

COMMONWEALTH OF MASSACHUSETTS



CONTRACT DOCUMENTS AND SPECIAL PROVISIONS

RE-ADVERTISED PROJECT

PROPOSAL NO.	606272-114724
P.V. =	\$15,660,000.00
PLANS	YES

FOR

**Federal Aid Project Nos. CMQ-0035(043), HSI-0035(043),
NFP(N/I)-0035(043), STP-0035(043) & TAP-0035(043)
Intersection Improvements and Related Work (Including Signals)
at Iyannough Road (Route 28) and Yarmouth Road**

in the Town of**BARNSTABLE**

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS AND BRIDGES dated 2021

This Proposal to be opened and read:

TUESDAY, JULY 20, 2021 @ 2:00 P.M.

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DOCUMENT 00010

TABLE OF CONTENTS

DOCUMENT 00010	
TABLE OF CONTENTS	00010-1 through 2
DOCUMENT 00104	
NOTICE TO CONTRACTORS	00104-1 through 4
DOCUMENT 00210	
REQUIREMENTS OF MASSACHUSETTS GENERAL LAWS	
CHAPTER 30, SECTION 39R; CHAPTER 30, SECTION 39O.....	00210-1 through 4
DOCUMENT 00331	
LOCUS MAP	00331-1 through 2
DOCUMENT 00439	
CONTRACTOR PROJECT EVALUATION FORM	00439-1 through 2
DOCUMENT 00440	
SUBCONTRACTOR PROJECT EVALUATION FORM	00440-1 through 2
DOCUMENT 00710	
GENERAL CONTRACT PROVISIONS.....	00710-1 through 2
DOCUMENT 00711	
PRECAST CONCRETE HIGHWAY UNITS	00711-1 through 14
DOCUMENT 00713	
SUBSECTION 701	
CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS, AND DRIVEWAYS	
AND GUIDE TO THE INTERIM SUBSECTION 701	
CEMENT CONCRETE SIDEWALK SPECIFICATION.....	00713-1 through 34
DOCUMENT 00715	
SUPPLEMENTAL SPECIFICATIONS	00715-1 through 8
DOCUMENT 00719	
SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED	
BUSINESS ENTERPRISES	00719-1 through 18
DOCUMENT 00760	
REQUIRED CONTRACT PROVISIONS FOR FEDERAL-AID	
CONSTRUCTION CONTRACTS.....	00760-1 through 16
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 ADJUSTMENTS 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 WAGE RATES	00861-1 through 34
DOCUMENT 00870	
STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY	
CONSTRUCTION CONTRACT SPECIFICATIONS	00870-1 through 8
DOCUMENT 00875	
TRAINEE SPECIAL PROVISIONS	00875-1 through 2
DOCUMENT 00880	
FEDERAL WAGE RATES	00880-1 through 10
DOCUMENT A00801	
SPECIAL PROVISIONS	A00801-1 through 208
DOCUMENT A00802	
DETAIL SHEETS	A00802-1 through 38
DOCUMENT A00806	
RAILROAD SPECIFICATIONS	A00806-1 through 48
DOCUMENT A00808	
PROJECT UTILITY COORDINATION FORM	A00808-1 through 6
DOCUMENT A00815	
WORK ZONE SAFETY	
TEMPORARY TRAFFIC CONTROL	A00815-1 through 86
DOCUMENT A00820	
REQUEST FOR RELEASE OF MASSDOT AUTOCAD FILES FORM	A00820-1 through 2
DOCUMENT A00885	
ATTACHMENTS AND APPENDIXES	A00885-1 through 312
DOCUMENT B00420	
PROPOSAL	B00420-1 through 34
DOCUMENT B00853	
SCHEDULE OF PARTICIPATION BY DISADVANTAGED	
BUSINESS ENTERPRISES (DBEs)	B00853-1 through 2
DOCUMENT B00854	
DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION	
LETTER OF INTENT	B00854-1 through 2
DOCUMENT B00855	
DBE JOINT CHECK ARRANGEMENT APPROVAL FORM	B00855-1 through 2
DOCUMENT B00856	
JOINT VENTURE AFFIDAVIT	B00856-1 through 4

END TABLE OF CONTENTS

DOCUMENT 00104

**NOTICE TO CONTRACTORS**

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

RE-ADVERTISED PROJECT**TUESDAY, JULY 20, 2021 at 2:00 P.M. ******BARNSTABLE**

**Federal Aid Project Nos. CMQ-0035(043), HSI-0035(043), NFP(N/I)-0035(043),
STP-0035(043) & TAP-0035(043)
Intersection Improvements and Related Work (Including Signals)
at Iyannough (Route 28) and Yarmouth Roads**

****Date Subject to Change****PROJECT VALUE = \$15,660,000.00**

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

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

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

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

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

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

NOTICE TO CONTRACTORS (Continued)

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

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

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

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

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

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

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

NOTICE TO CONTRACTORS (Continued)**PRICE ADJUSTMENTS**

This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For reference the base prices are as follows: liquid asphalt \$542.50 per ton, Portland cement \$146.36 per ton, diesel fuel \$2.473 per gallon, and gasoline \$2.385 per gallon. MassDOT posts the **Price Adjustments** on their Highway Division's website at <https://www.mass.gov/topics/highway-construction-resources>

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: Jamey Tesler, Acting Secretary and CEO, MassDOT
Jonathan L. Gulliver, Administrator, MassDOT Highway Division
SATURDAY, MAY 29, 2021

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DOCUMENT 00210

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

July 1, 1981, updated October 2016

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

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

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

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

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

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

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

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

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

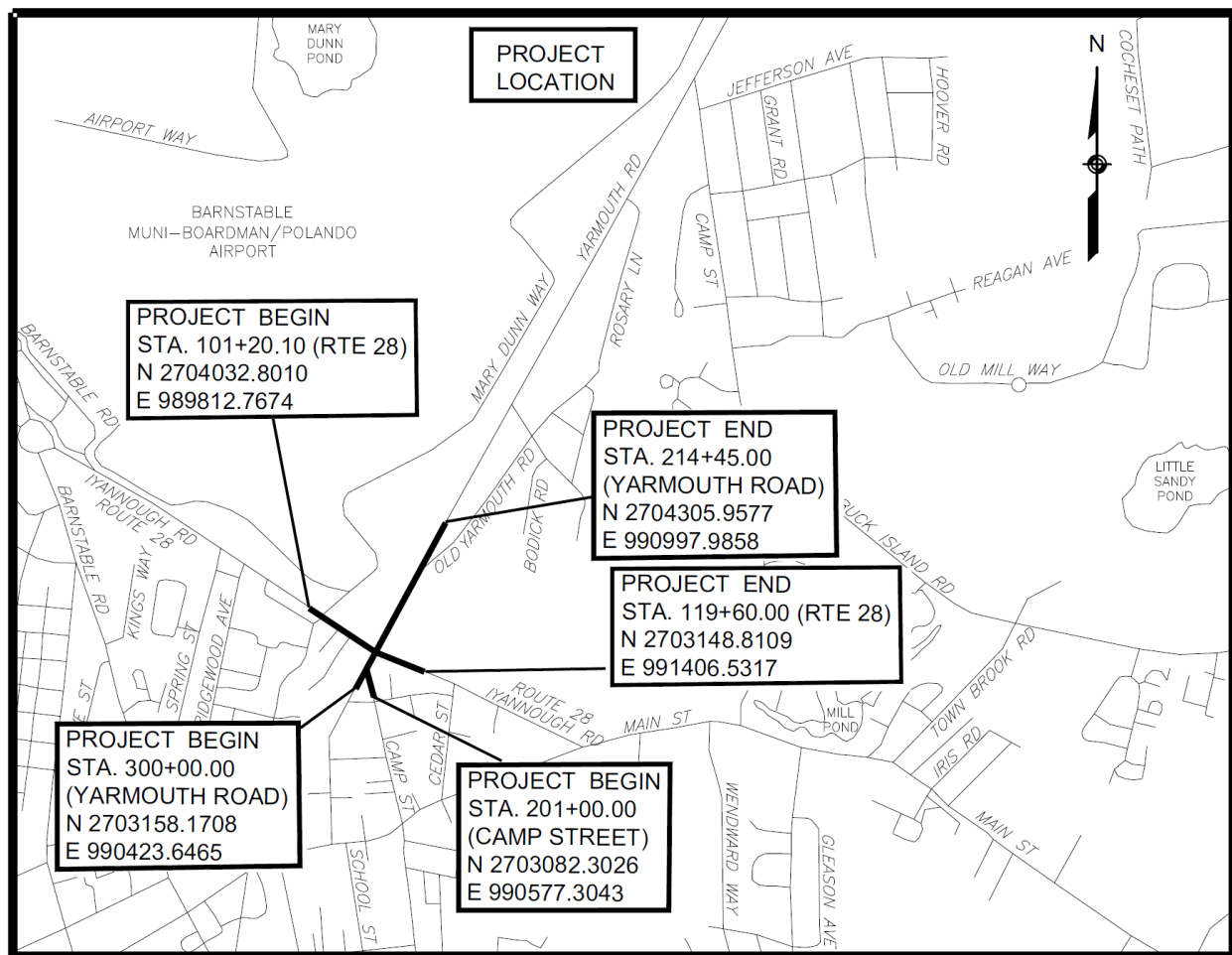
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DOCUMENT 00331

LOCUS MAP**BARNSTABLE**

**Federal Aid Project Nos. CMQ-0035(043), HSI-0035(043), NFP(N/I)-0035(043),
STP-0035(043) & TAP-0035(043)**

**Intersection Improvements and Related Work (Including Signals)
at Iyannough (Route 28) and Yarmouth Roads**



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DOCUMENT 00439

Final Report ☐Interim Report ☐**CONTRACTOR PROJECT EVALUATION FORM***For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010*

Date: _____

City/Town: _____

Contractor: _____

Project: _____

Address: _____

F.A. No: _____

Contract Number: _____

Bid Price: _____

Notice to Proceed: _____

Funds: State: _____ Fed Aid: _____

Current Contract Completion Date: _____

Date Work Started: _____

Date Work Completed*: _____

Contractor's Superintendent: _____

Division: (indicates class of work) Highway: _____ Bridge: _____ Maintenance: _____

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

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

*(Give explanation of items 1 through 9 on the following page in numerical order if overall rating is below 80%. Use additional sheets if necessary.)*_____
District Construction Engineer's Signature/Date_____
Resident Engineer's Signature/Date_____
Contractor's Signature Acknowledging Report/DateContractor Requests Meeting with the District: No ☐Yes ☐

Date Meeting Held: _____

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

DOCUMENT 00440

Final Report ☐Interim Report ☐**SUBCONTRACTOR PROJECT EVALUATION FORM***For instructions on using this form, see Engineering Directive E-10-002, Dated 4/20/2010*

Date: _____

City/Town: _____

Subcontractor: _____

Project: _____

Address: _____

F.A. No.: _____

Contract Number: _____

Prime Contractor _____

Current Contract Completion Date: _____

Date Work Started: _____

Date Work Completed*: _____

Subcontractor's Superintendent: _____

Type of Work Performed by Subcontractor: _____

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

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

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

District Construction Engineer's Signature/Date

Resident Engineer's Signature/Date

Contractor Signature Acknowledging Report/Date

Subcontractor Signature Acknowledging Report/Date

Subcontractor Requests Meeting with the District: No ☐Yes ☐

Date Meeting Held: _____

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

Contractor's Comments:

DOCUMENT 00710
GENERAL CONTRACT PROVISIONS
Revised: 04/08/21

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2021, the SUPPLEMENTAL SPECIFICATIONS, the 1996 METRIC CONSTRUCTION AND TRAFFIC STANDARD DETAILS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the 2017 CONSTRUCTION STANDARD DETAILS are available online at <https://www.mass.gov/massdot-highway-division-manuals-and-publications>

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

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

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

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

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

ALTERNATIVE DISPUTE RESOLUTION

Forum, Choice of Law and Mediations:

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

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SUBSECTION M4.02.14

Precast Concrete Highway Units

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SUBSECTION M4.02.14 Precast Units

Replace this Subsection with the following :

SUBSECTION M4.02.14 Precast Concrete Highway Units

The following Precast Concrete Highway Units shall meet the materials and fabrication requirements specified herein:

- (a) Standard Temporary and Permanent Barriers
- (b) Box Culverts with spans less than or equal to 10 feet
- (c) Catch basins
- (d) Drainage Pipes
- (e) Pipe Flared Ends
- (f) Manholes
- (g) Handholes
- (h) Proprietary Retaining Wall Systems
- (i) Traffic Light Pole Bases
- (j) Luminaire Bases

Precast Concrete Highway Units shall be fabricated in conformance with the MassDOT Construction Standard Details, Traffic Standard Drawings for Traffic Signals and Highway Lighting, Overhead Signal Structure and Foundation Standard Drawings, and Standard Drawings for Signs and Supports. Circular vertical precast reinforced concrete manholes and structures used in sewer, drainage, and water works shall conform with the requirements of AASHTO M 199. The outside surface of the tapered or cone section of precast drainage structures shall be dried, cleaned, and coated with an RS-1-H coating meeting the requirements of AASHTO M 140.

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). 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. Plant.

Prior to the fabrication of Precast Concrete Highway Units, 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 Highway Unit(s) being fabricated
- (b) MassDOT Approval

C. Fabricator Quality Control.

Quality Control shall be performed by the Fabricator. The Fabricator shall maintain a Quality Control system to monitor, assess, and adjust placement and fabrication processes to ensure the fabricated Precast Concrete Highway Unit(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 inspection 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.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)**1. Personnel.**

The Fabricator shall provide adequate training for all QC personnel in accordance with the Fabricator's NPCA or PCI Certification. A sufficient amount of QC personnel shall be trained and certified to perform the tests as specified in 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 six (6) months continuous experience in the manufacture of Precast Concrete Highway Products. The QC Manager shall be on site while the batch plant is producing and placing concrete for MassDOT projects.
- (b) Technicians/Inspectors with an active American Concrete Institute (ACI) Concrete Field Testing Technician – Grade I certification, or higher.

The Fabricator shall provide to the MassDOT Plant Inspector copies of the Fabricator's Quality Control Personnel required qualifications, as specified above.

2. 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. The moisture storage room or curing box shall be thermostatically controlled to maintain temperatures consistent with AASHTO T23. The laboratory 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.

3. 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 T152
- (b) Air Content Meter Volumetric Method: AASHTO T196 (Required for Lightweight Concrete)
- (c) Slump Cone: AASHTO T119
- (d) Cylinder Molds: AASHTO M205
- (e) Concrete Testing Machine: AASHTO T22
- (f) Screening Sieve: AASHTO T27, AASHTO T11
- (g) Curing Box: AASHTO T23
- (h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM 1611
- (i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

4. Inspection.

Quality Control personnel shall monitor and inspect the fabrication of each Precast Concrete Highway Unit. Quality Control personnel shall report all inspection activities on Quality Control Inspection Reports and non-conformances on Non-Conformance Reports (NCRs) throughout the entire fabrication process, as specified herein.

5. Temperature Monitoring.

At a minimum, the Fabricator shall monitor, record, and report the temperatures of the form and ambient temperatures surrounding the concrete continuously, without interruption as specified below:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Prior to placement of concrete to verify the temperatures are greater than or equal to 50°F.
- (b) Immediately after placement to verify that the temperatures are greater than or equal to 50°F.
- (c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 70% Design Strength (f'_c) is attained.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°F. The Fabricator shall verify all temperature requirements meet the specifications herein. Fabricator Quality Control concrete temperature monitoring records reporting the concrete temperature at the specified minimum frequency shall be provided to the MassDOT Inspector upon request.

6. Sampling and Testing.

At a minimum, the Fabricator shall perform random Quality Control sampling and testing for each Sublot of concrete produced 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 Subsection M4.02.13 and AASHTO R 60.

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size ^(b)	Sublot Size ^(c)	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 in a year, per Mix Design	50 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.	≥ 70% 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				

Notes:

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (c) 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.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)**7. Certificate of Compliance.**

The Fabricator shall provide a Certificate of Compliance in accordance with Standard Specifications, Division I, Subsection 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.

8. 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 MassDOT Standard Shop Drawings
- (e) Fabricator Certificate of Compliance for each fabricated Precast Concrete Highway Unit
- (f) Admixture Manufacturer's Certification of Compliance and Technical Data Sheet for each approved Admixture
- (g) Completed QC Inspection Checklist for each fabricated Precast Concrete Highway Unit
- (h) Identification Number for each fabricated Precast Concrete Highway Unit
- (i) Time and date of casting of each fabricated Precast Concrete Highway Unit
- (j) Date of stripping the forms of each fabricated Precast Concrete Highway Unit
- (k) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
- (l) QC Test Report Forms for each subplot of concrete produced
- (m) Non-Conformance Reports (NCRs)
- (n) Documentation of Repairs (if applicable)

D. Acceptance.

MassDOT will perform Acceptance inspection, sampling, and testing during fabrication and installation, to evaluate the quality and degree of compliance of the fabricated Precast Concrete Highway Unit 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 Highway Units shall be determined by MassDOT.

