sqrt{\frac{\sin(\phi'_f+\delta)\sin(\phi'_f-\beta)}{\sin(\theta-\delta)\sin(\theta+\beta)}}\right]^2$$

Rankine Formula for Ka, coefficient of active pressure

$k_a = \tan^2(45 + \phi'/2)$

Housatonic Railroad Line Improvements - Bridge 77.28
Lee, MA
FRICTION FACTORS TABLE - NAVFAC 1982

Table C3.11.5.3-1—Friction Angle for Dissimilar Materials (U.S. Department of the Navy, 1982a)

Interface Materials	Friction Angle, δ (degrees)	Coefficient of Friction, tan δ (dim.)
Mass concrete on the following foundation materials:		
• Clean sound rock	35	0.70
• Clean gravel, gravel-sand mixtures, coarse sand	29 to 31	0.55 to 0.60
• Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	24 to 29	0.45 to 0.55
• Clean fine sand, silty or clayey fine to medium sand	19 to 24	0.34 to 0.45
• Fine sandy silt, nonplastic silt	17 to 19	0.31 to 0.34
• Very stiff and hard residual or preconsolidated clay	22 to 26	0.40 to 0.49
• Medium stiff and stiff clay and silty clay	17 to 19	0.31 to 0.34
Masonry on foundation materials has same friction factors.		
Steel sheet piles against the following soils:		
• Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	22	0.40
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17	0.31
• Silty sand, gravel or sand mixed with silt or clay	14	0.25
• Fine sandy silt, nonplastic silt	11	0.19
Formed or precast concrete or concrete sheet piling against the following soils:		
• Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	22 to 26	0.40 to 0.49
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17 to 22	0.31 to 0.40
• Silty sand, gravel or sand mixed with silt or clay	17	0.31
• Fine sandy silt, nonplastic silt	14	0.25
Various structural materials:		
• Masonry on masonry, igneous and metamorphic rocks:		
○ dressed soft rock on dressed soft rock	35	0.70
○ dressed hard rock on dressed soft rock	33	0.65
○ dressed hard rock on dressed hard rock	29	0.55
• Masonry on wood in direction of cross grain	26	0.49
• Steel on steel at sheet pile interlocks	17	0.31

99 High Street Suite 2300
Boston, MA 02110
Telephone: 617.357.7700

BORING NUMBER B-77-1

CLIENT MassDOT Rail Division
PROJECT NAME Berkshire Line Improvements
PROJECT NUMBER 10370244
PROJECT LOCATION Lee and Lenox, MA
NORTH 2949237 **EAST** 185132
DATE STARTED 1/8/25 **COMPLETED** 1/9/25
STATION --- **OFFSET** ---
GROUND ELEVATION _____ **CASING SIZE (IN)** 4 (ID)
DRILLING CO. New England Boring Co. **DRILLER** Z. Ohman
GROUND WATER LEVELS:
DRILLING METHOD Drive & Wash **SPT HAMMER TYPE** Safety
AT TIME OF DRILLING 15.0 ft measured with casing to 24 ft
LOGGED BY R. Manson, EIT **CHECKED BY** R. Lavorati, PE
AT END OF DRILLING ---
NOTES Behind bridge 77.28 south abutment. Top sample frozen due to freezing temperatures
AFTER DRILLING ---

DEPTH (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Other Tests	Remarks
0			Black GRAVEL, little fine to coarse Sand, trace Silt, medium dense, dry [Ballast]	SPT 1	29	19-12-9-12 (21)		Ground surface elevation defined as the top of the railroad tie.
5			Brown fine to coarse SAND, some Gravel, little Silt, medium dense, moist	SPT 2	50	7-7-9-8 (16)		
10			Brown fine to coarse SAND, some Gravel, little Silt, medium dense, moist	SPT 3	33	6-5-5-5 (10)		
15			▽ Brown fine to coarse SAND, some Gravel, little Silt, trace roots/wood, medium dense, wet	SPT 4	21	14-7-7-9 (14)		Roots and buried vegetation indicate likely bottom of fill layer.
20			Brown GRAVEL, some fine to coarse Sand, trace Silt, medium dense, wet	SPT 5	13	19-8-10-10 (18)		
25			Brown GRAVEL, little fine to coarse Sand, trace Silt, medium dense, wet	SPT 6	42	18-10-8-8 (18)		
30			Brown GRAVEL and fine to coarse Sand, some Silt, very dense, wet	SPT 7	92	43-23-50/1 (50/1)		Strata change at 28 ft inferred based on casing advancment difficulty.
			Weathered Rock	SPT 8	63	52-50/2 (50/2)		Borehole backfilled with cuttings at the end of drilling.
			Bottom of borehole at 33.7 feet.					

Latitude: Longitude:

GEOTECH BH WTT - GINT STD US LAB.GDT - 1/22/25 09:25 - C:\USERS\RMANSON\ONEDRIVE - HDR, INC\DESKTOP\PROJECTS\HOUSATONIC RAILROAD\BORING LOGS\BERKSHIRE LINE IMPROVEMENTS.GPJ

APPENDIC C.3

SEISMIC SITE CLASS

Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

Objective: Evaluate the seismic coefficients using AREMA procedures .

References: 1) AREMA Chapter 9 Section 1.3.1 to 1.3.2
2) USGS Unified Hazard Web Tool
3) Railroad information provided by MassDOT

Analysis: 1. Evaluate Immediate Safety, Immediate Value, and Replacement Value coefficients for each bridge.
2. Apply multipliers for servicability, ultimate, and survivability limit states before obtaining sum values for each level.
3. Evaluate the return periods for each level in accordance with AREMA.
4. Use bridge location and USGS Unified Hazard Tool to determine PGA, and responses at 0.2 seconds and 1 second.
5. Modify USGS Hazard Tool Results using FPGA, Fa, and Fv determined from tables found in AREMA Article 1.4.4.1.2 for Site Class C

Results: Results of the seismic analysis are summarized in the table below:

	Limit State	Return period (yr)	PGA	0.2 sec	1.0 sec
Bridge 76.23	Serviceability	190	0.02328	0.04944	0.01955
	Ultimate	743	0.05148	0.10500	0.04369
	Survivability	2475	0.10020	0.19080	0.07922

	Limit State	Return period (yr)	PGA	0.2 sec	1.0 sec
Bridge 77.28	Serviceability	190	0.02328	0.04956	0.01955
	Ultimate	743	0.05160	0.10512	0.04369
	Survivability	2475	0.10032	0.19104	0.07939

Conclusions: Once the seismic coefficients have been determined, the structural engineer should perform the required calculations with seismic loads determined by this analysis.