1. Inspection.

A MassDOT Inspector may be assigned to perform Acceptance activities during the fabrication of the Precast Concrete Highway Products, which includes the inspection of the materials, work procedures, and Precast Concrete Highway Units. When a MassDOT Inspector is assigned to the Fabricator's plant, 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 start date. The Fabricator shall perform the following activities prior to notifying MassDOT RMS of the scheduled start date:

- (a) Receive approval for all submitted Fabricator cement concrete mix designs from the MassDOT Research and Materials Section for the current year, as specified under the *Mix Design* section and *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete shall meet the requirements of M4.02.17.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

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 Highway Unit(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 Highway Unit(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 in a year, per Mix Design	50 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).

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (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**E. Materials.**

Materials shall meet the following specifications, where 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
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
Self-Consolidating Concrete (SCC)	M4.02.17
Slag	AASHTO M-302
High Performance Cement Concrete	M4.06.1
Reinforcing Bars	M8.01.0
Epoxy Coated Reinforcing Bars	M8.01.7
Asphalt Emulsions	M3.03.0

1. Cement Concrete Mix Design.

Cement concrete for Precast Concrete Highway Units shall meet the requirements of M4.02.0. When used, High Performance Cement Concrete shall meet the requirements of M4.06.1 and self-consolidating concrete (SCC) shall meet the requirements of M4.02.17. The cement concrete shall be composed of specified proportions by the mass of aggregates, cement, supplementary cementitious materials (SCMs), water, and QCML approved admixtures to form a homogenous composition. The particular quantities and uniform combination of materials and sources of supply to be used by the Fabricator on MassDOT Highway Construction contracts shall be reported on the MassDOT Cement Concrete Mix Design Sheet and submitted to MassDOT RMS 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.

Prior to the production and placement of the cement concrete for Precast Concrete Highway Units, the Fabricator's proposed mix design shall be approved by MassDOT RMS. Modifications made to the aggregate, cement, supplementary cementitious materials (SCMs), admixtures (including coloring agents), or formulation to previously approved mix designs during fabrication are prohibited. All new mix design formulations and modifications made to previously approved mix designs will require resubmission of the Cement Concrete Mix Design Sheet to MassDOT RMS for review and trial batch testing for the new mix design(s) by the Fabricator. 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:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Performed by a qualified laboratory and/or AASHTO accredited laboratory.
- (b) Performed and/or sampled in the presence of a MassDOT Inspector.
- (c) Meet the requirements as specified in *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete (SCC) shall meet M4.02.17.

Failure to perform all of the required trial batch testing or provide MassDOT RMS trial batch test results within the Specification Limits (as specified in Table 3) will result in the disqualification of the Fabricator's proposed mix design(s).

Table 3: Trial Batch Sampling and Testing for New Mix Designs

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump ^(a)	AASHTO T 119	Per AASHTO	Max. 8 inches or as approved by the Engineer	Quality Control
Air Content (AC)	AASHTO T 152	Per AASHTO	$5\% \leq AC \leq 8\%$	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	$50^{\circ}\text{F} \leq ^{\circ}\text{F} \leq 90^{\circ}\text{F}$	Quality Control
Compressive Strength ^(b)	AASHTO T 22 AASHTO T 23	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Lab Mixed: 130% f'_c at 28 days Batch Mixed: 120% f'_c at 28 days	MassDOT
Alkali-Silica Reaction (ASR) ^(c)	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration ^(d)	AASHTO T 358 ^(e)	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Resistivity $\geq 15 \text{ k}\Omega\text{-cm}$ at 28 days	MassDOT

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. Cylinders shall be haLaboratory 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) 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).
- (d) Resistance to Chloride Ion Penetration testing shall be performed only on proposed High Performance Cement Concrete mix designs. The 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.
- (e) The Wenner probe tip spacing "a" shall be 1.5.

CONSTRUCTION METHODS – PLANT FABRICATION

F. Shop Drawings.

Fabricator shop drawings for Precast Concrete Highway Units shall conform with the MassDOT Construction Standard Details, Traffic Standard Drawings for Traffic Signals and Highway Lighting, Overhead Signal Structure and Foundation Standard Drawings, and Standard Drawings for Signs and Supports. Circular vertical precast reinforced concrete manholes and structures used in sewer, drainage, and water works shall conform with the requirements of AASHTO M 199.

G. Tolerances.

Precast unit tolerances shall be as indicated on the plans, as specified in Subsection 901, or as indicated in the MassDOT Construction Standard Details, as appropriate.

H. Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Highway Units within specified tolerances to the shapes, lines and dimensions shown on the MassDOT Construction Standard Details. 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 minor nature, due to form work, stripping or handling, shall be cause for rejection, as defined in Repairs and Replacement, unless approved for repair through the NCR process. 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 a MassDOT approved mix design. 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. The Quality Control Inspector shall inspect and accept the placement of the reinforcing steel prior to the placement of concrete into the forms. When a MassDOT Inspector is assigned to perform Acceptance activities at the Fabricator's facility, 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.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)**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. Exposed Surfaces of Precast Concrete Highway Units.

As soon as conditions permit and 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.

M. Final Curing Methods.

All exposed concrete surfaces shall meet the requirements of the selected final curing method and maintain the required concrete temperature ranges throughout the duration of the final curing method cycle. Controlled and gradual termination of the final curing method cycle shall occur after all the specified conditions are met.

1. Water Spray Curing.

The final curing method cycle shall begin immediately after the concrete has hardened sufficiently to prevent surface damage from the water spray. After the concrete has sufficiently hardened, all exposed concrete surfaces shall remain moist with a continuous fine spray of water throughout the entire duration of the final curing method cycle. Controlled and gradual termination of the final curing method cycle shall occur after all specified conditions are met (see *Table 4: Termination of Curing Cycle for Water Spray Curing*).

Table 4: Termination of Curing Cycle for Water Spray

Sustained Ambient Temperature	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ 70% f'_c

2. Saturated Covers for Curing.

The final curing method cycle shall begin immediately after the concrete has hardened sufficiently to prevent surface damage from the saturated burlap. After the concrete has sufficiently hardened, all exposed concrete surfaces shall be covered with water-saturated burlap throughout the entire duration of the final curing method cycle. Controlled and gradual termination of the final curing method cycle shall occur after all specified conditions are met (see *Table 5: Termination of Curing Cycle for Saturated Cover Curing*).

Table 5: Termination of Curing Cycle for Saturated Covers

Sustained Ambient Temperature	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ 70% f'_c

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

3. Curing Covers.

Curing covers shall be Plastic Coated Fiber Blankets or Polyethylene Curing Covers. Proposed curing covers shall be submitted for approval to the Designer of Record with a copy to the MassDOT Research and Materials Section. The final curing method cycle shall begin immediately after the concrete has hardened sufficiently to prevent surface damage from the curing covers. After the concrete has sufficiently hardened, all exposed concrete surfaces shall be covered with curing covers throughout the entire duration of the final curing method cycle. The Fabricator shall ensure that the surface of the concrete remains wet until the covers are placed. If forms are removed from the Precast Concrete Highway Unit, curing covers shall be placed over the exposed concrete for the remainder of 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 (100% minimum relative humidity). Controlled and gradual termination of the final curing method cycle shall occur after all specified conditions are met (see *Table 6: Termination of Curing Cycle for Curing Covers*).

Table 6: Termination of Curing Cycle for Curing Covers

Sustained Ambient Temperature	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ 70% f'_c

N. Stripping.

The Fabricator shall not strip forms or handle the Precast Concrete Highway Unit until Quality Control compressive strength cylinders attain a minimum compressive strength of 70% Design Strength (f'_c).

O. Handling and Storage of Precast Concrete Highway Units.

Precast Concrete Highway Units shall not be exposed to temperatures below 50°F until Quality Control compressive strength results have achieved 70% f'_c . Precast units 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 units shall be supported on the ground by means of continuous blocking.

Precast units shall be loaded on a trailer with continuous blocking. Shock-absorbing cushioning material shall be used at all bearing points during transportation of the precast units. Blocking shall be provided at all locations of tie-down straps. The precast units shall not be subject to damaging torsional or impact stresses.

P. Repairs and Replacement (not including Proprietary Retaining Wall Systems)

Where noted, defects shall be repaired according to the PCI Northeast Region Guidelines for Resolution of Non-Conformances in Precast Concrete Highway Units, Report Number PCINE-18-RNPCBE. Please note that reference to PCINE-18-RNPCBE is made for repair details only. In the case of conflict with this specification, this specification shall govern.

Any required repairs shall utilize materials listed on the MassDOT QCML. All repairs shall be completed at the expense of the Contractor.

Q. Repairs and Replacement for Proprietary Retaining Wall Systems.

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.

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:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Surface voids or bug holes that are less than 5/8-inch in diameter and less than 1/4-inch deep, except when classified as Category 3
- (b) cracks less than or equal to 0.006" wide

2. Category 2, Minor Defects.

Category 2 defects shall be repaired and documented. Non-conformance Reports are not required for this category. Documentation of the repair shall be submitted to the MassDOT District Engineer. Minor defects are defined as:

- (a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
- (b) Cracks greater than 0.006" and less than or equal to 0.060"
- (c) Broken corners without exposed reinforcing steel

Defects and cracks shall be repaired according to the Guidelines for Resolution of Non-Conformances in Precast Concrete Highway Units, Report Number PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor. Any required repairs shall utilize materials listed on the MassDOT QCML.

3. Category 3, Rejectable Defects.

Rejectable defects as determined by the MassDOT Inspector and MassDOT Resident Engineer will be rejected, unless the Fabricator receives MassDOT approval of a Non-Conformance Report. Some rejectable defects are defined as:

- (a) Surface defects on more than 5% of the surface area
- (b) Minor defects that in total make up more than 5% of the surface area of the unit
- (c) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area.
- (d) Exposed reinforcing steel
- (e) 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
- (f) Cracks greater than 0.060" in width
- (g) Elements fabricated outside of the specified tolerances
- (h) Compressive strength that does not meet the specified Design Strength, f'_c

R. Loading.

Prior to the Fabricator loading the Precast Concrete Highway Unit 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 Concrete Highway Unit. 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.

S. Shipping.

Prior to shipment, the Fabricator shall perform the following actions and provide the required documentation to the MassDOT Plant Inspector:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Precast Concrete Highway Units 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 Highway Unit'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 and MassDOT Inspector and/or MassDOT RMS.

T. 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 Highway Unit'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 Highway Units upon receipt at the site. Precast Concrete Highway Units damaged during delivery shall be repaired or replaced at MassDOT's direction at no cost to MassDOT..

DOCUMENT 00713

Subsection 701

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

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

DESCRIPTION

701.20: General

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

MATERIALS

701.30: General

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

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

^[1] Preformed expansion joint filler shall conform to Subsection M9.14.0 or ASTM D8139.

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

A. Combined Aggregate System.

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

1. Tarantula Curve.

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

Table 701.30-1: Tarantula Curve Particle Size Distribution

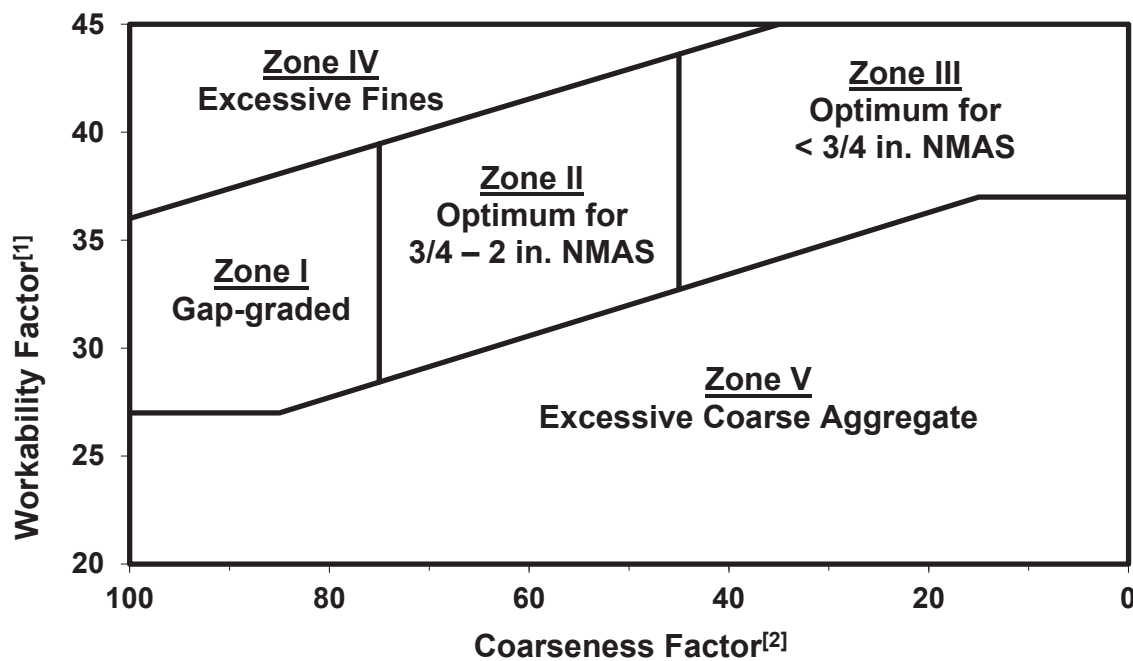
Sieve Opening	Percent by Mass Targets (%)		Percent by Mass Retained (%)		
	Passing	Retained			
1-1/2 in.	100	–	–	–	–
1 in.	92	8	0 – 16	–	–
3/4 in.	82	10	0 – 20	–	–
1/2 in.	69	13	4 – 20	–	–
3/8 in.	56	13	4 – 20	–	–
No. 4	43	13	4 – 20	–	–
No. 8	37	6	0 – 12	Coarse Sand 20 – 40	–
No. 16	31	6	0 – 12		–
No.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

2. Shilstone Workability-Coarseness Chart.

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

Table 701.30-2: Shilstone Workability-Coarseness

Zone	Property	Cause
Zone I	Gap-graded; High potential for segregation during placement and consolidation; Cracking, blistering, spalling, and scaling	Deficiency in intermediate particles; Non-cohesive
Zone II	Optimum mixture for nominal maximum aggregate size from 2 in. – ¾ in.	Optimized workability factor and coarseness factor
Zone III	Optimum mixture for nominal maximum aggregate size < ¾ in.	Optimized workability factor and coarseness factor
Zone IV	Sticky; High potential for segregation during consolidation and finishing; Variable strength, high shrinkage, cracking, curling, spalling, and scaling	Excessive fines
Zone V	Rocky; Lacking plasticity	Excessive amount of coarse and intermediate aggregate

Figure 701.30-1: Shilstone Workability-Coarseness Chart

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

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

3. Fineness Modulus.

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

4. Coarse Aggregate Content.

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

B. Paste System.

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

1. Water-Cementitious Ratio.

The water-cementitious ratio for the mix design may be analyzed to evaluate potential properties of the concrete, including strength, concrete and reinforcement bonding, and resistance to freezing, thawing, de-icing, sulfate reaction, corrosion of steel reinforcement, drying shrinkage, cracking, and volume change from wetting and drying. The water-cementitious ratio is determined by calculating the total water content by mass and dividing by the total cement and supplementary cementitious material (SCM) content by mass. The recommended water-cementitious ratio design target is identified in Table 701.30-3. The water-cementitious ratio shall be less than or equal to 0.45.

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

Exposure Class	Severity	Condition	Water-Cementitious Ratio	
			Recommendation	Requirement
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	≤ 0.40	≤ 0.45

2. Air Content.

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

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

Exposure Class	Severity	Condition	Nominal Maximum Aggregate Size (in.)	Air Content Target Recommendation (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	3/8	7.5
			1/2	7.0
			3/4	6.0

3. Cement and Supplementary Cementitious Materials Content.

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

Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance^{[1][2]}

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

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

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

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

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

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

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

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

4. Chemical Admixtures.

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

Table 701.30-7: Chemical Admixtures

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

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

5. Paste Content.

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

Table 701.30-8: Paste Content

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

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

$$\begin{aligned}
 V_{\text{CEMENT}} &= W_{\text{CEMENT}} / SG_{\text{CEMENT}} * D_{\text{WATER}} \\
 V_{\text{SCM}} &= W_{\text{SCM}} / SG_{\text{SCM}} * D_{\text{WATER}} \\
 V_{\text{ADMIXTURE}} &= V_{\text{ADMIXTURE}} \text{ in oz.} / 957.5 \text{ oz. per cf} \\
 V_{\text{WATER}} &= V_{\text{WATER}} \text{ in gal.} / 7.48 \text{ gal. per cf} \\
 V_{\text{COARSE}} &= W_{\text{COARSE}} / SG_{\text{COARSE}} * D_{\text{WATER}} \\
 V_{\text{FINE}} &= W_{\text{FINE}} / SG_{\text{FINE}} * D_{\text{WATER}} \\
 V_{\text{CONCRETE}} &= V_{\text{CEMENT}} + V_{\text{SCM}} + V_{\text{ADMIXTURE}} + V_{\text{WATER}} + V_{\text{COARSE}} + V_{\text{FINE}} + V_{\text{AIR}}
 \end{aligned}$$

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

$$\begin{aligned}
 V_{\text{PASTE}} &= V_{\text{CEMENT}} + V_{\text{SCM}} + V_{\text{ADMIXTURE}} + V_{\text{WATER}} \\
 PC_{\text{CONCRETE}} &= V_{\text{PASTE}} / V_{\text{CONCRETE}}
 \end{aligned}$$

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

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

$$\begin{aligned}
 VC_{\text{COARSE}} &= SG_{\text{COARSE}} * D_{\text{WATER}} - BD_{\text{COARSE}} / D_{\text{COARSE}} \\
 VC_{\text{FINE}} &= SG_{\text{FINE}} * D_{\text{WATER}} - BD_{\text{FINE}} / D_{\text{FINE}} \\
 VC_{\text{AGGREGATE}} &= [(V_{\text{COARSE}} / (V_{\text{COARSE}} + V_{\text{FINE}})) * VC_{\text{COARSE}} + (V_{\text{FINE}} / (V_{\text{COARSE}} + V_{\text{FINE}})) * VC_{\text{FINE}}] \\
 AVC_{\text{CONCRETE}} &= [VC_{\text{AGGREGATE}} * ((V_{\text{COARSE}} + V_{\text{FINE}}) / V_{\text{CONCRETE}})] \\
 R_{\text{PC-AVC}} &= PC_{\text{CONCRETE}} / AVC_{\text{CONCRETE}}
 \end{aligned}$$

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

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

C. Initial Curing Materials.

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

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

1. Liquid-Applied Evaporation Reducers.

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

D. Intermediate Curing Materials.

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

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

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

E. Final Curing Materials.

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

Curing water shall be free of deleterious impurities, causing staining and deterioration. The potential staining ability of curing water shall be evaluated by means of CRD-C401 (US Army Corps of Engineers 1975) for instances where curing water quality is questioned. Curing water shall not exceed a temperature differential of more than 20°F from the internal concrete temperature, to prevent cracking due to temperature gradients causing strain that exceeds the strain capacity of concrete. Curing water shall remain above freezing temperatures throughout the duration of the curing cycle.

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

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

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

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

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

1. Saturated Covers.

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

2. Sheet Materials.

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

a. Polyethylene Film.

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

i. White Polyethylene Film.

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

ii. Clear and Black Polyethylene Films.

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

b. White Burlap-Polyethylene Sheeting.

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

c. Reinforced Impervious Paper.

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

3. Liquid Membrane-Forming Compounds.

Compounds shall form a continuous, non-yellowing, and durable film with quality moisture-retention properties. Compounds shall maintain the relative humidity of the concrete surface above 80% for seven days to sustain cement hydration. Compounds shall not affect the original color of the concrete surface. Compounds shall not degrade due to exposure to ultraviolet light from direct sunlight. Compounds shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

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

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

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

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

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

The Contractor shall verify the application rate and procedures are in accordance with the Manufacturer's instructions and recommendations. At least one uniform coat shall be applied at a rate of 150 to 200 ft²/gallon. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of the surface. In such cases, two separate applications may be needed, each at 200 ft²/gallon or greater if specified by the Manufacturer to achieve the desired moisture retention rate, with the first being allowed to become tacky before the second is applied. If two coats are necessary to ensure complete coverage, for effective protection the second coat should be applied at right angles to the first. Complete coverage of the surface shall be attained due to the potential for formation of small pinholes in the membrane, which will result in loss of moisture from the concrete. Compounds shall not sag, run off peaks, or collect in grooves.

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

a. Liquid Membrane-Forming Compounds for Curing.

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

Table 701.30-1: Types of Compounds for Curing

Type	Description
Type 1	Clear or translucent without dye
Type 1-D	Clear or translucent with fugitive dye
Type 2	White pigmented

Table 701.30-2: Composition Class of Compounds for Curing

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

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

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

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

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

Type	Description
Type I	Clear or translucent
Type II	White pigmented

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

Type	Description
Class A	Non-yellowing

F. Protective Sealing Compounds.

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

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

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

G. Cold Weather Concreting Materials.

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

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of cold weather exposure. The protection period shall remain in place while cold weather conditions exist. Controlled and gradual termination of the protection period shall be conducted only after 100% $f'c$ is attained and all specified conditions are met.

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

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

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

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

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

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

1. Insulating Materials.

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

2. Heaters.

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

a. Direct Fired Heaters.

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

b. Indirect Fired Heaters.

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

c. Hydronic Heaters.

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

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

3. Enclosures.

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

H. Hot Weather Concreting Materials.

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

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

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

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

where E = evaporation rate of water-covered surface (lb/ft²/hr), T_c = concrete temperature of the evaporating surface (°F), r = relative humidity of air surrounding the evaporating surface (%), T_a = temperature of the air surrounding the evaporative surface (°F), and V = average wind speed 20 inches above the evaporating surface. The air surrounding the evaporating surface shall be defined as the air approximately 4 to 6 feet above the evaporating surface on the windward side and shielded from the sun's rays.

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

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

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

CONSTRUCTION METHODS

701.40: Pre-Placement

A. Excavation.

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

B. Subgrade and Subbase.

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

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

C. Forms.

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

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

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

All forms shall be oiled before placing concrete.

701.41: Placement

The concrete shall be placed in alternate slabs 30 ft long except as otherwise ordered. The slabs shall be separated by transverse preformed expansion joint filler ½ in. thick.

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

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

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

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

The surface of all concrete sidewalks shall be uniformly scored into block units of areas not more than 36 ft². The depth of the scoring shall be at least ½ in. deep and no more than ½ in. wide.

701.42: Initial Curing

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

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

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

701.43: Finishing

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

701.44: Intermediate Curing

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

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

701.45: Final Curing

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

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

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

Table 701.45-1: Termination of Curing Cycle

Sustained Concrete Temperature	Final Curing Cycle Duration	Compressive Strength^[1]
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 70% f _c

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

701.46: Protective Sealing

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

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

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

701.47: Cold Weather Concreting

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

701.48: Hot Weather Concreting

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

CONTRACTOR QUALITY CONTROL**701.60: General**

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

701.61: Contractor Quality Control Plan

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

701.62: Production Personnel**A. Foreman.**

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

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

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

Table 701.62-1: Minimum Foreman Activities

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

B. Operators.

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

Table 701.62-2: Minimum Operator Activities

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

^[1] Recommended number of operators.

Table 701.62-2: Minimum Operator Activities (Continued)

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

^[1] Recommended number of operators.

701.63: Quality Control Inspection

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

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

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

DEPARTMENT ACCEPTANCE

701.70: General

Acceptance shall be performed by the Department, including consultants under direct contract with the Department independent of the Contractor, to evaluate the degree of compliance with contract requirements, to monitor each Contractor entity's Quality Control activities, to determine the corresponding value for a given product, and to determine the acceptability of all material produced and placed.

701.71: Acceptance of Contractor Quality Control Plan

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

701.72: Acceptance Inspection

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

701.73: Acceptance Sampling and Testing

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

Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements

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

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

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

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

^[4] Testing only required if compressive strength results at 28 days do not conform with specifications.

COMPENSATION

701.80: Method of Measurement

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

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

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

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

701.81: Basis of Payment

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

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

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

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

701.82: Payment Items

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

GUIDE TO THE INTERIM SUBSECTION 701 CEMENT CONCRETE SIDEWALK SPECIFICATION

MATERIALS ACTIVITIES

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

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

CONTRACTOR ACTIVITIES

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

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

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

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

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

DOCUMENT 00715



SUPPLEMENTAL SPECIFICATIONS

(English Units)

DATE: MARCH 31, 2021

The 2021 *Standard Specifications for Highways and Bridges* are amended by the following modifications, additions and deletions. This Supplemental Specifications prevail over those published in the Standard Specifications. These amendments were approved by the MassDOT-Highway Specifications Committee during the period January 1, 2021 through March 31, 2021.

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

Contractors are cautioned that these Supplemental Specifications are dated and may vary from time to time as they are updated.

DIVISION I

GENERAL REQUIREMENTS AND COVENANTS

SECTION 7.00: Legal Relations and Responsibility to Public

Subsection 7.15 Claims Against Contractors for Payment of Labor, Materials and Other Purposes.

(page I.61) Replace the words after "Chapter 30, Section 39G, of the General Laws, as amended, reads as follows:" with the following;

Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Subsection 7.15 (Continued)

Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one per cent retainage, if held by the awarding authority, on that work, including the quantity, price and all but one per cent retainage, if held by the awarding authority, for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the awarding authority, on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment.

Subsection 7.15 (Continued)

Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one per cent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

DIVISION II CONSTRUCTION DETAILS

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

SUBSECTION 445: SHOULDERS

MATERIALS

Subsection 445.40 General

(page II.103) Replace the words Sodding (Field) with the word Sod.

SECTION 800: TRAFFIC CONTROL DEVICES

SUBSECTION 815: TRAFFIC CONTROL SIGNALS

SUBSECTION 815.20 General

(page II.366) Replace the ninth paragraph with the following,

All electrical connections, splicing, grounding, resistance tests, service connections and circuit identification shall be done by a licensed electrician holding "Certificate B" issued by the State Examiners of Electricians. All work within the traffic control cabinet shall be done by an IMSA Certified Traffic Signal Field Technician Level II.

SUBSECTION 828: TRAFFIC SIGNS

Subsection 828.20 General.

(page II.389) Replace this Subsection with the following;

The provisions of this subsection shall apply to the fabricating, furnishing and erecting overhead and roadside guide signs, warning and regulatory signs, route and project markers and supports for delineators and markers.

Traffic Signs are officially erected devices, mounted on fixed or portable supports, whereby specific messages are conveyed by means of words or symbols, for the purpose of regulating, warning or guiding traffic.

The signs, foundations and supports shall be fabricated and erected in conformity with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals*.

Subsection 828.21 Plans.

(page II.391) Delete the last sentence.

Subsection 828.40 General.

(page II.390) Replace this Subsection with the following;

Materials shall meet the requirements specified in the following Subsection of Division III.
Materials:

Retroreflective Sheeting	M9.30.0
Acrylic Plastic 3.25-Inch Diameter Center-Mount Reflector	M9.30.4
Demountable Reflectorized Delineator-Guard Rail.....	M9.30.7
Reflectorized Flexible Delineator Post	M9.30.8

Subsection 828.55 Hazzard Markers

(page II.395) Delete this Subsection.

Subsection 828.60 General.

(page II.396) Delete the first, second, fifth and sixth paragraphs.

Subsection 828.80 Method of Measurement.

(page II.397) Delete the third, fourth and fifth paragraphs.

Subsection 828.81 Basis of Payment.

(page II.398) Delete the second, third and fourth paragraphs.

Subsection 828.82 Payment Items.

(page II.398) Delete payment items 827.27, 827.33 and 835.

SUBSECTION 860: REFLECTORIZED PAVEMENT MARKINGS

CONSTRUCTION METHODS

SUBSECTION 860.64 Accommodation of Traffic

(page II.424) Replace this subsection with the following,

All traffic control devices required for pavement marking installation or protection of markings shall be in accordance with Subsection 850: Traffic Controls for Construction and Maintenance Operations.

Lane closures, shifts, or other temporary traffic control setups to accommodate pavement marking operations shall be approved by the Engineer.

SUBSECTION 860.65 Recessed Markings

(page II.424) Add this new subsection.

860.65: Recessed Markings

Prior to cutting out the grooves for recessed markings, the Contractor shall layout the proposed pavement markings per 860.61: Layout of Work. Once the Engineer has inspected and approved the proposed striping layout, the grooves for the proposed pavement markings may be cut. No pavement grooving shall be done without the prior approval of the Engineer.

Groove position shall be a minimum of 4 inches from the edge of the pavement marking to any longitudinal pavement joints. The groove shall not be installed on bridge joints, on drainage structures, or in other areas identified by the Engineer. The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The use of gang stacked diamond cutting blades to grind a smooth square slot is required for producing all grooves. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades. The acceptability of the surface texture will be determined by the Engineer.

The diamond grinder shall have an articulating head so that the slots are installed correctly on grades and super elevated sections.

Grooves that are ground deeper or wider than the specified allowable limits shall be repaired per the direction of the Engineer at no additional cost. Grooves that are ground too shallow, too narrow, or with unacceptable rises between blade cuts shall be reground to the correct size, depth, and surface finished at no additional cost. Slots ground out of alignment shall be patched using an approved method and materials.

Grooves shall be 1 inch \pm ¼ inch wider than the pavement marking width. Groove depth is dependent upon pavement marking material type and shall be per Table 860.65-1.

Table 860.65-1: Groove Depth for Recessed Pavement Markings

Pavement Marking Material Type	Groove Depth
Multi-Component (i.e., Epoxy, Polyurea, Urethane)	80 mil
Preformed	150 mil
Thermoplastic	Proposed wet thickness of line + 40 mil
Water-borne Paint	80 mil

The Contractor may propose an alternate groove depth based upon recommendations of the pavement marking material manufacturer. An alternate depth shall be approved by the Engineer prior to installation.

Subsection 860.65 (Continued)

Groove depth shall be consistent across the full width of the groove. Depth plates shall be provided by the Contractor to the Engineer to assure that the specified groove depth is achieved.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. Shrouds and a vacuum apparatus shall be included as part of the grinder to remove larger pieces of pavement that are ground out. If water is used to clean the groove or the grooving process takes place during rainfall, a minimum of 24 hours of dry time is required prior to the placement of pavement markings. The grooves shall be dry for 24 hour prior to placement of the pavement markings.

After the depth, width, length, and surface condition has been approved by the Engineer, an air lance shall be used to remove fine particles from the groove. Air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up from entering the groove. The Contractor shall prevent traffic from traversing the grooves per 860.63: Protection of Markings and re-clean grooves, as necessary, prior to application of pavement markings at no additional cost.

All grooves must be approved by the Engineer prior to the placement of pavement markings.

SECTION 900: STRUCTURES**SUBSECTION 901: CEMENT CONCRETE****CONSTRUCTION METHODS****SUBSECTION 901.66 Placement, Finishing and Curing of Concrete Bridge Decks.**

(page II.447) Replace paragraph A., 5. with the following,

5. The method for curing the concrete deck. This will include the number of personnel that will be exclusively dedicated for this operation, the means for pre-wetting the burlap, the location of the wet burlap at the work site, the means for conveying the wet burlap to the work bridges and the amount of wet burlap that will be required to completely cover the deck. It shall also include a letter certifying that the fogging equipment produces atomized water droplets with an average droplet diameter of 0.003 in. or less that are uniformly distributed at a rate of at least 0.10 gallons/square foot/hour.

(page II.450) Replace paragraph D. Consolidation with the following,

The concrete shall be consolidated by means of approved high frequency internal vibrators (9,000 to 12,500 vibrations per minute in concrete) that shall be applied in a manner to ensure the consolidation of the concrete throughout the full depth of the deck in advance of the finishing machine. The Contractor shall use rubber vibrator heads or take other approved preventive measures to ensure that the vibrators will not damage the epoxy coated reinforcement. The Contractor shall have approved vibrators in service for each placement operation in accordance with Table 901.66-1. The backup vibrator shall be fully functional and shall be on site and available in case of equipment failure.

Table 901.66-1: Minimum Number of Internal Concrete Vibrators Required

Concrete Placement Rate	Number of Vibrators Required to be In Service	Total Number of Vibrators Required Including Backup
35 yd ³ to 60 yd ³ per hr	3	4
Greater than 60 yd ³ per hr	4	5

Subsection 901.66 (Continued)

These vibrators shall be in operation in addition to the surface vibratory action from the vibrating pan(s) of the finishing machine. Consolidation by the vibrators shall leave the concrete free from voids and insure a dense surface texture, but the vibration of the concrete shall not be continued so long as to cause segregation or bleeding. A small uniform quantity of concrete shall be maintained ahead of the screed on each pass. At no time shall the quantity of concrete carried ahead of the screed be so great as to cause slipping or lifting.

(page II.454) Replace the second paragraph under F. with the following,

Curing shall begin by fog spraying during the placing and finishing operations. Fogging shall continue and shall be applied continuously, rather than intermittently, after the finishing operation until wet covering material has been placed over the concrete surface.

SUBSECTION 945: DRILLED SHAFTS

CONSTRUCTION METHODS

SUBSECTION 945.58 Steel Reinforcement Configuration and Placement.

(page II.496) Replace the second paragraph with the following,

The clear spacing between bars of the steel reinforcement cage shall be at least 5 times the size of the maximum coarse aggregate size of concrete. Reinforcing steel bars shall be connected together using double wire ties at each intersection of the longitudinal bars and spirals. Hooks at the top of the steel reinforcement cage shall not be bent outward if there is any chance that temporary casing will be used. Similarly, interior hooks must be designed to permit adequate clearance for a concrete tremie pipe, i.e., 12 in. minimum.

DIVISION III MATERIALS SPECIFICATIONS

SECTION M9: MISCELLANEOUS MATERIALS

M9.30.3 Acrylic, Prismatic Reflectors and Embossed Aluminum Frames for Signs

(page III.140) Delete this Subsection.