Attach.: 1) Return Period Calculations - Bridge 76.23 and Bridge 77.28
2) USGS Unified Hazard Web Tool Results
3) Reference Pages from AREMA

Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

Immediate Safety (IS)	Occupancy Factor	1
	Hazardous Material Factor	1
	Community Lifelines Factor	1
		3

Immediate Value (IV)	RR Utilization Factor	2
	Detour Availability Factor	1
		2

Replacement Value (RV)	Span Length Factor	1
	Bridge Length Factor	1
	Bridge Height Factor	0.75
		0.75

Serviceability		Multipliers	
IS	3	0.8	2.4
IV	2	0.2	0.4
RS	0.75	0	0
			2.8

Ultimate		Multipliers	
IS	3	0.1	0.3
IV	2	0.8	1.6
RS	0.75	0.1	0.075
			1.975

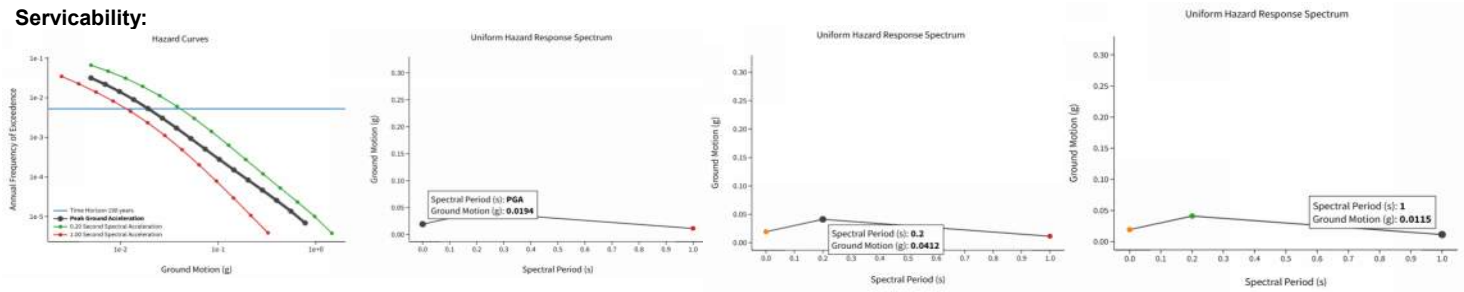
Survivability		Multipliers	
IS	3	0	0
IV	2	0.2	0.4
RS	0.75	0.8	0.6
			1

USGS Data Summary - See Figures Below

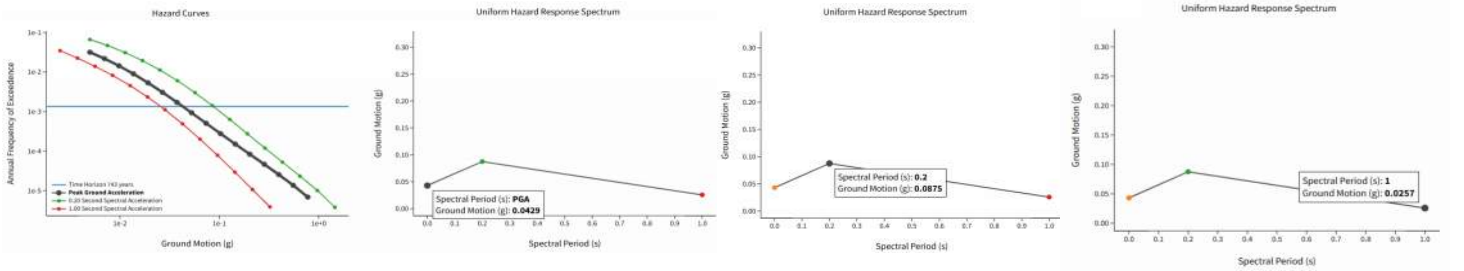
	Return period	PGA	0.2 sec	1.0 sec
Serviceability	190	0.0194	0.0412	0.0115
Ultimate	743	0.0429	0.0875	0.0257
Survivability	2475	0.0835	0.1590	0.0466

USGS Data Output Charts - Based on Lat: 42.314 deg, Long: -73.247 deg

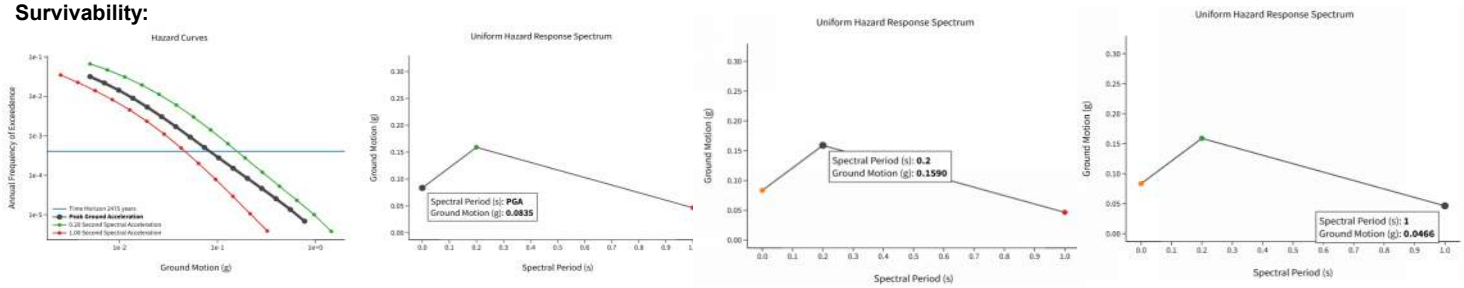
Servicability:



Ultimate:



Survivability:



Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

Modification Factors per AREMA Article 1.4.4.1.2 Tables 9.1.7, 9.1.8, and 9.1.9

Site Class: C

	Return period	FPGA	Fa (Ss/0.2 sec)	Fv (S1/1.0 sec)
Serviceability	190	1.2	1.2	1.7
Ultimate	743.125	1.2	1.2	1.7
Survivability	2475	1.2	1.2	1.7

Modified Seismic Parameters

	Return period	PGA	0.2 sec	1.0 sec
Serviceability	190	0.0233	0.0494	0.0196
Ultimate	743	0.0515	0.105	0.0437
Survivability	2475	0.100	0.191	0.0792

Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

Immediate Safety (IS)	Occupancy Factor	1
	Hazardous Material Factor	1
	Community Lifelines Factor	1
		3

Immediate Value (IV)	RR Utilization Factor	2
	Detour Availability Factor	1
		2

Replacement Value (RV)	Span Length Factor	1
	Bridge Length Factor	1
	Bridge Height Factor	0.75
		0.75

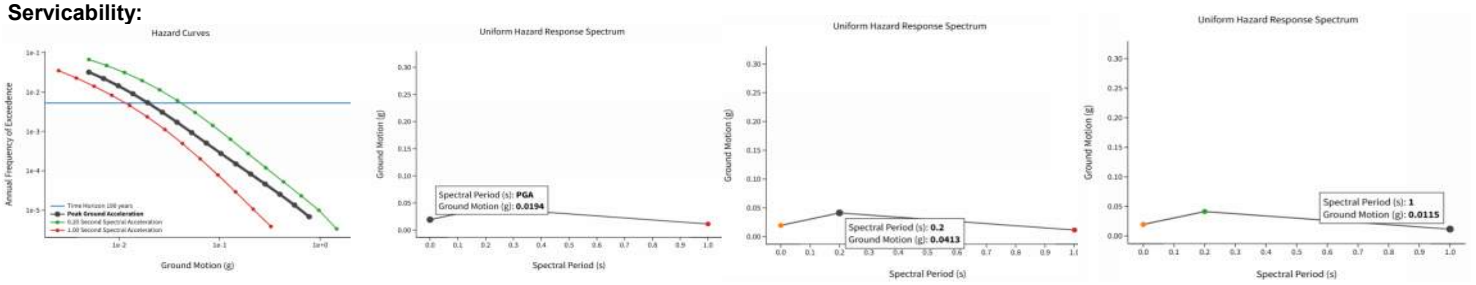
Serviceability		Multipliers	
	IS	3	0.8	2.4
	IV	2	0.2	0.4
	RS	0.75	0	0
				2.8
Ultimate		**Multipliers**	
	IS	3	0.1	0.3
	IV	2	0.8	1.6
	RS	0.75	0.1	0.075
				1.975
Survivability		**Multipliers**	
	IS	3	0	0
	IV	2	0.2	0.4
	RS	0.75	0.8	0.6
				1