[illegible]

END OF SUPPLEMENTAL SPECIFICATIONS

DOCUMENT 00719

(Revised June 6, 2016 – for all Federally Aided Projects)

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

Section:

Page 00719-

POLICY	2
1. DEFINITIONS	3
2. DBE PARTICIPATION	5
a. Goal.....	5
b. Bidders List.....	5
3. CONTRACTOR ASSURANCES	6
4. REQUIRED SUBCONTRACT PROVISIONS	6
5. ELIGIBILITY OF DBES.....	6
a. Massachusetts DBE Directory	6
b. DBE Certification	6
c. Joint Venture Approval.....	7
6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS	7
a. Commercially Useful Function.....	7
b. Counting Participation Toward The Contract Participation Goal	7
c. Joint Check Policy	9
d. Joint Check Procedure(s).....	10
7. AWARD DOCUMENTATION AND PROCEDURES.....	11
8. COMPLIANCE	13
9. SANCTIONS	16
10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND CONFIDENTIALITY.	16
11. LIST OF ADDITIONAL DOCUMENTS.	18

POLICY

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

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

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

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

<i>Type of Info</i>	<i>Website</i>	<i>Description</i>
MassDOT Highway Division Policies and Info	http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ContractorVendorInformation.aspx	MassDOT– Highway Div'n Page
For copies of the Code of Federal Regulations	http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR	FDsys – US Gov't Printing Office
For information about the U.S.DOT DBE Program	https://www.transportation.gov/small-business/disadvantaged-business-enterprise-dbe-program	U.S. DOT/ FHWA page

1. DEFINITIONS

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

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

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

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

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

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

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

(a) that is at least fifty-one (51%) percent owned by one or more individuals who are both socially and economically disadvantaged, or, in the case of any corporation, in which at least fifty-one (51%) percent of the stock is owned by one or more such individuals; and

(b) where the management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

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

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

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

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

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

"Regular Dealer" shall mean a DBE firm that owns, operates, or maintains a store, warehouse, or other establishment in which materials, supplies, articles or equipment of the general character described by the specifications and required under the Contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

(a) To be a regular dealer, the firm must be an established, regular business that engages, as its principal business, and under its own name, in the purchase and sale of the products in question.

(b) A person may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided above if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by long term lease agreement and not on an ad hoc or contract by contract basis.

(c) Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers within the meaning of this definition.

"Responsive" and "Responsible" refers to the bidder's submittal meeting all of the requirements of the advertised request for proposal. The term responsible refers to the ability of the Contractor to perform the work. This ability can be determined prior to bid invitations.¹

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

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

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

(a) Individuals found by SDO to be socially and economically disadvantaged individuals on a case by case basis.

(b) Individuals in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:

¹ <http://www.fhwa.dot.gov/resourcecenter/teams/operations/gloss.cfm>

(1) "Black Americans" which includes persons having origin in any of the Black racial groups of Africa; (2) "Hispanic Americans" which include persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race; (3) "Native Americans" which include persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians; (4) "Asian Pacific Americans" which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kiribati, Tuvalu, Nauru, Federated States of Micronesia, or Hong Kong; (5) "Subcontinent Asian Americans" which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka; (6) Women; or (7) Any additional groups whose members are designated as socially and economically disadvantaged by the Small Business Administration (SBA), at such time as the SBA designation becomes effective.

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

2. DBE PARTICIPATION

a. Goal

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

☒ Design-Bid-Build Projects: DBE Participation Goal 16 %
(One half of this goal shall be met in the form of Subcontractor construction activity)

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

b. Bidders List

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

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

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

3. CONTRACTOR ASSURANCES

No Contractor or any Subcontractor shall discriminate on the basis of race color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in all respects and as applicable prior to, or subsequent to, award of U.S. DOT assisted Contracts. The Contractor agrees to affirmatively seek out and consider DBE firms as Contractors, Subcontractors, and/or suppliers of materials and services for this Contract. No Contract will be approved until MassDOT has reviewed Bidders'/Contractors' affirmative actions concerning DBEs. Failure to carry out these requirements is a material breach of this Contract which may result in the termination of the Contract or such other remedy as MassDOT or FHWA deem appropriate.

4. REQUIRED SUBCONTRACT PROVISIONS

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

5. ELIGIBILITY OF DBES

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

a. Massachusetts DBE Directory

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

Contractors are encouraged to make use of the DBE Directory maintained by SDO on the Internet. This listing is updated daily and may be accessed at the SDO's website at: <https://www.sdo.osd.state.ma.us> .

b. DBE Certification

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

c. Joint Venture Approval

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

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

6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS

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

a. Commercially Useful Function

(1) In general, a DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. With respect to materials and supplies used on the Contract, the DBE must be responsible for negotiating price, determining quality and quantity, ordering the material, installing (where applicable) and paying for the material itself.

(2) To determine whether a DBE is performing a commercially useful function, MassDOT will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and other relevant factors.

(3) A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, MassDOT will examine similar transactions, particularly those in which DBEs do not participate.

b. Counting Participation Toward The Contract Participation Goal

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

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

(2) MassDOT will count the entire amount of fees or commissions charged by a DBE firm for providing bona fide services, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a U.S. DOT assisted Contract, toward DBE participation goals, provided it is determined that the fee is reasonable and not excessive as compared with fees customarily allowed for similar services.

(3) When a DBE performs as a participant in a joint venture, MassDOT will count toward DBE participation goals a portion of the total dollar value of the contract that is equal to the distinct, clearly defined portion of the work of the Contract that the DBE performs with its own forces.

(4) MassDOT will use the following factors in determining whether a DBE trucking company is performing a commercially useful function:

(i) the DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract; there cannot be a contrived arrangement for the purpose of meeting DBE participation goals.

(ii) the DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the Contract.

(iii) the Contractor will receive DBE credit for the total value of the transportation services the DBE provides on the Contract using trucks owned, insured, and operated by the DBE itself and using drivers the DBE employs alone.

(iv) the DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The Contractor who has a contract with a DBE who leases trucks from another DBE will receive credit for the total value of the transportation services of the lease.

(v) the DBE may also lease trucks from a non-DBE firm, including an owner-operator. The Contractor who has a Contract with a DBE who leases trucks from a non-DBE is entitled to credit for the total value of the transportation services provided by non-DBE lessees not to exceed the value of transportation services provided by DBE-owned trucks on the Contract. Additional participation by non-DBE lessees receives credit only for the fee or commission it receives as a result of the lease arrangement, fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.

(vi) the lease must indicate that the DBE has exclusive use of, and control over, the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

(5) MassDOT will count the Prime Contractor's expenditures with DBEs for materials or supplies toward DBE participation goals as follows:

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

c. Joint Check Policy

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

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

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

Other factors MassDOT may consider:

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

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

d. Joint Check Procedure(s)

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

7. AWARD DOCUMENTATION AND PROCEDURES

a. The two lowest bidders shall submit, by the close of business on the third (3rd) business day after the bid opening, a completed Schedule of Participation by DBEs (Document B00853) which shall list:

- (1)** The full company name, address and telephone number of each DBE with whom the bidder intends to make a commitment;
- (2)** The contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each DBE as set forth in the Letters of Intent. The Bidder shall list only firms which have the capacity to perform, manage and supervise the work proposed in accordance with the requirements of 49 CFR Part 26 and Section **6.b** of these Special Provisions.
- (3)** The total dollar amount to be paid to each DBE. (Bidders are cautioned that at least one half of the participation goal must be met with construction activity work.)
- (4)** The total dollar amount to be paid to each DBE that is eligible for credit toward the DBE participation goal under the counting rules set out in Section **6.b**.
- (5)** The total creditable DBE participation as a percentage of the total bid price.

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

c. The two lowest bidders shall each submit, with their Schedules of Participation, fully completed, signed Letters of Intent (Document B00854) from each of the DBEs listed on the Schedule. The Letters of Intent shall be in the form attached and shall identify specifically the contract activity the DBE proposes to perform, expressed as contract item number, if applicable, description of the activity, NAICS code, quantity, unit price and total price. In the event of discrepancy between the Schedule and the Letter of Intent, the Letter of Intent shall govern.

d. Evidence of good faith efforts will be evaluated by MassDOT in the selection of the lowest responsible bidder.

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

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

f. If MassDOT finds that the percentage of DBE participation submitted by the bidder on its Schedule does not meet the Contract participation goal, or that Schedule and Letters of Intent were not timely filed, and that the bidder has not demonstrated good faith efforts to comply with these requirements, it shall propose that the bidder be declared ineligible for award. In that case, the bidder may request administrative reconsideration. Such requests must be sent in writing within three (3) calendar days of receiving notice of proposed ineligibility to: The Office of the General Counsel, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA, 02116.

g. If, after administrative reconsideration, MassDOT finds that the bidder has not shown that sufficient good faith efforts were made to comply with the requirements of these Special Provisions, it shall reject the bidder's proposal and may retain the proposal guaranty.

h. Actions which constitute evidence of good faith efforts to meet a DBE participation goal include, but are not limited to, the following examples, which are set forth in 49 CFR Part 26, Appendix A:

- (1)** Soliciting through all reasonable and available means (e.g., attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the Contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
- (2)** Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE participation goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Prime Contractor might otherwise prefer to perform these work items with its own forces.
- (3)** Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (4)** Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE Subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE Subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone number of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.

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

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

8. COMPLIANCE

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

- (5)** A list of: (1) all projects (public and private) which the DBE is currently performing; (2) all projects (public and private) to which the DBE is committed; and (3) all projects (public and private) to which the DBE intends to make a commitment. For each Contract, list the contracting organization, the name and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and the DBE's work schedule for each project.
- e.** If, pursuant to the Subcontractor approval process, MassDOT finds that a DBE Subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of 49 CFR Part 26, approval of the DBE Subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements paragraphs **8.f** and **8.j** of this section.
- f.** If, for reasons beyond its control, the Prime Contractor cannot comply with its DBE participation commitment in accordance with the Schedule of Participation submitted under Section 7, the Prime Contractor shall submit to MassDOT the reasons for its inability to comply with its obligations and shall submit, and request approval for, a revised Schedule of Participation. If approved by MassDOT, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these Special Provisions.
- g.** A Prime Contractor's compliance with the participation goal in Section 2 shall be determined by reference to the established percentage of the total contract price, provided, however, that no decrease in the dollar amount of a bidder's commitment to any DBE shall be allowed without the approval of MassDOT.
- h.** If the contract amount is increased, the Prime Contractor may be required to submit a revised Schedule of Participation in accordance with paragraphs **8.f** and **8.j** of this section.
- i.** In the event of the decertification of a DBE scheduled to participate on the Contract for credit toward the participation goal, but not under subcontract, the Contractor shall proceed in accordance with paragraphs **8.f** and **8.j** of this section.
- j.** The Prime Contractor shall notify MassDOT immediately of any facts that come to its attention indicating that it may or will be unable to comply with any aspect of its DBE obligation under this Contract.
- k.** Any notice required by these Special Provisions shall be given in writing to: (1) the Resident Engineer; (2) the District designated Compliance Officer; and (3) the Director of Compliance, MassDOT Office of Civil Rights, 10 Park Plaza, 4th Floor East, Boston, MA, 02116.
- l.** The Prime Contractor and its Subcontractors shall comply with MassDOT's Electronic Reporting System Requirements (MassDOT Document 00821) and submit all information required by MassDOT related to the DBE Special Provisions through the Equitable Business Opportunity Solution ("EBO"). MassDOT reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.
- m.** Termination of DBE by Prime Contractor
- (1)** A Prime Contractor shall not terminate a DBE Subcontractor or an approved substitute DBE firm without the prior written consent of MassDOT. This includes, but is not limited to, instances in which a Prime Contractor seeks to perform work originally designated for a DBE Subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

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

n. Prompt Payment.

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

9. SANCTIONS

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

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

10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND CONFIDENTIALITY.

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

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

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

11. LIST OF ADDITIONAL DOCUMENTS.

a. The following documents shall be completed and signed by the bidder and designated DBEs in accordance with Section 7 - Award Documentation and Procedures. These documents must be returned by the bidder to MassDOT's Bid Document Distribution Center:

- ☐ Schedule of DBE Participation (Document B00853)
- ☐ Letter of Intent (Document B00854)
- ☐ DBE Joint Check Arrangement Approval Form (Document B00855), if Contractor and DBE plan, or if DBE is required to use a Joint Check

b. The following document shall be signed and returned by Contractor and Subcontractors/DBEs to the MassDOT District Office overseeing the Project, as applicable:

- ☐ Contractor/Subcontractor Certification Form (Document No. 00859) (a checklist of other documents to be included with every subcontract (DBEs and non-DBEs alike)).

c. The following document shall be provided to MassDOT's Office of Civil Rights and Prequalification Office at least fourteen (14) business days before the bid opening date, if applicable:

- ☐ Affidavit of DBE/Non-DBE Joint Venture (Document B00856)

*** END OF DOCUMENT ***

DOCUMENT 00760

FHWA-1273

REQUIRED CONTRACT PROVISIONS FOR FEDERAL-AID CONSTRUCTION CONTRACTS

Revised May 1, 2012

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Government wide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

- A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and

conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. Davis-Bacon and Related Act Provisions

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4).

Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

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

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or

their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of

the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to

journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract

subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

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

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

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

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

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

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

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

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely

upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

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

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

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

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

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

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

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers to any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

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

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

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

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an

employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to

grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

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

END OF DOCUMENT

DOCUMENT 00811

SPECIAL PROVISIONS
MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
ENGLISH AND METRIC UNITS
Revised: 06/04/2019

This provision applies to all projects using greater than 100 tons (91 megagrams) 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/2019-massdot-contract-price-adjustments> within two (2) business days 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. This method of period price determination was formerly called the New Asphalt Period Price Method. Separate website postings using both the New Asphalt Period Price Method and the Old Asphalt Period Price Method were discontinued after June 2013.

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 Standard Specifications for Highways and Bridges, Division III, Section M3.11.03.

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

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

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

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DOCUMENT 00812

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

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

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

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

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

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

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

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

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

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

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DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

June 16, 2021

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 in which MassDOT opened bids for the project. This date is used to select the Base Price Index.

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 = $\$0.82/\text{Pound} \times 0.950 = \$0.78/\text{Pound}$

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	\$0.41
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	\$0.56
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	\$0.56
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	\$0.60
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	\$0.63
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	\$0.59
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	\$0.63
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	\$0.59
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	\$0.64
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	\$0.60
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	\$0.64
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	\$0.60
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	\$0.69
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	\$0.72
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	\$1.11
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	\$0.64
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	\$0.60
18	ASTM A276 Type 316 Stainless Steel	\$3.31
19	ASTM A240 Type 316 Stainless Steel	\$3.31
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	\$1.14
21	ASTM A53 Grade B Structural Steel Pipe	\$0.73
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	\$0.73
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	\$0.58
24	ASTM 252, Grade 2 Permanent Steel Casing	\$0.58
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	\$0.62
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	\$1.08
27	ASTM A572 / A572M, Grade 50 Sheetpiling	\$1.08
28	ASTM A36/36M, Grade 50	\$0.63
29	ASTM A570, Grade 50	\$0.62
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	\$0.63
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	\$0.73
32	AREA 140 LB Rail and Track Accessories	\$0.38

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

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DOCUMENT 00814

SPECIAL PROVISIONS
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

January 12, 2009

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

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

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

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

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

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

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

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

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

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DOCUMENT 00820

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

I. Definitions

For purposes of this contract,

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

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

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

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

II. Equal Opportunity, Non-Discrimination and Affirmative Action

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

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

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

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

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

III. Minority and Women Workforce Participation

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

IV. Liaison Committee

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

V. Reports and Records

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

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

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

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

VI. Access to Work Site

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

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

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

VIII. Sanctions

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

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

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

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

IX. Severability

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

X. Contractor's Certification

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

XI. Subcontractor Requirements

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

Rev'd 03/07/14

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DOCUMENT 00821

ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAMS AND CERTIFIED PAYROLL

Implemented on March 2, 2009

Revised June 04, 2019

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

Contractor and Sub-Contractor EBO User Certification

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

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

Vetting of Firms and Designated Firm Individuals

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

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

Interim Reporting Requirements

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

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DOCUMENT 00859

CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM

(Contractor) **Date:** _____

‡This form shall be prepared and submitted to MassDOT for each and every subcontractor; the Prime Contractor shall ensure that the indicated documents have been given, as applicable, to its SubContractors.

_____ (Subcontractor) ☐ District Approved Subcontractor

Contract No: 114724 **Project No:** 606272 **Federal Aid No:** CMQ-0035(043), HIS 0035(043),
NFP(N/I)-0035(043), STP-0035(043) &
Location: Barnstable TAP-0035(043)

Project Description: Intersection Improvements and Related Work (Including Signals) at Iyannough Road (Route 28) and Yarmouth Road

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

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

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

Document

- | | |
|--------------------------|--|
| <input type="checkbox"/> | 00718 – Participation By Minority Or Women's Business Enterprises and SDVOBE† |
| <input type="checkbox"/> | 00761 – Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion |
| <input type="checkbox"/> | 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program |
| <input type="checkbox"/> | 00821 – Electronic Reporting Requirements, Civil Rights Programs, and Certified Payroll |
| <input type="checkbox"/> | 00859 – Contractor/Subcontractor Certification Form (this document) |
| <input type="checkbox"/> | 00860 – MA Employment Laws |
| <input type="checkbox"/> | 00861 – Applicable State Wage Rates in the Contract Proposal** |
| <input type="checkbox"/> | B00842 – MA Schedule of Participation By Minority or Women Business Enterprises (M/WBEs)† |
| <input type="checkbox"/> | 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 |
| <input type="checkbox"/> | B00844 – Schedule of Participation By SDVOBE |
| <input type="checkbox"/> | B00845 – Letter of Intent – SDVOBE |
| <input type="checkbox"/> | B00846 – M/WBE or SDVOBE Joint Check Arrangement Approval Form |
| <input type="checkbox"/> | 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 : <http://www.massdot.state.ma.us/Debarred.aspx>.
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)

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 than two weeks 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 WAGE RATES

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CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

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

Prevailing Wage Rates

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

ROSALIN ACOSTA
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority: MassDOT Highway

Contract Number: 114724 **City/Town:** BARNSTABLE

Description of Work: BARNSTABLE - FAP#s CMQ-0035(043), HSI-0035(043) NFP(N/I)-0035(043) STP-0035(043) & TAP-0035(043) Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) & Yarmouth Road

Job Location: Route 28 and Yarmouth Road

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- 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 from the Department of Labor Standards (“DLS”) 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 any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person 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 DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- 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. Awarding authorities are required to request these updates 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, 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. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F “rental of equipment” contracts.
- Every contractor or subcontractor which performs construction work on the project is required to 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. A sample of a payroll reporting form may be obtained at <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.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- 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.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2021	\$35.95	\$12.91	\$14.82	\$0.00	\$63.68
	08/01/2021	\$35.95	\$13.41	\$14.82	\$0.00	\$64.18
	12/01/2021	\$35.95	\$13.41	\$16.01	\$0.00	\$65.37
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2021	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	08/01/2021	\$36.02	\$13.41	\$14.82	\$0.00	\$64.25
	12/01/2021	\$36.02	\$13.41	\$16.01	\$0.00	\$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2021	\$36.14	\$12.91	\$14.82	\$0.00	\$63.87
	08/01/2021	\$36.14	\$13.41	\$14.82	\$0.00	\$64.37
	12/01/2021	\$36.14	\$13.41	\$16.01	\$0.00	\$65.56
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.75	\$8.60	\$16.64	\$0.00	\$60.99
	12/01/2021	\$36.66	\$8.60	\$16.64	\$0.00	\$61.90
	06/01/2022	\$37.56	\$8.60	\$16.64	\$0.00	\$62.80
	12/01/2022	\$38.41	\$8.60	\$16.64	\$0.00	\$63.65
	06/01/2023	\$39.31	\$8.60	\$16.64	\$0.00	\$64.55
	12/01/2023	\$40.21	\$8.60	\$16.64	\$0.00	\$65.45
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$35.75	\$8.60	\$16.64	\$0.00	\$60.99
	12/01/2021	\$36.66	\$8.60	\$16.64	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS WORKER (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)</i>	12/01/2020	\$38.10	\$12.80	\$9.45	\$0.00	\$60.35
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$50.73	\$13.75	\$15.80	\$0.00	\$80.28
	12/01/2021	\$51.88	\$13.75	\$15.80	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$50.73	\$13.75	\$15.80	\$0.00	\$80.28
	12/01/2021	\$51.88	\$13.75	\$15.80	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER	06/01/2021	\$35.75	\$8.60	\$16.64	\$0.00	\$60.99
<i>LABORERS - ZONE 2</i>	12/01/2021	\$36.66	\$8.60	\$16.64	\$0.00	\$61.90
	06/01/2022	\$37.56	\$8.60	\$16.64	\$0.00	\$62.80
	12/01/2022	\$38.41	\$8.60	\$16.64	\$0.00	\$63.65
	06/01/2023	\$39.31	\$8.60	\$16.64	\$0.00	\$64.55
	12/01/2023	\$40.21	\$8.60	\$16.64	\$0.00	\$65.45
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY)	06/01/2021	\$35.75	\$8.60	\$16.64	\$0.00	\$60.99
<i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	12/01/2021	\$36.66	\$8.60	\$16.64	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15
<i>BOILERMAKERS LOCAL 29</i>						

Apprentice - BOILERMAKER - Local 29**Effective Date -** 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
2	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
3	70	\$32.27	\$7.07	\$12.59	\$0.00	\$51.93
4	75	\$34.58	\$7.07	\$13.49	\$0.00	\$55.14
5	80	\$36.88	\$7.07	\$14.38	\$0.00	\$58.33
6	85	\$39.19	\$7.07	\$15.29	\$0.00	\$61.55
7	90	\$41.49	\$7.07	\$16.18	\$0.00	\$64.74
8	95	\$43.80	\$7.07	\$17.09	\$0.00	\$67.96

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

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)	02/01/2021	\$55.75	\$11.39	\$22.09	\$0.00	\$89.23
<i>BRICKLAYERS LOCAL 3 (NEW BEDFORD)</i>	08/01/2021	\$57.15	\$11.39	\$22.25	\$0.00	\$90.79
	02/01/2022	\$57.74	\$11.39	\$22.25	\$0.00	\$91.38

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 New Bedford						
Effective Date - 02/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.88	\$11.39	\$22.09	\$0.00	\$61.36
2	60	\$33.45	\$11.39	\$22.09	\$0.00	\$66.93
3	70	\$39.03	\$11.39	\$22.09	\$0.00	\$72.51
4	80	\$44.60	\$11.39	\$22.09	\$0.00	\$78.08
5	90	\$50.18	\$11.39	\$22.09	\$0.00	\$83.66
Effective Date - 08/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.58	\$11.39	\$22.25	\$0.00	\$62.22
2	60	\$34.29	\$11.39	\$22.25	\$0.00	\$67.93
3	70	\$40.01	\$11.39	\$22.25	\$0.00	\$73.65
4	80	\$45.72	\$11.39	\$22.25	\$0.00	\$79.36
5	90	\$51.44	\$11.39	\$22.25	\$0.00	\$85.08
Notes:						
Apprentice to Journeyworker Ratio:1:5						
BULLDOZER/GRADER/SCRAPER	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN	06/01/2021	\$41.82	\$8.60	\$17.72	\$0.00	\$68.14
LABORERS - FOUNDATION AND MARINE	12/01/2021	\$42.83	\$8.60	\$17.72	\$0.00	\$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER	06/01/2021	\$40.67	\$8.60	\$17.72	\$0.00	\$66.99
LABORERS - FOUNDATION AND MARINE	12/01/2021	\$41.68	\$8.60	\$17.72	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN	06/01/2021	\$40.67	\$8.60	\$17.72	\$0.00	\$66.99
LABORERS - FOUNDATION AND MARINE	12/01/2021	\$41.68	\$8.60	\$17.72	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
LABORERS - ZONE 2	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
CARPENTER	03/01/2021	\$43.54	\$9.40	\$18.95	\$0.00	\$71.89
CARPENTERS -ZONE 2 (Eastern Massachusetts)	09/01/2021	\$44.19	\$9.40	\$18.95	\$0.00	\$72.54
	03/01/2022	\$44.79	\$9.40	\$18.95	\$0.00	\$73.14
	09/01/2022	\$45.44	\$9.40	\$18.95	\$0.00	\$73.79
	03/01/2023	\$46.04	\$9.40	\$18.95	\$0.00	\$74.39

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - CARPENTER - Zone 2 Eastern MA						
Effective Date - 03/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.77	\$9.40	\$1.73	\$0.00	\$32.90
2	60	\$26.12	\$9.40	\$1.73	\$0.00	\$37.25
3	70	\$30.48	\$9.40	\$13.76	\$0.00	\$53.64
4	75	\$32.66	\$9.40	\$13.76	\$0.00	\$55.82
5	80	\$34.83	\$9.40	\$15.49	\$0.00	\$59.72
6	80	\$34.83	\$9.40	\$15.49	\$0.00	\$59.72
7	90	\$39.19	\$9.40	\$17.22	\$0.00	\$65.81
8	90	\$39.19	\$9.40	\$17.22	\$0.00	\$65.81
Effective Date - 09/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.10	\$9.40	\$1.73	\$0.00	\$33.23
2	60	\$26.51	\$9.40	\$1.73	\$0.00	\$37.64
3	70	\$30.93	\$9.40	\$13.76	\$0.00	\$54.09
4	75	\$33.14	\$9.40	\$13.76	\$0.00	\$56.30
5	80	\$35.35	\$9.40	\$15.49	\$0.00	\$60.24
6	80	\$35.35	\$9.40	\$15.49	\$0.00	\$60.24
7	90	\$39.77	\$9.40	\$17.22	\$0.00	\$66.39
8	90	\$39.77	\$9.40	\$17.22	\$0.00	\$66.39
Notes: % Indentured After 10/1/17; 45/45/55/55/70/70/80/80 Step 1&2 \$30.72/ 3&4 \$36.75/ 5&6 \$55.37/ 7&8 \$61.45						
Apprentice to Journeyworker Ratio:1:5						
CARPENTER WOOD FRAME	04/01/2021	\$23.16	\$7.21	\$4.80	\$0.00	\$35.17
CARPENTERS-ZONE 3 (Wood Frame)	04/01/2022	\$23.66	\$7.21	\$4.80	\$0.00	\$35.67
	04/01/2023	\$24.16	\$7.21	\$4.80	\$0.00	\$36.17
All Aspects of New Wood Frame Work						

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - CARPENTER (Wood Frame) - Zone 3**Effective Date -** 04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$13.90	\$7.21	\$0.00	\$0.00	\$21.11
2	60	\$13.90	\$7.21	\$0.00	\$0.00	\$21.11
3	65	\$15.05	\$7.21	\$0.00	\$0.00	\$22.26
4	70	\$16.21	\$7.21	\$0.00	\$0.00	\$23.42
5	75	\$17.37	\$7.21	\$3.80	\$0.00	\$28.38
6	80	\$18.53	\$7.21	\$3.80	\$0.00	\$29.54
7	85	\$19.69	\$7.21	\$3.80	\$0.00	\$30.70
8	90	\$20.84	\$7.21	\$3.80	\$0.00	\$31.85

Effective Date - 04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$14.20	\$7.21	\$0.00	\$0.00	\$21.41
2	60	\$14.20	\$7.21	\$0.00	\$0.00	\$21.41
3	65	\$15.38	\$7.21	\$0.00	\$0.00	\$22.59
4	70	\$16.56	\$7.21	\$0.00	\$0.00	\$23.77
5	75	\$17.75	\$7.21	\$3.80	\$0.00	\$28.76
6	80	\$18.93	\$7.21	\$3.80	\$0.00	\$29.94
7	85	\$20.11	\$7.21	\$3.80	\$0.00	\$31.12
8	90	\$21.29	\$7.21	\$3.80	\$0.00	\$32.30

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
 Step 1&2 \$17.63/ 3&4 \$19.95/ 5&6 \$27.22/ 7&8 \$29.54

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING

01/01/2020

\$49.07

\$12.75

\$22.41

\$0.62

\$84.85

BRICKLAYERS LOCAL 3 (NEW BEDFORD)

Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (New Bedford)**Effective Date -** 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$12.75	\$15.41	\$0.00	\$52.70
2	60	\$29.44	\$12.75	\$17.41	\$0.62	\$60.22
3	65	\$31.90	\$12.75	\$18.41	\$0.62	\$63.68
4	70	\$34.35	\$12.75	\$19.41	\$0.62	\$67.13
5	75	\$36.80	\$12.75	\$20.41	\$0.62	\$70.58
6	80	\$39.26	\$12.75	\$21.41	\$0.62	\$74.04
7	90	\$44.16	\$12.75	\$22.41	\$0.62	\$79.94

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$51.73	\$13.75	\$15.80	\$0.00	\$81.28
	12/01/2021	\$52.88	\$13.75	\$15.80	\$0.00	\$82.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$33.40	\$13.75	\$15.80	\$0.00	\$62.95
	12/01/2021	\$34.19	\$13.75	\$15.80	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2021	\$52.06	\$8.25	\$22.75	\$0.00	\$83.06

Apprentice - PAINTER Local 35 - BRIDGES/TANKS**Effective Date - 01/01/2021**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.25	\$0.00	\$0.00	\$34.28
2	55	\$28.63	\$8.25	\$6.16	\$0.00	\$43.04
3	60	\$31.24	\$8.25	\$6.72	\$0.00	\$46.21
4	65	\$33.84	\$8.25	\$7.28	\$0.00	\$49.37
5	70	\$36.44	\$8.25	\$19.39	\$0.00	\$64.08
6	75	\$39.05	\$8.25	\$19.95	\$0.00	\$67.25
7	80	\$41.65	\$8.25	\$20.51	\$0.00	\$70.41
8	90	\$46.85	\$8.25	\$21.63	\$0.00	\$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN <i>LABORERS - ZONE 2</i>	06/01/2021	\$40.82	\$8.60	\$17.57	\$0.00	\$66.99
	12/01/2021	\$41.83	\$8.60	\$17.57	\$0.00	\$68.00
	06/01/2022	\$42.83	\$8.60	\$17.57	\$0.00	\$69.00
	12/01/2022	\$43.83	\$8.60	\$17.57	\$0.00	\$70.00
	06/01/2023	\$44.83	\$8.60	\$17.57	\$0.00	\$71.00
	12/01/2023	\$46.08	\$8.60	\$17.57	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2021	\$41.82	\$8.60	\$17.57	\$0.00	\$67.99
	12/01/2021	\$42.83	\$8.60	\$17.57	\$0.00	\$69.00
	06/01/2022	\$43.83	\$8.60	\$17.57	\$0.00	\$70.00
	12/01/2022	\$44.83	\$8.60	\$17.57	\$0.00	\$71.00
	06/01/2023	\$45.83	\$8.60	\$17.57	\$0.00	\$72.00
	12/01/2023	\$47.08	\$8.60	\$17.57	\$0.00	\$73.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BURNERS <i>LABORERS - ZONE 2</i>	06/01/2021	\$41.57	\$8.60	\$17.57	\$0.00	\$67.74
	12/01/2021	\$42.58	\$8.60	\$17.57	\$0.00	\$68.75
	06/01/2022	\$43.58	\$8.60	\$17.57	\$0.00	\$69.75
	12/01/2022	\$44.58	\$8.60	\$17.57	\$0.00	\$70.75
	06/01/2023	\$45.58	\$8.60	\$17.57	\$0.00	\$71.75
	12/01/2023	\$46.83	\$8.60	\$17.57	\$0.00	\$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 2</i>	06/01/2021	\$41.82	\$8.60	\$17.57	\$0.00	\$67.99
	12/01/2021	\$42.83	\$8.60	\$17.57	\$0.00	\$69.00
	06/01/2022	\$43.83	\$8.60	\$17.57	\$0.00	\$70.00
	12/01/2022	\$44.83	\$8.60	\$17.57	\$0.00	\$71.00
	06/01/2023	\$45.83	\$8.60	\$17.57	\$0.00	\$72.00
	12/01/2023	\$47.08	\$8.60	\$17.57	\$0.00	\$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2021	\$41.57	\$8.60	\$17.57	\$0.00	\$67.74
	12/01/2021	\$42.58	\$8.60	\$17.57	\$0.00	\$68.75
	06/01/2022	\$43.58	\$8.60	\$17.57	\$0.00	\$69.75
	12/01/2022	\$44.58	\$8.60	\$17.57	\$0.00	\$70.75
	06/01/2023	\$45.58	\$8.60	\$17.57	\$0.00	\$71.75
	12/01/2023	\$46.83	\$8.60	\$17.57	\$0.00	\$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER <i>LABORERS - ZONE 2</i>	06/01/2021	\$40.82	\$8.60	\$17.57	\$0.00	\$66.99
	12/01/2021	\$41.83	\$8.60	\$17.57	\$0.00	\$68.00
	06/01/2022	\$42.83	\$8.60	\$17.57	\$0.00	\$69.00
	12/01/2022	\$43.83	\$8.60	\$17.57	\$0.00	\$70.00
	06/01/2023	\$44.83	\$8.60	\$17.57	\$0.00	\$71.00
	12/01/2023	\$46.08	\$8.60	\$17.57	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$68.70	\$9.40	\$23.12	\$0.00	\$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$73.60	\$9.40	\$23.12	\$0.00	\$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>DRAWBRIDGE - SEIU LOCAL 888</i>	07/01/2020	\$26.77	\$6.67	\$3.93	\$0.16	\$37.53
ELECTRICIAN <i>ELECTRICIANS LOCAL 223</i>	09/01/2020	\$43.66	\$10.90	\$14.66	\$0.00	\$69.22

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - ELECTRICIAN - Local 223**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.46	\$10.90	\$0.52	\$0.00	\$28.88
2	45	\$19.65	\$10.90	\$0.59	\$0.00	\$31.14
3	50	\$21.83	\$10.90	\$0.65	\$0.00	\$33.38
4	55	\$24.01	\$10.90	\$6.28	\$0.00	\$41.19
5	60	\$26.20	\$10.90	\$6.77	\$0.00	\$43.87
6	65	\$28.38	\$10.90	\$7.24	\$0.00	\$46.52
7	70	\$30.56	\$10.90	\$7.73	\$0.00	\$49.19
8	75	\$32.75	\$10.90	\$8.21	\$0.00	\$51.86

Notes:**Apprentice to Journeyworker Ratio:2:3*****

ELEVATOR CONSTRUCTOR	01/01/2021	\$63.47	\$15.88	\$19.31	\$0.00	\$98.66
ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86

Apprentice - ELEVATOR CONSTRUCTOR - Local 4**Effective Date - 01/01/2021**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.74	\$15.88	\$0.00	\$0.00	\$47.62
2	55	\$34.91	\$15.88	\$19.31	\$0.00	\$70.10
3	65	\$41.26	\$15.88	\$19.31	\$0.00	\$76.45
4	70	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
5	80	\$50.78	\$15.88	\$19.31	\$0.00	\$85.97