USGS Data Summary - See Figures Below

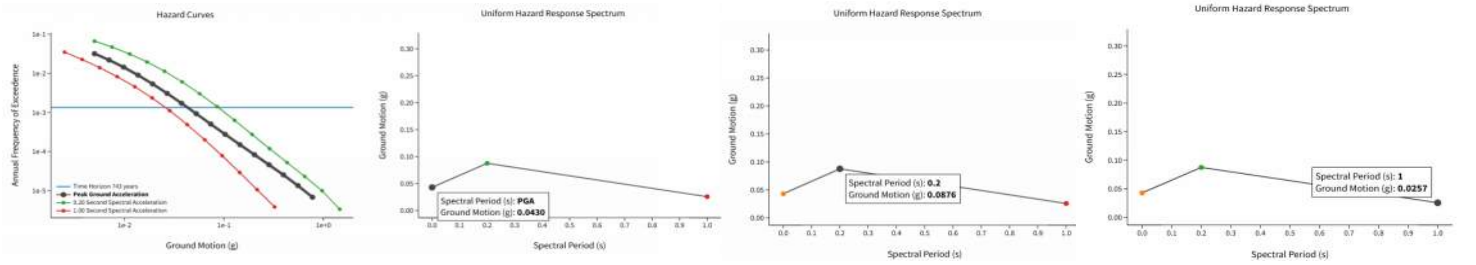
	Return period	PGA	0.2 sec	1.0 sec
Serviceability	190	0.0194	0.0413	0.0115
Ultimate	743	0.0430	0.0876	0.0257
Survivability	2475	0.0836	0.1592	0.0467

USGS Data Output Charts - Based on Lat: 42.328 deg, Long: -73.242 deg

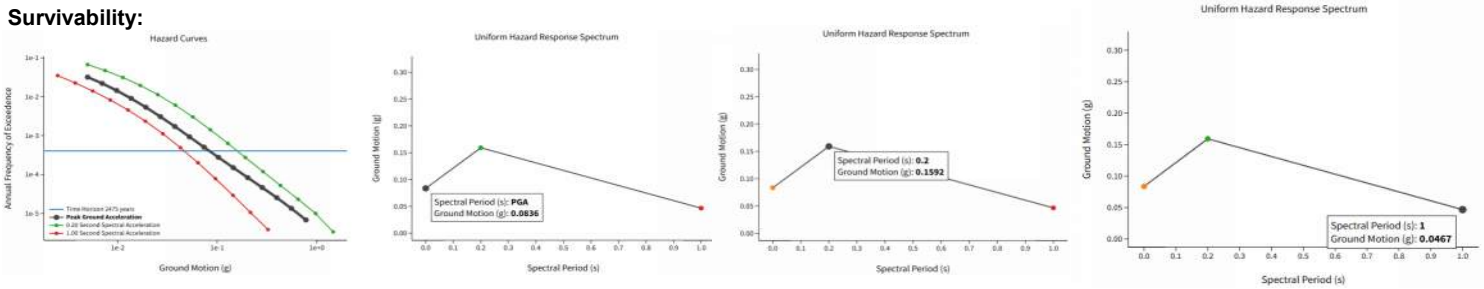
Servicability:



Ultimate:



Survivability:



Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

Modification Factors per AREMA Article 1.4.4.1.2 Tables 9.1.7, 9.1.8, and 9.1.9

Site Class: C

	Return period	FPGA	Fa (Ss/0.2 sec)	Fv (S1/1.0 sec)
Serviceability	190	1.2	1.2	1.7
Ultimate	743	1.2	1.2	1.7
Survivability	2475	1.2	1.2	1.7

Modified Seismic Parameters

	Return period	PGA	0.2 sec	1.0 sec
Serviceability	190	0.0233	0.0496	0.0196
Ultimate	743	0.0516	0.105	0.0437
Survivability	2475	0.100	0.191	0.0794

Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

References from AREMA

1.3.2.2.1 Immediate Safety[2]

Immediate safety is a measure of the magnitude of earthquake a structure should be able to survive without any interruption of service. Factors to be considered are occupancy, hazardous material and community life lines. These factors should be summed to obtain the immediate safety factor. The immediate safety factor should not exceed 4.

a. Occupancy Factor

Freight Service only. 1
Less Than 10 Passenger Trains per Day 2
More than 10 Passenger Trains per Day 4

b. Hazardous Material Factor

The value of the hazardous material factor should be determined by the engineer by considering the type of material being handled, the volume and the proximity of the structure to population. The hazardous material factor should be a value between 0 and 4.

c. Community Life Lines Factor

The community life line factor should reflect the danger to community if the structure fails during a seismic event. The community life line factor should be a value between 0 and 4. The nature of the structure should be taken into account when determining the community life line factor. If the structure is over a route that is critical for post seismic evacuation, a high community life line factor should be used. A high community life line factor should also be used when the structure is over a community's water supply. The potential disruption of telephone, electric, and water lines attached to the bridge and the importance of continued rail service should also be considered when determining the community life line factor.

1.3.2.2.2 Immediate Value[1]

Immediate Value is a measure of the magnitude of earthquake a structure should be able to survive with an interruption of service but with the ability to return to service after minor repairs. The factor is based on the railroad's utilization of the structure and the ability to detour around the structure. The utilization of the structure by others should also be taken into account.

a. Railroad Utilization Factor

Under 10 million gross tons annual traffic. 1
Between 10 million and 50 million gross tons annual traffic 2
Over 50 million gross tons annual traffic 4

b. Detour Availability Factor

No Detour Available. 1.00
Inconvenient Detour Route 0.50
Detour Route Readily Available. 0.25

The Immediate Value factor should be determined by multiplying the railroad utilization factor by the detour availability factor. Usage by outside parties should be taken into account after this railroad utilization and detour availability is taken into account.

Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

1.3.2.2.3 Replacement Value[2]

Replacement value is a measure of the magnitude of the ultimate earthquake the structure should be able to survive. The factor is determined by the difficulty of replacing the structure.

a. Span Length Factor

Span length less than 35 feet 1
Span length between 35 feet and 125 feet 2
Span length between 125 feet and 250 feet 3
Span length greater than 250 feet 4

b. Bridge Length Factor

Bridge length less than 100 feet 1.0
Bridge length between 100 feet and 1,000 feet 1.5
Bridge length greater than 1,000 feet 2.0

c. Bridge Height Factor

Bridge height less than 20 feet 0.75
Bridge height between 20 feet and 40 feet 1.00
Bridge height greater than 40 feet 1.25

The replacement value factor is determined by multiplying the span length, bridge length and bridge height factors, but should not exceed 4.0. The replacement value should be increased for conditions that would increase the difficulty of replacement such as multiple track, movable structures, difficult foundation and substructure reconstruction conditions, urban location and difficult access.

1.3.2.2.4 Conversion of Factors to Return Periods

The importance classification factor for each limit state is calculated using the following weighting factors. Individual railroads may decide to change the weighting factors to better represent the conditions that they operate under.

Table 9-1-5. Weighting Factors

Weighting Factors			Limit State
Immediate Safety	Immediate Value	Replacement Value	
0.80	0.20	0.00	Serviceability
0.10	0.80	0.10	Ultimate
0.00	0.20	0.80	Survivability

Seismic Parameter Evaluation

Project: MassDOT Berkshire Line Improvements
Location: Lee, MA
Calculated By: RM **Date:** 2/20/2025
Checked By: RL **Date:** 2/21/2025

1.4.4.1.2 Site Factors[1]

Site factors shall be determined from Table 9-1-7 through Table 9-1-11 based on the Site Class determined from Table 9-1-6 and the values of the acceleration coefficients. Separate tables are provided for United States Geological Survey (USGS) and Geological Survey of Canada (GSC) based accelerations and must be used accordingly.

Table 9-1-7. USGS Site Factor, F_{pga}

USGS Site Class	Peak Ground Acceleration Coefficient (PGA)[1]				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F[2]	*	*	*	*	*

Notes:
[1]Use straight-line interpolation for intermediate values of PGA.
[2]Site-specific hazard analysis should be performed for all sites in Site Class F.