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.81	\$16.03	\$0.00	\$0.00	\$48.84
2	55	\$36.09	\$16.03	\$20.21	\$0.00	\$72.33
3	65	\$42.65	\$16.03	\$20.21	\$0.00	\$78.89
4	70	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
5	80	\$52.50	\$16.03	\$20.21	\$0.00	\$88.74

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER	01/01/2021	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2021	\$45.88	\$13.50	\$15.70	\$0.00	\$75.08
	11/01/2021	\$46.88	\$13.50	\$15.70	\$0.00	\$76.08
	05/01/2022	\$48.03	\$13.50	\$15.70	\$0.00	\$77.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2021	\$47.40	\$13.50	\$15.70	\$0.00	\$76.60
	11/01/2021	\$48.41	\$13.50	\$15.70	\$0.00	\$77.61
	05/01/2022	\$49.57	\$13.50	\$15.70	\$0.00	\$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2021	\$22.91	\$13.50	\$15.70	\$0.00	\$52.11
	11/01/2021	\$23.51	\$13.50	\$15.70	\$0.00	\$52.71
	05/01/2022	\$24.18	\$13.50	\$15.70	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 223</i>	09/01/2020	\$43.66	\$10.90	\$14.66	\$0.00	\$69.22
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE <i>/ COMMISSIONINGELECTRICIANS LOCAL 223</i>	09/01/2020	\$36.86	\$10.90	\$12.45	\$0.00	\$60.21
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$41.31	\$13.75	\$15.80	\$0.00	\$70.86
	12/01/2021	\$42.26	\$13.75	\$15.80	\$0.00	\$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$24.50	\$8.60	\$16.64	\$0.00	\$49.74
	12/01/2021	\$24.50	\$8.60	\$16.64	\$0.00	\$49.74
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE II</i>	03/01/2021	\$46.28	\$9.40	\$19.25	\$0.00	\$74.93
	09/01/2021	\$47.08	\$9.40	\$19.25	\$0.00	\$75.73
	03/01/2022	\$47.88	\$9.40	\$19.25	\$0.00	\$76.53

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - FLOORCOVERER - Local 2168 Zone II**Effective Date - 03/01/2021**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.14	\$9.40	\$1.79	\$0.00	\$34.33
2	55	\$25.45	\$9.40	\$1.79	\$0.00	\$36.64
3	60	\$27.77	\$9.40	\$13.88	\$0.00	\$51.05
4	65	\$30.08	\$9.40	\$13.88	\$0.00	\$53.36
5	70	\$32.40	\$9.40	\$15.67	\$0.00	\$57.47
6	75	\$34.71	\$9.40	\$15.67	\$0.00	\$59.78
7	80	\$37.02	\$9.40	\$17.46	\$0.00	\$63.88
8	85	\$39.34	\$9.40	\$17.46	\$0.00	\$66.20

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.54	\$9.40	\$1.79	\$0.00	\$34.73
2	55	\$25.89	\$9.40	\$1.79	\$0.00	\$37.08
3	60	\$28.25	\$9.40	\$13.88	\$0.00	\$51.53
4	65	\$30.60	\$9.40	\$13.88	\$0.00	\$53.88
5	70	\$32.96	\$9.40	\$15.67	\$0.00	\$58.03
6	75	\$35.31	\$9.40	\$15.67	\$0.00	\$60.38
7	80	\$37.66	\$9.40	\$17.46	\$0.00	\$64.52
8	85	\$40.02	\$9.40	\$17.46	\$0.00	\$66.88

Notes: Steps are 750 hrs.

% After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)

Step 1&2 \$31.99/ 3&4 \$38.37/ 5&6 \$57.47/ 7&8 \$63.88

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER

OPERATING ENGINEERS LOCAL 4

06/01/2021

\$50.73

\$13.75

\$15.80

\$0.00

\$80.28

12/01/2021

\$51.88

\$13.75

\$15.80

\$0.00

\$81.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATOR/LIGHTING PLANT/HEATERS

OPERATING ENGINEERS LOCAL 4

06/01/2021

\$33.40

\$13.75

\$15.80

\$0.00

\$62.95

12/01/2021

\$34.19

\$13.75

\$15.80

\$0.00

\$63.74

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR
SYSTEMS)

GLAZIERS LOCAL 1333

06/01/2020

\$39.18

\$10.80

\$10.45

\$0.00

\$60.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - GLAZIER - Local 1333						
Effective Date - 06/01/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.59	\$10.80	\$1.80	\$0.00	\$32.19
2	56	\$22.04	\$10.80	\$1.80	\$0.00	\$34.64
3	63	\$24.49	\$10.80	\$2.45	\$0.00	\$37.74
4	69	\$26.94	\$10.80	\$2.45	\$0.00	\$40.19
5	75	\$29.39	\$10.80	\$3.15	\$0.00	\$43.34
6	81	\$31.83	\$10.80	\$3.15	\$0.00	\$45.78
7	88	\$34.28	\$10.80	\$10.45	\$0.00	\$55.53
8	94	\$36.73	\$10.80	\$10.45	\$0.00	\$57.98
Notes:						
Apprentice to Journeyworker Ratio:1:3						
HOISTING ENGINEER/CRANES/GRADALLS	06/01/2021	\$50.73	\$13.75	\$15.80	\$0.00	\$80.28
OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.88	\$13.75	\$15.80	\$0.00	\$81.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - OPERATING ENGINEERS - Local 4						
Effective Date - 06/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$27.90	\$13.75	\$0.00	\$0.00	\$41.65
2	60	\$30.44	\$13.75	\$15.80	\$0.00	\$59.99
3	65	\$32.97	\$13.75	\$15.80	\$0.00	\$62.52
4	70	\$35.51	\$13.75	\$15.80	\$0.00	\$65.06
5	75	\$38.05	\$13.75	\$15.80	\$0.00	\$67.60
6	80	\$40.58	\$13.75	\$15.80	\$0.00	\$70.13
7	85	\$43.12	\$13.75	\$15.80	\$0.00	\$72.67
8	90	\$45.66	\$13.75	\$15.80	\$0.00	\$75.21
Effective Date - 12/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$28.53	\$13.75	\$0.00	\$0.00	\$42.28
2	60	\$31.13	\$13.75	\$15.80	\$0.00	\$60.68
3	65	\$33.72	\$13.75	\$15.80	\$0.00	\$63.27
4	70	\$36.32	\$13.75	\$15.80	\$0.00	\$65.87
5	75	\$38.91	\$13.75	\$15.80	\$0.00	\$68.46
6	80	\$41.50	\$13.75	\$15.80	\$0.00	\$71.05
7	85	\$44.10	\$13.75	\$15.80	\$0.00	\$73.65
8	90	\$46.69	\$13.75	\$15.80	\$0.00	\$76.24
Notes:						
Apprentice to Journeyworker Ratio:1:6						

HVAC (DUCTWORK)	04/01/2021	\$37.51	\$13.65	\$16.55	\$2.03	\$69.74
SHEETMETAL WORKERS LOCAL 17 - B	10/01/2021	\$38.51	\$13.65	\$16.55	\$2.06	\$70.77
	04/01/2022	\$39.51	\$13.65	\$16.55	\$2.09	\$71.80
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS)	09/01/2020	\$43.66	\$10.90	\$14.66	\$0.00	\$69.22
ELECTRICIANS LOCAL 223						
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR)	04/01/2021	\$37.51	\$13.65	\$16.55	\$2.03	\$69.74
SHEETMETAL WORKERS LOCAL 17 - B	10/01/2021	\$38.51	\$13.65	\$16.55	\$2.06	\$70.77
	04/01/2022	\$39.51	\$13.65	\$16.55	\$2.09	\$71.80
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER)	08/31/2020	\$44.69	\$10.15	\$19.80	\$0.00	\$74.64
PLUMBERS & PIPEFITTERS LOCAL 51	08/30/2021	\$46.69	\$10.15	\$19.80	\$0.00	\$76.64
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC	08/31/2020	\$44.69	\$10.15	\$19.80	\$0.00	\$74.64
PLUMBERS & PIPEFITTERS LOCAL 51	08/30/2021	\$46.69	\$10.15	\$19.80	\$0.00	\$76.64
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.75	\$8.60	\$16.64	\$0.00	\$60.99
	12/01/2021	\$36.66	\$8.60	\$16.64	\$0.00	\$61.90
	06/01/2022	\$37.56	\$8.60	\$16.64	\$0.00	\$62.80
	12/01/2022	\$38.41	\$8.60	\$16.64	\$0.00	\$63.65
	06/01/2023	\$39.31	\$8.60	\$16.64	\$0.00	\$64.55
	12/01/2023	\$40.21	\$8.60	\$16.64	\$0.00	\$65.45

For apprentice rates see "Apprentice- LABORER"

HYDRAULIC DRILLS (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$35.75	\$8.60	\$16.64	\$0.00	\$60.99
	12/01/2021	\$36.66	\$8.60	\$16.64	\$0.00	\$61.90

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)</i>	09/01/2020	\$44.10	\$13.80	\$17.14	\$0.00	\$75.04
	09/01/2021	\$46.50	\$13.80	\$17.14	\$0.00	\$77.44
	09/01/2022	\$48.95	\$13.80	\$17.14	\$0.00	\$79.89

Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Southern MA**Effective Date -** 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.05	\$13.80	\$12.42	\$0.00	\$48.27
2	60	\$26.46	\$13.80	\$13.36	\$0.00	\$53.62
3	70	\$30.87	\$13.80	\$14.31	\$0.00	\$58.98
4	80	\$35.28	\$13.80	\$15.25	\$0.00	\$64.33

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.25	\$13.80	\$12.42	\$0.00	\$49.47
2	60	\$27.90	\$13.80	\$13.36	\$0.00	\$55.06
3	70	\$32.55	\$13.80	\$14.31	\$0.00	\$60.66
4	80	\$37.20	\$13.80	\$15.25	\$0.00	\$66.25

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 37</i>	03/16/2021	\$42.46	\$7.70	\$17.10	\$0.00	\$67.26
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - IRONWORKER - Local 37**Effective Date -** 03/16/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	70	\$29.72	\$7.70	\$17.10	\$0.00	\$54.52
2	75	\$31.85	\$7.70	\$17.10	\$0.00	\$56.65
3	80	\$33.97	\$7.70	\$17.10	\$0.00	\$58.77
4	85	\$36.09	\$7.70	\$17.10	\$0.00	\$60.89
5	90	\$38.21	\$7.70	\$17.10	\$0.00	\$63.01
6	95	\$40.34	\$7.70	\$17.10	\$0.00	\$65.14

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

JACKHAMMER & PAVING BREAKER OPERATOR	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
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LABORERS - ZONE 2

12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95

For apprentice rates see "Apprentice- LABORER"

LABORER	06/01/2021	\$35.00	\$8.60	\$16.64	\$0.00	\$60.24
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LABORERS - ZONE 2

12/01/2021	\$35.91	\$8.60	\$16.64	\$0.00	\$61.15
06/01/2022	\$36.81	\$8.60	\$16.64	\$0.00	\$62.05
12/01/2022	\$37.66	\$8.60	\$16.64	\$0.00	\$62.90
06/01/2023	\$38.56	\$8.60	\$16.64	\$0.00	\$63.80
12/01/2023	\$39.46	\$8.60	\$16.64	\$0.00	\$64.70

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - LABORER - Zone 2**Effective Date -** 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$21.00	\$8.60	\$16.64	\$0.00	\$46.24
2	70	\$24.50	\$8.60	\$16.64	\$0.00	\$49.74
3	80	\$28.00	\$8.60	\$16.64	\$0.00	\$53.24
4	90	\$31.50	\$8.60	\$16.64	\$0.00	\$56.74

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$21.55	\$8.60	\$16.64	\$0.00	\$46.79
2	70	\$25.14	\$8.60	\$16.64	\$0.00	\$50.38
3	80	\$28.73	\$8.60	\$16.64	\$0.00	\$53.97
4	90	\$32.32	\$8.60	\$16.64	\$0.00	\$57.56

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

LABORER (HEAVY & HIGHWAY)

06/01/2021

\$35.00

\$8.60

\$16.64

\$0.00

\$60.24

LABORERS - ZONE 2 (HEAVY & HIGHWAY)

12/01/2021

\$35.91

\$8.60

\$16.64

\$0.00

\$61.15

Apprentice - LABORER (Heavy & Highway) - Zone 2**Effective Date -** 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$21.00	\$8.60	\$16.64	\$0.00	\$46.24
2	70	\$24.50	\$8.60	\$16.64	\$0.00	\$49.74
3	80	\$28.00	\$8.60	\$16.64	\$0.00	\$53.24
4	90	\$31.50	\$8.60	\$16.64	\$0.00	\$56.74

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$21.55	\$8.60	\$16.64	\$0.00	\$46.79
2	70	\$25.14	\$8.60	\$16.64	\$0.00	\$50.38
3	80	\$28.73	\$8.60	\$16.64	\$0.00	\$53.97
4	90	\$32.32	\$8.60	\$16.64	\$0.00	\$57.56

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.00	\$8.60	\$16.64	\$0.00	\$60.24
	12/01/2021	\$35.91	\$8.60	\$16.64	\$0.00	\$61.15
	06/01/2022	\$36.81	\$8.60	\$16.64	\$0.00	\$62.05
	12/01/2022	\$37.66	\$8.60	\$16.64	\$0.00	\$62.90
	06/01/2023	\$38.56	\$8.60	\$16.64	\$0.00	\$63.80
	12/01/2023	\$39.46	\$8.60	\$16.64	\$0.00	\$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.00	\$8.60	\$16.64	\$0.00	\$60.24
	12/01/2021	\$35.91	\$8.60	\$16.64	\$0.00	\$61.15
	06/01/2022	\$36.81	\$8.60	\$16.64	\$0.00	\$62.05
	12/01/2022	\$37.66	\$8.60	\$16.64	\$0.00	\$62.90
	06/01/2023	\$38.56	\$8.60	\$16.64	\$0.00	\$63.80
	12/01/2023	\$39.46	\$8.60	\$16.64	\$0.00	\$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.09	\$8.60	\$16.70	\$0.00	\$60.39
	12/01/2021	\$36.00	\$8.60	\$16.70	\$0.00	\$61.30
	06/01/2022	\$36.90	\$8.60	\$16.70	\$0.00	\$62.20
	12/01/2022	\$37.75	\$8.60	\$16.70	\$0.00	\$63.05
	06/01/2023	\$38.65	\$8.60	\$16.70	\$0.00	\$63.95
	12/01/2023	\$39.55	\$8.60	\$16.70	\$0.00	\$64.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.00	\$8.60	\$16.64	\$0.00	\$60.24
	12/01/2021	\$35.91	\$8.60	\$16.64	\$0.00	\$61.15
	06/01/2022	\$36.81	\$8.60	\$16.64	\$0.00	\$62.05
	12/01/2022	\$37.66	\$8.60	\$16.64	\$0.00	\$62.90
	06/01/2023	\$38.56	\$8.60	\$16.64	\$0.00	\$63.80
	12/01/2023	\$39.46	\$8.60	\$16.64	\$0.00	\$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.00	\$8.60	\$16.64	\$0.00	\$60.24
	12/01/2021	\$35.91	\$8.60	\$16.64	\$0.00	\$61.15
	06/01/2022	\$36.81	\$8.60	\$16.64	\$0.00	\$62.05
	12/01/2022	\$37.66	\$8.60	\$16.64	\$0.00	\$62.90
	06/01/2023	\$38.56	\$8.60	\$16.64	\$0.00	\$63.80
	12/01/2023	\$39.46	\$8.60	\$16.64	\$0.00	\$64.70
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"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2021	\$42.57	\$11.39	\$20.14	\$0.00	\$74.10
	08/01/2021	\$43.69	\$11.39	\$20.30	\$0.00	\$75.38
	02/01/2022	\$44.16	\$11.39	\$20.30	\$0.00	\$75.85

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**Effective Date -** 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.29	\$11.39	\$20.14	\$0.00	\$52.82
2	60	\$25.54	\$11.39	\$20.14	\$0.00	\$57.07
3	70	\$29.80	\$11.39	\$20.14	\$0.00	\$61.33
4	80	\$34.06	\$11.39	\$20.14	\$0.00	\$65.59
5	90	\$38.31	\$11.39	\$20.14	\$0.00	\$69.84

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.85	\$11.39	\$20.30	\$0.00	\$53.54
2	60	\$26.21	\$11.39	\$20.30	\$0.00	\$57.90
3	70	\$30.58	\$11.39	\$20.30	\$0.00	\$62.27
4	80	\$34.95	\$11.39	\$20.30	\$0.00	\$66.64
5	90	\$39.32	\$11.39	\$20.30	\$0.00	\$71.01

Notes:**Apprentice to Journeyworker Ratio:1:3**

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2021	\$55.77	\$11.39	\$22.08	\$0.00	\$89.24
	08/01/2021	\$57.17	\$11.39	\$22.24	\$0.00	\$90.80
	02/01/2022	\$57.74	\$11.39	\$22.24	\$0.00	\$91.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile						
Effective Date - 02/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.89	\$11.39	\$22.08	\$0.00	\$61.36
2	60	\$33.46	\$11.39	\$22.08	\$0.00	\$66.93
3	70	\$39.04	\$11.39	\$22.08	\$0.00	\$72.51
4	80	\$44.62	\$11.39	\$22.08	\$0.00	\$78.09
5	90	\$50.19	\$11.39	\$22.08	\$0.00	\$83.66
Effective Date - 08/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.59	\$11.39	\$22.24	\$0.00	\$62.22
2	60	\$34.30	\$11.39	\$22.24	\$0.00	\$67.93
3	70	\$40.02	\$11.39	\$22.24	\$0.00	\$73.65
4	80	\$45.74	\$11.39	\$22.24	\$0.00	\$79.37
5	90	\$51.45	\$11.39	\$22.24	\$0.00	\$85.08
Notes:						
Apprentice to Journeyworker Ratio:1:5						
MECH. SWEEPER OPERATOR (ON CONST. SITES)	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2)	01/04/2021	\$39.72	\$9.40	\$20.45	\$0.00	\$69.57
MILLWRIGHTS LOCAL 1121 - Zone 2	01/03/2022	\$40.97	\$9.40	\$20.45	\$0.00	\$70.82
	01/02/2023	\$42.22	\$9.40	\$20.45	\$0.00	\$72.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
Apprentice - MILLWRIGHT - Local 1121 Zone 2							
Effective Date - 01/04/2021							
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	55	\$21.85	\$9.40	\$5.58	\$0.00	\$36.83	
2	65	\$25.82	\$9.40	\$16.90	\$0.00	\$52.12	
3	75	\$29.79	\$9.40	\$17.92	\$0.00	\$57.11	
4	85	\$33.76	\$9.40	\$18.93	\$0.00	\$62.09	
Effective Date - 01/03/2022							
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	55	\$22.53	\$9.40	\$5.58	\$0.00	\$37.51	
2	65	\$26.63	\$9.40	\$16.90	\$0.00	\$52.93	
3	75	\$30.73	\$9.40	\$17.92	\$0.00	\$58.05	
4	85	\$34.82	\$9.40	\$18.93	\$0.00	\$63.15	
Notes: Step 1&2 Appr. indentured after 1/1/2020 receive no pension, but do receive annuity. (Step 1 \$5.58, Step 2 \$6.50) Steps are 2,000 hours							
Apprentice to Journeyworker Ratio:1:5							
MORTAR MIXER		06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
LABORERS - ZONE 2		12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
		06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
		12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
		06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
		12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS)		06/01/2021	\$23.40	\$13.75	\$15.80	\$0.00	\$52.95
OPERATING ENGINEERS LOCAL 4		12/01/2021	\$23.98	\$13.75	\$15.80	\$0.00	\$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS)		06/01/2021	\$28.26	\$13.75	\$15.80	\$0.00	\$57.81
OPERATING ENGINEERS LOCAL 4		12/01/2021	\$28.94	\$13.75	\$15.80	\$0.00	\$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II		06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
OPERATING ENGINEERS LOCAL 4		12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PAINTER (BRIDGES/TANKS)		01/01/2021	\$52.06	\$8.25	\$22.75	\$0.00	\$83.06
PAINTERS LOCAL 35 - ZONE 2							

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 - BRIDGES/TANKS						
Effective Date - 01/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.25	\$0.00	\$0.00	\$34.28
2	55	\$28.63	\$8.25	\$6.16	\$0.00	\$43.04
3	60	\$31.24	\$8.25	\$6.72	\$0.00	\$46.21
4	65	\$33.84	\$8.25	\$7.28	\$0.00	\$49.37
5	70	\$36.44	\$8.25	\$19.39	\$0.00	\$64.08
6	75	\$39.05	\$8.25	\$19.95	\$0.00	\$67.25
7	80	\$41.65	\$8.25	\$20.51	\$0.00	\$70.41
8	90	\$46.85	\$8.25	\$21.63	\$0.00	\$76.73
Notes:						
Steps are 750 hrs.						
Apprentice to Journeyworker Ratio:1:1						

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2021	\$42.96	\$8.25	\$22.75	\$0.00	\$73.96
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. <i>PAINTERS LOCAL 35 - ZONE 2</i>						

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New**Effective Date - 01/01/2021**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.48	\$8.25	\$0.00	\$0.00	\$29.73
2	55	\$23.63	\$8.25	\$6.16	\$0.00	\$38.04
3	60	\$25.78	\$8.25	\$6.72	\$0.00	\$40.75
4	65	\$27.92	\$8.25	\$7.28	\$0.00	\$43.45
5	70	\$30.07	\$8.25	\$19.39	\$0.00	\$57.71
6	75	\$32.22	\$8.25	\$19.95	\$0.00	\$60.42
7	80	\$34.37	\$8.25	\$20.51	\$0.00	\$63.13
8	90	\$38.66	\$8.25	\$21.63	\$0.00	\$68.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	01/01/2021	\$41.02	\$8.25	\$22.75	\$0.00	\$72.02
<i>PAINTERS LOCAL 35 - ZONE 2</i>						

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint**Effective Date -** 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.51	\$8.25	\$0.00	\$0.00	\$28.76
2	55	\$22.56	\$8.25	\$6.16	\$0.00	\$36.97
3	60	\$24.61	\$8.25	\$6.72	\$0.00	\$39.58
4	65	\$26.66	\$8.25	\$7.28	\$0.00	\$42.19
5	70	\$28.71	\$8.25	\$19.39	\$0.00	\$56.35
6	75	\$30.77	\$8.25	\$19.95	\$0.00	\$58.97
7	80	\$32.82	\$8.25	\$20.51	\$0.00	\$61.58
8	90	\$36.92	\$8.25	\$21.63	\$0.00	\$66.80

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *

01/01/2021

\$41.56

\$8.25

\$22.75

\$0.00

\$72.56

* If 30% or more of surfaces to be painted are new construction,

NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2

Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**Effective Date -** 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.78	\$8.25	\$0.00	\$0.00	\$29.03
2	55	\$22.86	\$8.25	\$6.16	\$0.00	\$37.27
3	60	\$24.94	\$8.25	\$6.72	\$0.00	\$39.91
4	65	\$27.01	\$8.25	\$7.28	\$0.00	\$42.54
5	70	\$29.09	\$8.25	\$19.39	\$0.00	\$56.73
6	75	\$31.17	\$8.25	\$19.95	\$0.00	\$59.37
7	80	\$33.25	\$8.25	\$20.51	\$0.00	\$62.01
8	90	\$37.40	\$8.25	\$21.63	\$0.00	\$67.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)

01/01/2021

\$39.62

\$8.25

\$22.75

\$0.00

\$70.62

PAINTERS LOCAL 35 - ZONE 2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT						
Effective Date - 01/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.81	\$8.25	\$0.00	\$0.00	\$28.06
2	55	\$21.79	\$8.25	\$6.16	\$0.00	\$36.20
3	60	\$23.77	\$8.25	\$6.72	\$0.00	\$38.74
4	65	\$25.75	\$8.25	\$7.28	\$0.00	\$41.28
5	70	\$27.73	\$8.25	\$19.39	\$0.00	\$55.37
6	75	\$29.72	\$8.25	\$19.95	\$0.00	\$57.92
7	80	\$31.70	\$8.25	\$20.51	\$0.00	\$60.46
8	90	\$35.66	\$8.25	\$21.63	\$0.00	\$65.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	06/01/2021	\$35.00	\$8.60	\$16.64	\$0.00	\$60.24
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/01/2021	\$35.91	\$8.60	\$16.64	\$0.00	\$61.15
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PANEL & PICKUP TRUCKS DRIVER	06/01/2021	\$35.78	\$12.91	\$14.82	\$0.00	\$63.51
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	08/01/2021	\$35.78	\$13.41	\$14.82	\$0.00	\$64.01
	12/01/2021	\$35.78	\$13.41	\$16.01	\$0.00	\$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	08/01/2020	\$46.11	\$9.40	\$23.12	\$0.00	\$78.63
PILE DRIVER LOCAL 56 (ZONE 2) For apprentice rates see "Apprentice- PILE DRIVER"						
PILE DRIVER	08/01/2020	\$46.11	\$9.40	\$23.12	\$0.00	\$78.63
PILE DRIVER LOCAL 56 (ZONE 2)						

Apprentice - PILE DRIVER - Local 56 Zone 2**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Notes: Apprentice wages shall be no less than the following Steps;

(Same as set in Zone 1)

1\$57.06/2\$61.96/3\$66.87/4\$69.32/5\$71.78/6\$71.78/7\$76.68/8\$76.68

Apprentice to Journeyworker Ratio:1:5

PIPELAYER	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
LABORERS - ZONE 2	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER (HEAVY & HIGHWAY)	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
<i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PLUMBER & PIPEFITTER	08/31/2020	\$44.69	\$10.15	\$19.80	\$0.00	\$74.64
<i>PLUMBERS & PIPEFITTERS LOCAL 51</i>	08/30/2021	\$46.69	\$10.15	\$19.80	\$0.00	\$76.64

Apprentice - PLUMBER/PIPEFITTER - Local 51**Effective Date - 08/31/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.88	\$10.15	\$2.50	\$0.00	\$30.53
2	50	\$22.35	\$10.15	\$2.50	\$0.00	\$35.00
3	60	\$26.81	\$10.15	\$8.73	\$0.00	\$45.69
4	70	\$31.28	\$10.15	\$10.60	\$0.00	\$52.03
5	80	\$35.75	\$10.15	\$17.45	\$0.00	\$63.35

Effective Date - 08/30/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.68	\$10.15	\$2.50	\$0.00	\$31.33
2	50	\$23.35	\$10.15	\$2.50	\$0.00	\$36.00
3	60	\$28.01	\$10.15	\$8.73	\$0.00	\$46.89
4	70	\$32.68	\$10.15	\$10.60	\$0.00	\$53.43
5	80	\$37.35	\$10.15	\$17.45	\$0.00	\$64.95

Notes:

Steps 2000hrs. Prior 9/1/05; 40/40/45/50/55/60/65/75/80/85

Apprentice to Journeyworker Ratio:1:3

PNEUMATIC CONTROLS (TEMP.)	08/31/2020	\$44.69	\$10.15	\$19.80	\$0.00	\$74.64
<i>PLUMBERS & PIPEFITTERS LOCAL 51</i>	08/30/2021	\$46.69	\$10.15	\$19.80	\$0.00	\$76.64
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
<i>LABORERS - ZONE 2</i>	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
<i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWDERMAN & BLASTER	06/01/2021	\$36.00	\$8.60	\$16.64	\$0.00	\$61.24
<i>LABORERS - ZONE 2</i>	12/01/2021	\$36.91	\$8.60	\$16.64	\$0.00	\$62.15
	06/01/2022	\$37.81	\$8.60	\$16.64	\$0.00	\$63.05
	12/01/2022	\$38.66	\$8.60	\$16.64	\$0.00	\$63.90
	06/01/2023	\$39.56	\$8.60	\$16.64	\$0.00	\$64.80
	12/01/2023	\$40.46	\$8.60	\$16.64	\$0.00	\$65.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY)	06/01/2021	\$36.00	\$8.60	\$16.64	\$0.00	\$61.24
<i>LABORERS - ZONE 2 (HEAVY & HIGHWAY)</i>	12/01/2021	\$36.91	\$8.60	\$16.64	\$0.00	\$62.15
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE	06/01/2021	\$50.73	\$13.75	\$15.80	\$0.00	\$80.28
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.88	\$13.75	\$15.80	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE)	06/01/2021	\$50.73	\$13.75	\$15.80	\$0.00	\$80.28
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.88	\$13.75	\$15.80	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER)	06/01/2021	\$33.40	\$13.75	\$15.80	\$0.00	\$62.95
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$34.19	\$13.75	\$15.80	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER	05/01/2021	\$24.00	\$12.41	\$6.90	\$0.00	\$43.31
<i>TEAMSTERS 653 - Southeastern Concrete (Weymouth)</i>	08/01/2021	\$24.00	\$12.91	\$6.90	\$0.00	\$43.81
	05/01/2022	\$24.50	\$12.91	\$6.90	\$0.00	\$44.31
	08/01/2022	\$24.50	\$13.41	\$6.90	\$0.00	\$44.81
	05/01/2023	\$25.00	\$13.41	\$6.90	\$0.00	\$45.31
	08/01/2023	\$25.00	\$13.91	\$6.90	\$0.00	\$45.81
RECLAIMERS	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
<i>LABORERS - ZONE 2</i>	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg)	02/01/2021	\$46.60	\$12.28	\$17.15	\$0.00	\$76.03
<i>ROOFERS LOCAL 33</i>	08/01/2021	\$48.03	\$12.28	\$17.15	\$0.00	\$77.46
	02/01/2022	\$49.46	\$12.28	\$17.15	\$0.00	\$78.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ROOFER - Local 33						
Effective Date - 02/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.30	\$12.28	\$4.31	\$0.00	\$39.89
2	60	\$27.96	\$12.28	\$17.15	\$0.00	\$57.39
3	65	\$30.29	\$12.28	\$17.15	\$0.00	\$59.72
4	75	\$34.95	\$12.28	\$17.15	\$0.00	\$64.38
5	85	\$39.61	\$12.28	\$17.15	\$0.00	\$69.04
Effective Date - 08/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.02	\$12.28	\$4.31	\$0.00	\$40.61
2	60	\$28.82	\$12.28	\$17.15	\$0.00	\$58.25
3	65	\$31.22	\$12.28	\$17.15	\$0.00	\$60.65
4	75	\$36.02	\$12.28	\$17.15	\$0.00	\$65.45
5	85	\$40.83	\$12.28	\$17.15	\$0.00	\$70.26
Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1 Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs. (Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)						
Apprentice to Journeyworker Ratio:**						
ROOFER SLATE / TILE / PRECAST CONCRETE	02/01/2021	\$46.85	\$12.28	\$17.15	\$0.00	\$76.28
ROOFERS LOCAL 33	08/01/2021	\$48.28	\$12.28	\$17.15	\$0.00	\$77.71
	02/01/2022	\$49.71	\$12.28	\$17.15	\$0.00	\$79.14
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER	04/01/2021	\$37.51	\$13.65	\$16.55	\$2.03	\$69.74
SHEETMETAL WORKERS LOCAL 17 - B	10/01/2021	\$38.51	\$13.65	\$16.55	\$2.06	\$70.77
	04/01/2022	\$39.51	\$13.65	\$16.55	\$2.09	\$71.80

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - SHEET METAL WORKER - Local 17-B**Effective Date -** 04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$15.00	\$13.65	\$4.02	\$1.00	\$33.67
2	45	\$16.88	\$13.65	\$4.52	\$1.07	\$36.12
3	50	\$18.76	\$13.65	\$10.48	\$1.31	\$44.20
4	55	\$20.63	\$13.65	\$10.48	\$1.37	\$46.13
5	60	\$22.51	\$13.65	\$13.52	\$1.49	\$51.17
6	65	\$24.38	\$13.65	\$13.78	\$1.55	\$53.36
7	70	\$26.26	\$13.65	\$14.03	\$1.62	\$55.56
8	75	\$28.13	\$13.65	\$14.28	\$1.68	\$57.74
9	80	\$30.01	\$13.65	\$14.54	\$1.75	\$59.95
10	85	\$31.88	\$13.65	\$14.79	\$1.81	\$62.13

Effective Date - 10/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$15.40	\$13.65	\$4.02	\$1.00	\$34.07
2	45	\$17.33	\$13.65	\$4.52	\$1.07	\$36.57
3	50	\$19.26	\$13.65	\$10.48	\$1.31	\$44.70
4	55	\$21.18	\$13.65	\$10.48	\$1.37	\$46.68
5	60	\$23.11	\$13.65	\$13.52	\$1.51	\$51.79
6	65	\$25.03	\$13.65	\$13.78	\$1.57	\$54.03
7	70	\$26.96	\$13.65	\$14.03	\$1.64	\$56.28
8	75	\$28.88	\$13.65	\$14.28	\$1.70	\$58.51
9	80	\$30.81	\$13.65	\$14.54	\$1.77	\$60.77
10	85	\$32.73	\$13.65	\$14.79	\$1.84	\$63.01

Notes:**Apprentice to Journeyworker Ratio:1:3****SPECIALIZED EARTH MOVING EQUIP < 35 TONS***TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*

06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66

SPECIALIZED EARTH MOVING EQUIP > 35 TONS*TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*

06/01/2021	\$36.53	\$12.91	\$14.82	\$0.00	\$64.26
08/01/2021	\$36.53	\$13.41	\$14.82	\$0.00	\$64.76
12/01/2021	\$36.53	\$13.41	\$16.01	\$0.00	\$65.95

SPRINKLER FITTER*SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2*

03/01/2021	\$56.21	\$10.00	\$21.25	\$0.00	\$87.46
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - SPRINKLER FITTER - Local 550 (Section B) Zone 2**Effective Date -** 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.67	\$10.00	\$11.99	\$0.00	\$41.66
2	40	\$22.48	\$10.00	\$12.70	\$0.00	\$45.18
3	45	\$25.29	\$10.00	\$13.41	\$0.00	\$48.70
4	50	\$28.11	\$10.00	\$14.13	\$0.00	\$52.24
5	55	\$30.92	\$10.00	\$14.84	\$0.00	\$55.76
6	60	\$33.73	\$10.00	\$15.55	\$0.00	\$59.28
7	65	\$36.54	\$10.00	\$16.26	\$0.00	\$62.80
8	70	\$39.35	\$10.00	\$16.98	\$0.00	\$66.33
9	75	\$42.16	\$10.00	\$17.69	\$0.00	\$69.85
10	80	\$44.97	\$10.00	\$18.40	\$0.00	\$73.37