Table 9-1-8. USGS Site Factor, F_a

USGS Site Class	Spectral Acceleration Coefficient at 0.2 second period (S_s)[1]				
	$S_s \leq$ 0.25	$S_s =$ 0.50	$S_s =$ 0.75	$S_s =$ 1.00	$S_s \geq$ 1.25
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F[2]	*	*	*	*	*

Notes:
[1]Use straight-line interpolation for intermediate values of S_s.
[2]Site-specific hazard analysis should be performed for all sites in Site Class F.

Table 9-1-9. USGS Site Factor, F_v

USGS Site Class	Spectral Acceleration Coefficient at 1.0 second period (S_1)[1]				
	$S_1 \leq$ 0.10	$S_1 =$ 0.20	$S_1 =$ 0.30	$S_1 =$ 0.40	$S_1 \geq$ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F[2]	*	*	*	*	*

Notes:
[1]Use straight-line interpolation for intermediate values of S_1.
[2]Site-specific hazard analysis should be performed for all sites in Site Class F.

DOCUMENT A00904

TRAFFIC MANAGEMENT PLAN

THIS PAGE IS INTENTIONALLY LEFT BLANK

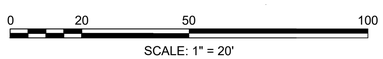
TRAFFIC MANAGEMENT PLAN FOR BR. 85.52

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
2. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
7. THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET (3.3m) UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

TEMPORARY TRAFFIC CONTROL SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)			COLOR			UNIT AREA (S.F.)
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.	BACK-GROUND	LEGEND	BORDER	
W1-4L	36"	36"		AS PER MASSDOT STANDARDS			FLUOR-ESCENT ORANGE	BLACK	BLACK	9.00
W1-4R	36"	36"		AS PER MASSDOT STANDARDS			FLUOR-ESCENT ORANGE	BLACK	BLACK	9.00
W5-1	36"	36"		AS PER MASSDOT STANDARDS			FLUOR-ESCENT ORANGE	BLACK	BLACK	9.00



SCALE: 1" = 20'

PEDESTRIAN RAMP 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 SLOP 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. DETECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
5. CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
6. THE CURB RAMP WALKWAY EDGE SHALL BE MARKED WITH A CONTRASTING COLOR 2 TO 4 IN. WIDE MARKING. THE MARKING IS OPTIONAL WHERE COLOR CONTRASTING EDGING IS USED.
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.

LEGEND

S	TRAFFIC SIGNAL
	REFLECTORIZED DRUM
	TEMPORARY CONSTRUCTION SIGN
	WORK AREA (PUBLIC ACCESS RESTRICTED)
	TRANSITION/BUFFER AREAS
	TRAFFIC FLOW
	PEDESTRIAN ROUTE
	TEMPORARY PRECAST MEDIAN BARRIER
	TEMPORARY CURB RAMP - PARALLEL TO CURB
	IMPACT ATTENUATOR

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO.

REHABILITATION OF BRIDGE 85.52
OVER WEST HOUSATONIC STREET
TEMPORARY TRAFFIC CONTROL PLAN
GENERAL NOTES, LEGEND, AND SIGN SUMMARY

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation Rail & Transit Division

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 3/3/2025	BENCE KOVACS	BENCE KOVACS	HUGH NEENAN	SHEET: TR-01	

0 40 100 160

SCALE: 1" = 40'

ISSUE	DATE	DESCRIPTION	BY	CHKD	APP.

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO.

REHABILITATION OF BRIDGE 85.52
OVER WEST HOUSATONIC STREET
TEMPORARY TRAFFIC CONTROL PLAN
SOUTHERN WORK ZONE

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT Massachusetts Department of Transportation
Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 3/3/2025	BENCE KOVACS	BENCE KOVACS	HUGH NEENAN	SHEET: TR-02	

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS
CONTRACT NO.

REHABILITATION OF BRIDGE 85.52
OVER WEST HOUSATONIC STREET
TEMPORARY TRAFFIC CONTROL PLAN
NORTHERN WORK ZONE

ISSUE	DATE	DESCRIPTION	BY	CHKD	APP.

HDR, INC.
99 HIGH STREET, SUITE 2300
BOSTON, MA 02110
(617) 357-7700

massDOT
Massachusetts Department of Transportation
Rail & Transit Division

SCALE:	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: 3/3/2025	BENCE KOVACS	BENCE KOVACS	HUGH NEENAN	SHEET: TR-03	

DOCUMENT B00420

PROPOSAL

For: MASSDOT BERKSHIRE LIVE CIVIL IMPROVEMENTS
COMMONWEALTH OF MASSACHUSETTS
LOCATION:
LEE, LENOX AND PITTSFIELD, MA

The contract prices shall include the furnishing of all materials (except as otherwise herein specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction, the doing of all the abovementioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof within **[540] CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the completion date falls between December 1st and March 15th then the same number of days beyond December 1st will be extended after March 15th. The Work of this Project is described by the following Items and quantities

The undersigned, identified as Bidder, declares that Bidder has carefully reviewed and examined the Contract Documents including Notice to Bidders, Bid Form, Special Provisions, General Contract Provisions, Schedule of Prevailing Wage Rates, Housatonic Railroad Timetable, Housatonic Railroad on Track Safety Manual, Housatonic Railroad Company Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR as Required by 49 CFR 213.118, MassDOT MW-1, Environmental Permits, Plans and other supporting documents (including Addenda thereto), and that Bidder has examined the site upon which the Project Work is to be performed.

After review of all Contract Documents and attesting to understanding and acceptance of same, the undersigned Bidder proposes to furnish all necessary labor, materials (other than those materials stipulated in the Special Provisions as being furnished by Owner), equipment, machinery and tools required to complete the Work as described and specified in the Contract Documents. Bidder understands and agrees that current prevailing wage rates are to be paid in accordance with applicable laws, the General Contract Provisions, and as set forth in this Bid Form.

This proposal includes a bid deposit in the amount of 5% of the Total Amount of Bid identified herein.

In submitting this Bid, Bidder represents that:

1. Bidder has examined copies of all the Contract Documents, including the Addenda thereto:

2. Bidder has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules, and regulations) and the conditions affecting cost, progress, or performance of the Work, and has made such independent investigations as Bidder deems necessary to complete this Bid and carry out the Work in accordance therewith.

3. The Bid is based on the prevailing wage rates identified for the Work to be performed as set forth in the Contract Documents, and as required by applicable laws.

4. This Bid is genuine and not made in the interest or on behalf of any undisclosed person, firm, or corporation; the Bid is not submitted in conformity with any agreement of rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or a corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for Bidder any advantage over any other Bidder.

(Remainder of Page Intentionally Left Blank)

The undersigned further agrees to perform the Work in its entirety in accordance with the Contract Documents within the prescribed time, and to the total and complete satisfaction of Owner (in consultation with their Authorized Representatives), at the identified Unit Prices and Lump Sum Amounts as set forth below:

Project #:614004 Contract #:129534				
Location: Lee, Lenox and Pittsfield				
MassDOT Berkshire Line Civil Improvements				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
114.1	1	DEMOLITION OF BRIDGE 74.17 AT _____ LUMP SUM		
114.2	1	PARTIAL DEMOLITION OF BRIDGE 76.23 AT _____ LUMP SUM		
114.3	1	DEMOLITION OF TIMBER RETAINING WALL ON BR 85.32 AT _____ LUMP SUM		
180.1	1	HEALTH AND SAFETY PLAN AT Five Thousand Dollars LUMP SUM	$ 5,000.00	$ 5,000.00
231.1	1	CLEANING EXISTING CULVERT MP 72.84 AT _____ LUMP SUM		
231.2	1	CLEANING EXISTING CULVERT MP 76.10 AT _____ LUMP SUM		
231.3	1	CLEANING EXISTING CULVERT MP 78.60 AT _____ LUMP SUM		
231.4	1	CLEANING EXISTING CULVERT MP 78.65 AT _____ LUMP SUM		
231.5	1	CLEANING EXISTING CULVERT MP 82.69 AT _____ LUMP SUM		
231.6	1	CLEANING EXISTING CULVERT MP 84.40 AT _____ LUMP SUM		
233.1	1	CULVERT MP 73.23 AND MP 73.24 REPLACEMENT AT _____ LUMP SUM		
233.2	1	CULVERT MP 74.30 REPLACEMENT AT _____ LUMP SUM		

Project #:614004 Contract #:129534
Location: Lee, Lenox and Pittsfield

MassDOT Berkshire Line Civil Improvements

ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
233.3	1	CULVERT MP 76.05 REPLACEMENT AT _____ LUMP SUM		
233.4	1	NEW CULVERT 77.90 AT _____ LUMP SUM		
233.5	1	CULVERT MP 78.10 REPLACEMENT AT _____ LUMP SUM		
233.6	1	CULVERT MP 78.17 REPLACEMENT AT _____ LUMP SUM		
233.7	1	CULVERT MP 78.21 REPLACEMENT AT _____ LUMP SUM		
233.8	1	CULVERT MP 78.50 REPLACEMENT AT _____ LUMP SUM		
233.9	1	CULVERT MP 80.90 REPLACEMENT AT _____ LUMP SUM		
458.6.1	1,087	FURNISH BALLAST AT _____ PER TON		
492.3	150	CLEANUP AND DISPOSAL OF DEFECTIVE CROSSTIES, TIMBERS, AND WOOD MATERIALS AT _____ PER TON		
492.8.1	5,693	SURFACE AND ALIGN BALLASTED TRACK AT _____ PER TRACK FOOT		
492.10	16,120	SPOT DITCHING OF RAILROAD RIGHT-OF-WAY AT _____ PER LINEAR FOOT		
492.10.1	400	BALLAST CLEANING AT _____ PER LINEAR FOOT		
492.11.2	240	TRACK CONSTRUCTION - BRIDGE AREA AT _____ PER TRACK FOOT		
492.12	856	TRACK UNDERDRAIN AT _____ PER LINEAR FOOT		
492.15	300	TRACKBED STABILIZATION AT _____ PER LINEAR FOOT		

Project #:614004 Contract #:129534				
Location: Lee, Lenox and Pittsfield				
MassDOT Berkshire Line Civil Improvements				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
493.1	1	MISCELLANEOUS WORK AS DIRECTED BY THE ENGINEER AT Five Hundred Thousand Dollars ALLOWANCE	$ 500,000.00	$ 500,000.00
722.2	1	SCHEDULE OF OPERATIONS (TYPE B) - FIXED PRICE AT Seventy-Seven Thousand Five Hundred Dollars LUMP SUM	$ 77,500.00	$ 77,500.00
748.0	1	MOBILIZATION AT _____ LUMP SUM		
767.121	115	SEDIMENT CONTROL BARRIER AT _____ PER LINEAR FOOT		
850.41	1	RAILROAD SERVICES AT Five Hundred Thousand Dollars ALLOWANCE	$ 500,000.00	$ 500,000.00
850.42	1	WORK TRAINS AT Thirty Thousand Dollars ALLOWANCE	$ 30,000.00	$ 30,000.00
909.1	3	REPAIRING STONE MASONRY AT _____ PER SQUARE YARD		
909.2	1,674	REPOINTING MASONRY JOINTS AT _____ PER LINEAR FOOT		
909.3	4	RESET ROTATED GRANITE STONE IN BACKWALL AT _____ PER EACH		
945.10	660	DRILLED MICROPILES AT _____ PER LINEAR FOOT		
948.60	1	MICROPILE VERIFICATION LOAD TEST AT _____ PER EACH		
948.61	2	MICROPILE PROOF LOAD TEST AT _____ PER EACH		
991.1	1	CONTROL OF WATER – BRIDGE NO. 74.17 AT _____ LUMP SUM		
991.2	1	CONTROL OF WATER – BRIDGE NO. 77.28 AT _____ LUMP SUM		
991.3	1	CONTROL OF WATER – BRIDGE NO. 80.72 AT _____ LUMP SUM		

Project #:614004 Contract #:129534				
Location: Lee, Lenox and Pittsfield				
MassDOT Berkshire Line Civil Improvements				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
995.1	1	BRIDGE STRUCTURE NO. 74.17 AT _____ LUMP SUM		
995.2	1	BRIDGE STRUCTURE NO. 76.23 AT _____ LUMP SUM		
995.3	1	REHABILITATION OF BRIDGE 77.28 AT _____ LUMP SUM		
995.4	1	REHABILITATION OF BRIDGE 80.72 AT _____ LUMP SUM		
995.5	1	REHABILITATION OF BRIDGE 85.32 AT _____ LUMP SUM		
995.6	1	REHABILITATION OF BRIDGE 85.52 AT _____ LUMP SUM		
996.1	5	PERMANENT TIEBACK ANCHORS FOR BR. 77.28 AT _____ PER EACH		

The Total Amount of Bid based upon the Contract Documents and proposed Bid Item Unit Prices; Lump Sum Amounts; and Allowances is:

TOTAL AMOUNT OF BID

(Summation of All Bid Items) Written in Words

TOTAL AMOUNT OF BID

(Summation of All Bid Items) Written in Figures

By submitting this Bid, Bidder specifically acknowledges that:

(1) The quantities shown on this Bid Form are estimates only and will be used to determine the Total Amount Bid.

(2) Owner reserves the right to reject any and all bids, or any bid item, to advertise for new proposals for the project, to waive technicalities as to form, or to proceed to do the work otherwise, as may be deemed in the best interest of Owner. Nothing herein shall be construed as depriving Owner of the right to reject any bid when such bid does not fully comply with the specifications for the project

or the applicable bidding laws and regulations, or if Bidder is otherwise not qualified or eligible to receive award of the contract. A bid will be considered irregular and will be rejected if it is determined that any of the unit prices are materially unbalanced to the detriment of Owner. The bidder will be required to justify in writing the price or prices bid for the work in question before MassDOT decides to award the contract or reject the bid.

(3) Bidder has prequalification in 1) MBTA Class 1 – General Transit Construction (>$10,000,000 for Maximum Single Project Rating), MBTA Class 4A- Steel Superstructures (>$10,000,000 for Maximum Single Project Rating) and Class 4B – Concrete Superstructures (>$10,000,000 for Maximum Single Project Rating), and 2) MassDOT Rail & Transit Prequalification as of the bid opening. In addition, if the bidders are not also prequalified in MBTA Class 3 – Trackage, then a subcontractor prequalified in MBTA Class 3 – Trackage must perform the track work as of the bid opening. Subcontractors are to be submitted for approval by MassDOT.

(4) Subject to the reservations contained in the preceding paragraphs, the contract shall be awarded to the lowest responsible and eligible bidder. The "lowest responsible and eligible bidder" shall mean Bidder who submits a complete bid in accordance with the requirements of the Bid Documents, and whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work.

(5) The Bid shall remain effective for a period of not less than ninety (90) days.

Bid submitted by _____
Name of Bidder

Signed by _____ _____
Duly Authorized Representative of Bidder Date

Required Documents to be Submitted by Bidder

The Contractor bidding on this project must be experienced in construction projects involving work on and around an active railroad; railroad bridge replacement and rehabilitation, culvert replacement, railroad track construction; railroad tie replacement; raising, lining and surfacing of railroad track; and heavy civil construction work.

The following bonds, forms, certificates and additional documents must be provided and/or completed and submitted as part of this Bid Form and Contractor's Bid Package:

A. Bid Deposit

1. Bid deposit in the amount of 5% of the bid. The bid deposit shall be a bid bond in a form satisfactory to the Department furnished by a surety company incorporated pursuant to Chapter 175, Section 105 of the General Laws or authorized to do business in the Commonwealth under Chapter 175, Section 106 of the General Laws and satisfactory to the Department; or cash; or a certified check drawn on a responsible bank or trust company (or a treasurer's or cashier's check issued by such bank or trust company), payable to the Massachusetts Department of Transportation.

B. Forms and Certifications

1. Certificate of Non-Collusion
2. Certificate of Independent Price Determination
3. Certificate of Compliance with Massachusetts Employment Security Law
4. Certification of Work in Harmony and OSHA Training
5. Affidavit of Compliance; Out of State Certificate
6. Vote of Corporation; Authorized Signatory
7. Executive Order 481 – Certification
8. Certificate Regarding Wage Rates; Statement of Compliance

C. Additional Documents

1. Preliminary Construction Schedule, including key benchmarks.
2. Approved Drug and Alcohol testing plan in compliance with all statutes and regulations administered by the Federal Railroad Administration (FRA) in implementing the required 49 CFR Part 219 Drug and Alcohol Program.
3. List of Equipment which will be used in the performance of the Work on the MassDOT Berkshire Live Civil Improvements Project. Please include the following information:
   - Type of Equipment
   - Manufacturer
   - Model
   - Approximate Year
   - Approximate Hours

- Operator Requirements

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

BID BOND

KNOW ALL MEN BY THESE PRESENTS: that we the undersigned,

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called OWNER, in the penal sum of

_____ Dollars, ($_____)

for payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____, 20___.

WHEREAS, the Principal has submitted to _____ a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

_____

_____

_____

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his or her faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other aspects perform the agreement created by the acceptance of said bid,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which OWNER may accept such BID and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
(Principal)

_____
(Surety)

By: _____

IMPORTANT – An appropriate Power of Attorney, dated the same date as the BOND, and evidencing the authority of the Attorney-in-Fact to act on behalf of the corporation shall be attached to the BID BOND.

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Certificate of Non-Collusion

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

_____
Signature of Authorized Signatory

_____
Name of Company

_____
Date

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Certificate of Independent Price Determination

A. By submission of this bid or proposal, each Bidder or offeror certifies, and in the case of a joint bid or proposal, each party thereto certifies as to its own organization, that in connection with this procurement:

   a. The process in this bid or proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Bidder or offeror or with any competitor;
   b. Unless otherwise required by law, the prices which have been quoted in this bid or proposal have not been knowingly disclosed by Bidder or offeror and will not knowingly be disclosed by Bidder offeror prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other Bidder or offeror or to any competitor; and
   c. No attempt has been made or will be made by Bidder or offeror to induce any other person or firm to submit or not to submit a bid or proposal for the purpose of restricting competition.

B. Each person signing this bid or proposal certifies that:

   a. They are the person in Bidder's organization responsible within that organization for the decision as to the prices being bid or offered herein and that they have not participated, and will not participate, in any action contrary to (A)(1) through (A)(3) above; or
   b. He or She is not the person in Bidder's or offeror's organization responsible within that organization for the decision as to the prices being bid or offered herein but that he or she has been authorized in writing to act as agent for the persons responsible for such decision(s) and to certify that such persons have not participated, and will not participate, in any action contrary to (A)(1) through (A)(3) above, and as their agent does hereby so certify; and they have not participated, and will not participate, in any action contrary to (A)(1) through (A)(3) above.

(Print Name)	(Company)
(Signature)	(Date)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Compliance with Massachusetts Employment Security Law

In accordance with the provisions of Section 19A(b) of Chapter 151A of the Massachusetts General Laws,

I,_____,
[Name & Title]

signing on behalf of _____
[Name of Company / Employer]

hereby certify that the aforementioned employer has complied with all employment security laws of the Commonwealth of Massachusetts relating to contributions and payments in lieu of contributions.

Signed under the pains and penalties of perjury this_____day of_____2025.

_____
Signature

_____
Notary Public

_____
My Commission Expires

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Certification of Work in Harmony and OSHA Safety Training

(a) In accordance with the provisions of Massachusetts General Laws Chapter 30, Section 39S, the undersigned certifies under penalties of perjury:

(1) that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

(2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and

(3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration.

(b) Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration shall be subject to immediate removal.

(c) The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection (b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding.

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Certificate of Compliance Issued by Commonwealth of Massachusetts Secretary of State to Foreign (Out of State) Corporations

"The Commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a Contract for the work with, and shall not approve as a Subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with the awarding authority a certificate of the state secretary stating that such corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D." M.G.L. c. 30, Section 39L.

If Bidder is a foreign corporation, it shall attach the certificate issued by the Massachusetts Secretary of State showing its compliance with the foregoing statutes.

SIGNED UNDER THE PENALTIES OF PERJURY THIS____day of_____, 20

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Vote of Corporation; Authorized Signatory

At a meeting of the Board of Directors of _____
[Name of Company]
held on the_____day of_____20___, at which all the Directors were present or

waived notice, it was VOTED, that,_____, who is the duly
[Name of Officer]
elected_____of this company be and hereby is authorized to execute
[Title of Officer]
contracts, bonds and other instruments in the name of and behalf of said company and affix its corporate

seal thereto; and such execution by said_____of any contract
[Name of Officer]
or other instrument or obligation in this company's name and on its behalf by such_____
[Title of Officer]
of the company under seal, shall be valid and binding upon this company.

A True Copy Attest:

Clerk _____
[Signature]

_____
[Print Name &Title]

_____
[Business Address]

_____
[Date]

I,_____, hereby certify that I am the Clerk of _____
[Name of Clerk] [Name of Company]
and that_____is the duly elected _____
[Name of Officer] [Title of Officer]
of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as of this date.

_____
Clerk [Corporate Seal]

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Executive Order 481

INSTRUCTIONS

Executive Order 481 applies to all state agencies in the Executive Branch, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established. As it is the policy of the Executive Branch to prohibit the use of undocumented workers in connection with the performance of state contracts, all contracts entered into after February 23, 2007 require that contractors, as a condition of receiving Commonwealth funds under any Executive Branch contract, make the following certification:

CONTRACTOR CERTIFICATION

As evidenced by the signature of the Contractor's Authorized Signatory below, the Contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of all Executive Branch contracts; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to such contracts without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker(s). The Contractor understands and agrees that breach of any of these terms during the period of each contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

Contractor Authorizing Signature	Date
Print Name	
Title	
Email	Telephone

The Contractor is required to sign this Certification only once and may provide a copy of the signed Certification for any contract executed with an Executive Branch Department. A copy of this signed Certification must be attached to the "record copy" of all contracts with this Contractor that are filed with the contracting Department.

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Wage Rates

In accordance with the provisions of Massachusetts General Laws, Chapter 30, Section 39M and Chapter 149, Sections 26 to 27H, the undersigned certifies under penalties of perjury, that

_____
Name of Company

shall comply with prevailing wage requirements as set forth in M.G.L. Chapter 149, Sections 26 to 27H.

Further, the undersigned acknowledges that he / she has read and understands the additional information pertaining to these requirements provided below, including the prevailing wage sheets, payroll certification statements, and payroll certification forms.

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Wage Rates Statement of Compliance

Date: _____

I,_____, do hereby state:
(Name of signatory) (Title)

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

_____pertaining to
(Contractor or Subcontractor)

_____
(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.

_____
Authorized Signature

_____
Print Name & Title

_____
Company

_____
Date

The above-referenced copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to MassDOT's Rail and Transit Division for such inspection.

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 Contractor. 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 than two (2) weeks before the anniversary of the Notice to Proceed date of the contract to allow for adequate processing by the Division of Occupational Safety (DOS). 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 DOS.

All Bidders and Contractors 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 and contractors are cautioned to carefully read the relevant sections of the Massachusetts General Laws (most recently amended August, 2008).

(Remainder of Page Intentionally Left Blank)

THIS PAGE IS INTENTIONALLY LEFT BLANK

*** END OF DOCUMENT***

DOCUMENT B00421

DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Additional Required Documents to be Submitted by Apparent Successful Bidder

The Apparent Successful Bidder will be required to provide and/or complete and submit additional documents after notification of successful bid in order to execute the Contract. The additional required documents include, but are not limited to, the following:

A. Bonds
   1. Completed Performance Bond in the amount of 100% of the Contract Price
      - Form is attached*
   2. Completed Payment Bond in the amount of 100% of the Contract Price
      - Form is attached*

   *The Performance Bond and the Payment Bond shall be in a form satisfactory to the Department, furnished by a surety company incorporated pursuant to Chapter 175, Section 105 of the General Laws or authorized to do business in the Commonwealth under Chapter 175, Section 106 of the General Laws and satisfactory to the awarding authority. The name of the agency or agent writing these bonds shall be identified with or on the bond.

B. Forms and Certifications
   1. Certificate of State Tax Compliance
      - Form is attached
   2. Insurance / Surety Powers of Attorney
   3. Insurer's Affidavit for Worker's Compensation
   4. Certification of Construction Equipment Standard Compliance
   5. Diesel Construction Equipment Data Sheet
      - List and certify all large non-road diesel construction equipment (greater than 50 HP) used on this Contract

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

PERFORMANCE BOND

Know all men by these presents, that _____, a corporation duly organized under the laws of the Commonwealth of Massachusetts and having a usual place of business in _____, _____ as principal, and _____ as surety, are held and firmly bound upon the Massachusetts Department of Transportation in the sum of _____ **($_____)** lawful money of the United States of America, to be paid to the Massachusetts Department of Transportation, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly be these presents.

Whereas, the said principal has made contract with the Massachusetts Department of Transportation, bearing date of _____, 2025, for the construction of Contract Number **129534 – MassDOT Berkshire Line Civil Improvements Project.**

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms, and conditions of the said contract on its part to be kept and performed during the original term of said contract and any extensions thereof that may be granted by the Massachusetts Department of Transportation, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said contract that may hereafter be made, notice to the surety of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the contract is abandoned by the Contractor, or is terminated by the Massachusetts Department of Transportation, under the provisions of Sec. 8.12 of the Standard Specifications for Highways and Bridges, said surety hereby further agrees that, if required in writing by the Massachusetts Department of Transportation, said surety shall take such action as is necessary to complete said contract.

In witness whereof we hereunto set our hands and seals this _____ day of _____, 2025

_____

Principal

_____ Corporate Seal

_____

_____ Surety

Corporate Seal

_____

_____

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

PAYMENT BOND

Know all men by these presents, that_____, a corporation duly organized under the laws of the Commonwealth of Massachusetts and having a usual place of business in _____, _____, and _____ as surety, are held and firmly bound unto the Massachusetts Department of Transportation in the sum of _____ **($_____)** lawful money of the United States of America, to be paid to the Massachusetts Department of Transportation, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executor administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the said principal has made a contract with the Massachusetts Department of Transportation bearing date of_____, 2025, for the construction of Contract Number **129534 – Berkshire Line Civil Improvements Project.**

Now the condition of this obligation is such that if the principal shall pay for all labor performed or furnished and for all materials used or employed in said contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said contract that may hereafter be made, notice to the surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, the provisions of Massachusetts General Laws, (Ter. Ed.), Chapter 30, Section 39A as amended and Chapter 149, Section 29 as amended, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In witness whereof we hereunto set our hands and seals this_____ day of _____, 2025

_____ Principal

BY _____ Corporate Seal

_____

_____ Surety
Corporate Seal

_____

1. Name and Address of Agent or Agency receiving commission on this Performance and Payment Bond.

_____

_____

2. Name and Address of Resident Agent, if any, of Surety, or other Agent appointed by Surety to Whom Notice should be sent (Must be completed by Attorney-in-Fact of Surety).

_____

_____ Surety
Corporate Seal

(Remainder of Page Intentionally Left Blank)

FY 2026 CAPITAL IMPROVEMENT PROGRAM

MASSDOT BERKSHIRE LINE CIVIL IMPROVEMENTS

Certificate of State Tax Compliance

In accordance with the provisions of Chapter 62C, Section 49A(b) of the Massachusetts

General Laws, I, _____
[Name & Title]

authorized signatory for _____
[Name of Company]

which has a principal place of business at _____

_____

do hereby certify under the pains and penalties of perjury that _____
[Name of Company]

has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child support.

_____
Authorized Signature

_____
Print Name and Title

_____
Company

_____
Date

*** END OF DOCUMENT***

DOCUMENT B00842

SCHEDULE OF PARTICIPATION
BY MINORITY OR WOMEN BUSINESS ENTERPRISES (M/WBE)

MASSDOT PROJECT NUMBER: 614004

PROJECT LOCATION: LEE, LENOX AND PITTSFIELD, MA

DATE OF BID OPENING: _____

NAME OF PRIME BIDDER: _____

Name Address and Phone Number of M/WBE	Name of Activity	(a) M/WBE Contractor Activity Amount	(b) M/WBE Other Business Amount	(c) Total amount eligible for credit under rules in Section VIII of the Special Provisions
Total Bid Amount $	TOTALS: M/WBE Percentage of Total bid:	$ %		$ %

Column (a) must be at least one-half of the M/WBE percentage goal.

SIGNATURE: _____ Date: _____ Tel No: _____

NAME AND TITLE (PRINT):_____

BIDDERS ARE CAUTIONED TO REVIEW DOCUMENT 00718 -- SPECIAL PROVISION FOR PARTICIPATION BY MINORITY OR WOMEN BUSINESS ENTERPRISES AND SERVICE DISABLED VETERAN OWNED BUSINESS ENTERPRISES.

*** END OF DOCUMENT ***

THIS PAGE IS INTENTIONALLY LEFT BLANK.

DOCUMENT B00843

MINORITY OR WOMEN'S BUSINESS ENTERPRISE PARTICIPATION LETTER OF INTENT
PAGE 1 OF 2

MASSDOT PROJECT NUMBER: 614004

PROJECT LOCATION: LEE, LENOX AND PITTSFIELD, MA

DATE OF BID OPENING: _____

FROM _____
(Minority or Women's Business Enterprise Company)

TO: _____
(Name of Prime Contractor)

1. My company is currently certified as an MBE or WBE by the Massachusetts Supplier Diversity Office, formerly known as the State Office of Minority and Women Business Assistance (SOMWBA). There have been no changes affecting the ownership, control or independence of my company since my last certification review.

2. If any such change occurs prior to my company's completion of this proposed work, I will give written notification to your firm and to the Massachusetts Department of Transportation (MassDOT).

3. (For contractor activity only.) My firm will provide to you, upon request, for the purpose of obtaining subcontractor approval from MassDOT; (1) a resume stating the qualifications and experience of the superintendent or foreperson who will supervise on site-work; (2) a list of equipment owned or leased by my firm for use on the project; (3) a list of all projects (public or private) which my firm is currently performing, is committed to perform, or intends to make a commitment to perform. I shall include, for each project, the names and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and my firm's work schedule for the Project.

4. If you are awarded the Contract, my company intends to enter into an agreement with your firm to perform the items of work or other activity described on the following sheet for the prices indicated.

5. My firm has the ability to manage, supervise and perform the activity described on the following page.

_____ _____
M/WBE Authorized Signature Date

MINORITY OR WOMEN'S BUSINESS ENTERPRISE PARTICIPATION LETTER OF INTENT
PAGE 2 OF 2

MASSDOT PROJECT NUMBER: 614004

PROJECT LOCATION: LEE, LENOX AND PITTSFIELD, MA

DATE OF BID OPENING: _____

NAME OF PRIME BIDDER: _____

Item number if applicable	Description of Activity with notations such as Installation Only, Material Only, or Complete	Quantity	Unit Price	Amount
		TOTAL AMOUNT:		

M/WBE COMPANY NAME: _____

M/WBE AUTHORIZED SIGNATURE: _____

NAME AND TITLE (PRINT): _____

TELEPHONE NUMBER: _____ FAX NUMBER: _____

Rev'd 9/20/19

*** END OF DOCUMENT ***

DOCUMENT B00846

M/WBE OR SDVOBE JOINT CHECK ARRANGEMENT APPROVAL FORM

(to be submitted by Prime Contractor)

Contract No: 129534 **Project No.** 614004

Location: LEE, LENOX AND PITTSFIELD, MA

Bid Opening Date: _____

Project Description: MassDOT Berkshire Line Civil Improvements

We have received the attached request for the use of a joint check arrangement from _____ _____ , a M/WBE or SDVOBE on the above- referenced Contract and _____ _____, a Material Supplier/Vendor for the subject Contract. The M/WBE or SDVOBE has complied with the requirements of Special Provision Document 00718. In particular, the M/WBE or SDVOBE has:

- a written agreement with the material supplier/vendor;
- applied for credit with the subject material supplier and has supplied the vendor's response;
- shown that it will place all orders to the subject material supplier/vendor;
- made and retains all decision-making responsibilities concerning the materials; and
- provided a Joint Check Agreement that is acceptable to MassDOT;

As the Contractor for the Project, we agree to issue joint checks (made payable to the Material Supplier/Vendor and the M/WBE or SDVOBE) for payment of sums due pursuant to invoices from the Supplier/Vendor and M/WBE or SDVOBE.

Contractor:

_____ _____
Company Name Signature
Duly Authorized

_____
Printed Name

_____ _____
Date Title

SubContractor:

_____ _____
Company Name Signature –
Duly Authorized

_____
Printed Name

_____ _____
Date Title

*** END OF DOCUMENT ***

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT B00847

JOINT VENTURE AFFIDAVIT

(All Firms)

- All Information Requested By This Schedule Must Be Answered. Additional Sheets May Be Attached.
- If, there is any change in the information submitted, the Joint Venture parties must inform MassDOT Pre-Qualifications Office (and, if one of the companies is a M/WBE or SDVOBE, the Director of Contract Compliance, Office of Civil Rights) *prior* to such change, in writing, either directly or through the Prime Contractor if the Joint Venture is a subcontractor.
- If the Joint Venture Entity will be the bidder on a prime Contract, it must bid and submit all required documents (insurance, worker's compensation, bonds, etc.) in the name of the Joint Venture Entity.

I. Name of Joint Venture: _____

Type of Entity if applicable (Corp., LLC):_____Filing State _____

Address of joint venture: _____

_____

Phone No(s) for JV Entity: _____E-mail:_____

Contact Person(s)_____

Tax ID/EIN of Joint Venture: _____Vendor Code:_____

II. Identify each firm or party to the Joint Venture:

Name of Firm: _____

Address: _____

Phone : _____E-mail:_____

Contact person(s) _____

Name of Firm: _____

Address: _____

Phone: _____E-mail:_____

Contact Person(s)_____

III. Describe the role(s) of the each party to the Joint Venture:

_____

_____

IV. Attach a copy of the Joint Venture Agreement. The proposed Joint Venture Agreement should include specific details including, but not limited to: (1) the contributions of capital and equipment; (2) work items to be performed by each company's forces, (3) work items to be performed under the supervision of any M/WBE or SDVOBE Venturer; (4) the commitment of management, supervisory and operative personnel employed by the M/WBE or SDVOBE to be dedicated to the performance of the Project; and (5) warranty, guaranty, and indemnification clauses.

V. Attach any applicable Corporate or LLC Votes, Authorizations, etc.

VI. Ownership of the Joint Venture:

A. What is the percentage(s) of each company's ownership in the Joint Venture?

ownership percentage(s): _____

ownership percentage(s): _____

B. Specify percentages for each of the following (provide narrative descriptions and other detail as applicable):

1. Sharing of profit and loss: _____

2. Capital contributions:

(a) Dollar amounts of initial contribution: _____

(b) Dollar amounts of anticipated on-going contributions: _____

(c) Contributions of equipment (specify types, quality and quantities of equipment to be provided by each firm): _____

_____

4. Other applicable ownership interests, including ownership options or other agreements, which restrict or limit ownership and/or control:

_____

_____

5. Provide copies of all other written agreements between firms concerning bidding and operation of this Project or projects or contracts.

6. Identify all current contracts and contracts completed during the past two (2) years by either of the Joint Venture partners to this Joint Venture:

_____

_____

VII. Control of and Participation in the Joint Venture. Identify by name and firm those individuals who are, or will be, responsible for and have the authority to engage in the following management functions and policy decisions. (Indicate any limitations to their authority such as dollar limits and co-signatory requirements.):

A. Joint Venture check signing:

_____

_____

B. Authority to enter Contracts on behalf of the Joint Venture:

_____

_____

C. Signing, co-signing and/or collateralizing loans:

_____

_____

D. Acquisition of lines of credit:

E. Acquisition and indemnification of payment and performance bonds:

F. Negotiating and signing labor agreements:

G. Management of contract performance. *(Identify by name and firm only)*:

1. Supervision of field operations:
2. Major purchases:
3. Estimating:
4. Engineering:

VIII. Financial Controls of Joint Venture:

A. Which firm and/or individual will be responsible for keeping the books of account?

B. Identify the "Managing Partner," if any, and describe the means and measure of their compensation:

C. What authority does each firm have to commit or obligate the other to insurance and bonding companies, financing institutions, suppliers, subcontractors, and/or other parties participating in the performance of this Contract or the work of this Project?

IX. Personnel of Joint Venture: State the approximate number of personnel (by trade) needed to perform the Joint Venture's work under this Contract. Indicate whether they will be employees of the majority firm, M/WBE or SDVOBE firm, or the Joint Venture.

	Firm 1 (number)	Firm 2 (number)	Joint Venture (number)
Trade			
Professional			
Administrative/Clerical			
Unskilled Labor			

Will any personnel proposed for this Project be employees of the Joint Venture?: _____

If so, who: _____

A. Are any proposed Joint Venture employees currently employed by either firm?

Employed by Firm 1: _____ Employed by firm 2 _____

B. Identify by name and firm the individual who will be responsible for Joint Venture hiring: ____

_____

X. Additional Information. Please state any material facts and additional information pertinent to the control and structure of this Joint Venture.

_____

_____

XI. AFFIDAVIT OF JOINT VENTURE PARTIES. The undersigned affirm that the foregoing statements and attached documents are correct and include all material information necessary to identify and explain the terms and operations of our Joint Venture and the intended participation of each firm in the undertaking. Further, the undersigned covenant and agree to provide to MassDOT current, complete and accurate information regarding actual Joint Venture work, payments, and any proposed changes to any provisions of the Joint Venture, or the nature, character of each party to the Joint Venture. We understand that any material misrepresentation will be grounds for terminating any Contract awarded and for initiating action under Federal or State laws concerning false statements.

Firm 1	Firm 2
Signature Duly Authorized	Signature Duly Authorized
Printed Name and Title	Printed Name and Title
Date	Date

*** END OF DOCUMENT ***