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

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 223</i>	09/01/2020	\$36.86	\$10.90	\$12.45	\$0.00	\$60.21

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 223**Effective Date -** 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Notes: See Electrician Apprentice Wages

Telecom Apprentice Wages shall be the same as the Electrician Apprentice Wages

Apprentice to Journeyworker Ratio:2:3***

TERRAZZO FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2021	\$54.69	\$11.39	\$22.09	\$0.00	\$88.17
	08/01/2021	\$56.09	\$11.39	\$22.25	\$0.00	\$89.73
	02/01/2022	\$56.68	\$11.39	\$22.25	\$0.00	\$90.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile						
Effective Date - 02/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.35	\$11.39	\$22.09	\$0.00	\$60.83
2	60	\$32.81	\$11.39	\$22.09	\$0.00	\$66.29
3	70	\$38.28	\$11.39	\$22.09	\$0.00	\$71.76
4	80	\$43.75	\$11.39	\$22.09	\$0.00	\$77.23
5	90	\$49.22	\$11.39	\$22.09	\$0.00	\$82.70
Effective Date - 08/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.05	\$11.39	\$22.25	\$0.00	\$61.69
2	60	\$33.65	\$11.39	\$22.25	\$0.00	\$67.29
3	70	\$39.26	\$11.39	\$22.25	\$0.00	\$72.90
4	80	\$44.87	\$11.39	\$22.25	\$0.00	\$78.51
5	90	\$50.48	\$11.39	\$22.25	\$0.00	\$84.12
Notes:						
Apprentice to Journeyworker Ratio:1:3						

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2021	\$42.07	\$8.60	\$17.72	\$0.00	\$68.39
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$43.08	\$8.60	\$17.72	\$0.00	\$69.40
TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2021	\$40.79	\$8.60	\$17.72	\$0.00	\$67.11
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$41.80	\$8.60	\$17.72	\$0.00	\$68.12
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2021	\$40.67	\$8.60	\$17.72	\$0.00	\$66.99
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$41.68	\$8.60	\$17.72	\$0.00	\$68.00
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2021	\$50.19	\$13.75	\$15.80	\$0.00	\$79.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	\$51.33	\$13.75	\$15.80	\$0.00	\$80.88
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2021	\$36.82	\$12.91	\$14.82	\$0.00	\$64.55
	08/01/2021	\$36.82	\$13.41	\$14.82	\$0.00	\$65.05
	12/01/2021	\$36.82	\$13.41	\$16.01	\$0.00	\$66.24
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	06/01/2021	\$52.90	\$8.60	\$18.17	\$0.00	\$79.67
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$53.91	\$8.60	\$18.17	\$0.00	\$80.68
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	06/01/2021	\$54.90	\$8.60	\$18.17	\$0.00	\$81.67
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$55.91	\$8.60	\$18.17	\$0.00	\$82.68
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2021	\$44.97	\$8.60	\$18.17	\$0.00	\$71.74
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$45.98	\$8.60	\$18.17	\$0.00	\$72.75

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE)	06/01/2021	\$46.97	\$8.60	\$18.17	\$0.00	\$73.74
LABORERS (FREE AIR TUNNEL)	12/01/2021	\$47.98	\$8.60	\$18.17	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
WAGON DRILL OPERATOR	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
LABORERS - ZONE 2	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
	06/01/2022	\$37.06	\$8.60	\$16.64	\$0.00	\$62.30
	12/01/2022	\$37.91	\$8.60	\$16.64	\$0.00	\$63.15
	06/01/2023	\$38.81	\$8.60	\$16.64	\$0.00	\$64.05
	12/01/2023	\$39.71	\$8.60	\$16.64	\$0.00	\$64.95
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	06/01/2021	\$35.25	\$8.60	\$16.64	\$0.00	\$60.49
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/01/2021	\$36.16	\$8.60	\$16.64	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR	06/01/2021	\$50.73	\$13.75	\$15.80	\$0.00	\$80.28
OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.88	\$13.75	\$15.80	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER	08/31/2020	\$44.69	\$10.15	\$19.80	\$0.00	\$74.64
PLUMBERS & PIPEFITTERS LOCAL 51	08/30/2021	\$46.69	\$10.15	\$19.80	\$0.00	\$76.64
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone)	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables)	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs)	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL)	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL)	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.)	08/30/2020	\$22.25	\$9.25	\$1.82	\$0.00	\$33.32
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - LINEMAN (Outside Electrical) - East Local 104**Effective Date - 08/30/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

Notes:**Apprentice to Journeyworker Ratio:1:2**

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
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TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
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TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
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Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

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DOCUMENT 00870

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT
SPECIFICATIONS
(EXECUTIVE ORDER 11246)
Revised April 9, 2019

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted:
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority.
 - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$ 10,000 the provisions of the specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in Paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
 - g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

- i. Direct its recruitment efforts both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
 - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
 9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
 10. The Contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
 11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as many be required by the Government and keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

APPENDIX A

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of \$ 10,000. The goals are applicable to the Contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a Federal or federally-assisted construction contract or subcontract.

Area covered: Goal for Women apply nationwide

Goals and TimetablesTimetableGoals (percent)

From Apr. 1, 1980 until further notice

6.9

APPENDIX B-80

Until further notice, the following goals for minority utilization in each construction craft and trade shall included in all Federal or federally assisted construction contracts and subcontracts in excess of \$ 10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on- site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

Construction contractors participating in an approved Hometown Plan (see 41 CFR 6-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply with the applicable SMSA or EA goal contained in this Appendix B-80.

Economic AreasSTATE:Goals (percent)

MASSACHUSETTS

004 Boston MA:

SMSA Counties:

1123 Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH

4.0

MA Essex, MA Middlesex, MA Norfolk, MA Plymouth,
MA Suffolk, NH Rockingham.

5403 Fall River- New Bedford MA, Bristol

1.6

9243 Worcester-Fitchburg-Leominster, MA

1.6

6323 Springfield-Chicopee-Holyoke MA-CT

4.8

MA Hampden, MA Hampshire

Non-SMSA Counties: MA Barnstable, MA Dukes, MA Nantucket

3.6

Non-SMSA Counties: MA Franklin

5.9

APPENDIX C

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
3. **Solicitations for Subcontractors, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor’s obligations under this contract and the Acts and the Regulations relative to nondiscrimination on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Massachusetts Department of Transportation (MassDOT) or FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor will so certify to MassDOT or FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a contractor’s noncompliance with the Nondiscrimination provisions of this contract, MassDOT will impose such contract sanctions as it or FHWA may determine to be appropriate, including, but not limited to:
 - a. withholding payments to the contractor under the contract until the contractor complies; and/or
 - b. cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as MassDOT or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request MassDOT to enter into any litigation to protect the interests of MassDOT. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX D

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor,” which includes consultants) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

PERTINENT NON-DISCRIMINATION AUTHORITIES:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-Aid programs and projects)
- Federal-Aid Highway Act of 1973 (23 U.S.C. § 324 *et seq.*) (prohibits discrimination on the basis of sex)
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability) and 49 CFR Part 27
- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 *et seq.*) (prohibits discrimination on the basis of age)
- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex)
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage, and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of Federal-Aid recipients, sub-recipients, and contractors, whether such programs or activities are Federally funded or not)
- Titles II and III of the Americans with Disabilities Act (42 U.S.C. §§ 12131-12189), as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38 (prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities)
- The Federal Aviation Administration’s Non-Discrimination Statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations)
- Executive Order 13166, Improving Access to Services for People with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100)
- Title IX of the Education Amendments Act of 1972, as amended (20 U.S.C. 1681 *et seq.*) (prohibits discrimination on the basis of sex in education programs or activities)

*** END OF DOCUMENT ***

DOCUMENT 00875
TRAINEE SPECIAL PROVISIONS
Revised October, 2016

THE REQUIRED NUMBER OF TRAINEES TO BE TRAINED UNDER THIS CONTRACT WILL BE **5**

The contractor shall provide on-the job training aimed at developing full journeyworkers in the type of trade of job classification involved.

In the event that a contractor subcontracts a portion of the contract work, the General Contractor shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeyworkers in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Massachusetts Department Of Transportation (MassDOT) for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyworker status is a primary objective of the Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority and women trainees (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that have been taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training.

No employee shall be trained under this Special Provision in any classification in which he or she has successfully completed a training course leading to journeyworker status or in which he or she has been employed as a journeyworker. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the finding in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration. The Massachusetts Department Of Transportation and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyworker status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typist or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc. where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Federal Highway Administration division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Reimbursement

Under these Training Special Provisions, reimbursement will be as follows:

The Contractor will only be reimbursed 80 cents for each hour of on the job training as specified in the approved Training Program.

The Contractor is advised and encouraged that it may train additional persons in excess of the number specified and will be reimbursed as stated above. Reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

If less than full training specified in the approved training programs is provided, payment to the contractor will be made at a rate of 80 cents for each hour of training completed under this contract. However, no payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyworker, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision.

Payment

Trainees will be paid:

1. Percentage (%) of the journeyworker's rate as provided in the existing programs approved by the Department of Labor or Transportation as of September 15, 1970.
2. For journeyworker programs submitted by the Contractor and approved by Massachusetts Department Of Transportation and the Federal Highway Administration at least 60 percent of the appropriate minimum journeyworker's rate specified in the contract for the first half of the training period, 75 percent for the third quarter if the training period, and 90 percent for the last quarter of the training period.
3. For skilled laborer programs, the minimum starting wage rate of unskilled laborer. At the conclusion of training, he or she will be paid the minimum wage rate of the Classification for programs submitted by the Contractor and approved by the Massachusetts Department Of Transportation and the Federal Highway Administration.
4. For the purposes of meeting the legal requirements of State Prevailing Wage Law, please be advised that no person may be paid the Apprentice wage rate as listed on a MA Prevailing Wage Rates schedule, unless that person and program is registered with the Department of Labor Standards/Division of Apprentice Standards (DLS/DAS). Any person or program not registered with DLS/DAS, regardless of whether or not they are registered with any other federal, state, local, or private entity must be paid the journeyworker's rate for the trade.

The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Form FHWA-1409, Federal-aid Highway Construction Contracting Semi Annual Training Report, shall be submitted as per instructions on the Form.

*** END OF DOCUMENT ***

DOCUMENT 00880

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS

Revised February 20, 2019



DEPARTMENT OF LABOR

Employment Standards Administration

**MINIMUM WAGES FOR
FEDERAL AND FEDERALLY
ASSISTED CONSTRUCTION**

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"General Decision Number: MA20210015 01/01/2021

Superseded General Decision Number: MA20200015

State: Massachusetts

Construction Type: Highway

County: Barnstable County in Massachusetts.

HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

* ELEC0223-001 09/01/2020

Rates

Fringes

ELECTRICIAN (Includes Traffic
Signalization).....\$ 43.66 31.18%+13.15

ENGI0004-032 06/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1.....	\$ 48.73	29.25+A
GROUP 1.....	\$ 49.33	29.75+a
Group 2.....	\$ 48.23	29.25+A
GROUP 2.....	\$ 48.81	29.75+a

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday,
Labor Day, Memorial Day, Independence Day, Patriot's Day,
Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid Steer/Skid
Loader; Broom/Sweeper; Crane; Gradall; Loader; Paver
(Asphalt, Aggregate, and Concrete); Post Driver
(Guardrail/Fences)

Group 2: Bulldozer; Grader/Blade; Milling Machine; Roller

IRON0007-026 03/16/2020

	Rates	Fringes
IRONWORKER (ORNAMENTAL AND STRUCTURAL).....	\$ 48.02	33.43

LABO0133-001 06/01/2018

	Rates	Fringes
LABORER (Concrete Surfacers).....	\$ 33.50	22.92

LABO0385-001 06/01/2018

	Rates	Fringes
LABORER		
Common or General.....	\$ 33.25	22.92
Fence Erection.....	\$ 33.50	22.92

LABO0385-005 06/01/2018

	Rates	Fringes
LABORER (Landscape)	\$ 33.25	22.92

LABO0596-009 06/04/2018

	Rates	Fringes
LABORER		
Guardrail Installation	\$ 31.25	22.19

PAIN0035-023 07/01/2019

	Rates	Fringes
PAINTER (Steel)	\$ 50.66	30.90

TEAM0059-001 08/01/2020

	Rates	Fringes
TRUCK DRIVER (Dump Truck)	\$ 34.98	26.6325+A+B

FOOTNOTES:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day

B. PAID VACATION: Employees with 4 months to 1 year of service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 - 10 years of service; and 3 weeks vacation for more than 10 years of service

SUMA2014-005 01/11/2017

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 43.64	22.09
CEMENT MASON/CONCRETE FINISHER...	\$ 56.70	21.08
IRONWORKER, REINFORCING.....	\$ 44.52	19.36
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor.....	\$ 33.65	17.32
LABORER: Concrete Saw (Hand Held/Walk Behind).....	\$ 44.43	14.18
LABORER: Jack Hammer.....	\$ 38.69	17.33
OPERATOR: Forklift.....	\$ 64.67	0.00
OPERATOR: Mechanic.....	\$ 48.74	11.79
OPERATOR: Piledriver.....	\$ 42.56	17.34
PAINTER: Spray (Linestriping)....	\$ 47.30	6.42
TRAFFIC CONTROL: Flagger.....	\$ 23.00	20.44
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper.....	\$ 53.35	12.78
TRUCK DRIVER: Concrete Truck....	\$ 33.69	15.79
TRUCK DRIVER: Flatbed Truck....	\$ 48.53	0.00

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this

classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

"

DOCUMENT A00801

SPECIAL PROVISIONS**BARNSTABLE****Federal-aid Project Numbers TAP/NFP(N/I)-0035(043)
Intersection Improvements and Related Work (Including Signals)
at Iyannough Road (Route 28) and Yarmouth Road**

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and Subcontractor's on-site construction workforce. Refer to Document 00820 for details.

SCOPE OF WORK

The work under this contract consists of demolition of building at #201 Yarmouth Road, full depth reconstruction, pavement micromilling and overlay, removing and stacking or resetting of existing granite curb, installation of new granite curb, construction of sidewalks, modifications to the water distribution system, drainage modifications, installation of underground electrical, telephone, sewer, cable systems, including within casing pipes previously installed under the railroad grade crossing, construction of driveway aprons, loaming and seeding, installation of signs and pavement markings, safety signing for construction operations, and all incidental labor, materials and equipment necessary to complete the work shown on the plans or described hereinafter.

The work also consists of new roadway traffic control signal system (including connection to railroad signal system designed by others) and equipment modifications/timing adjustments at existing traffic signal locations complete with vehicle detectors, signal posts, signal heads, mast arm assemblies, cabinet, foundation, wire and cable, pull boxes, communication links, electrical service connection, closed loop system technology, fully actuated and coordinated systems and all other equipment, materials and incidental costs necessary to furnish, install and program a complete and functioning traffic control signal system as specified and as shown in the contract documents.

All work under this Contract shall be done in conformance with the *2021 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control*, the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with Massachusetts Amendments; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 3:00 P.M. on the Tuesday of the previous week before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdotspecifications@dot.state.ma.us The MassDOT project file number and municipality is to be placed in the subject line.

ACCESS MASSDOT HIGHWAY INFORMATION ON WEBSITE

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

<https://www.mass.gov/orgs/highway-division>

SECTION 7.00: LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**Subsection 7.03: Permits and Licenses**

(page I.47) Replace Subsection 7.03 in its entirety with the following:

The Contractor shall procure all required permits and licenses, pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work. The cost thereof shall be included in the prices bid for the various items listed in the Proposal. Copies of all required permits and licenses shall be filed with the Engineer prior to the beginning of work.

For overweight vehicles in excess of 130,000 lbs., the Contractor shall provide a copy of each overweight vehicle permit to the Engineer prior to arrival or delivery of the vehicle to a project site. This requirement is for all Contractors, their subcontractors, equipment suppliers and material suppliers.

The Contractor's attention is directed to the provisions of General Laws, Chapter 90, Section 9 as amended, in which it is provided that earth-moving motor vehicles which exceed certain dimensions or weight limits as specified in said Act, and which are used exclusively for building, repair and maintenance of highways, may be operated without registration for a distance not exceeding 300 yd on any way adjacent to any highway or toll road being constructed, relocated or improved provided a permit, authorizing such use, to be issued by the Commissioner of Public Works or by the Board or officer having charge of such way, has been procured by the Contractor.

SUBSECTION 7.05 INSURANCE REQUIREMENTS**B. Public Liability Insurance**

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

Paragraphs 1 and 2

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

Paragraph 3

Railroad Protective Liability Insurance and Protective Property Damage Liability Insurance shall be obtained in the amount of \$2,000,000 per occurrence/\$6,000,000 in aggregate, on behalf of MASSACHUSETTS COASTAL RAILROAD, LLC.

Paragraph 4

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

RAILROAD IMPACTS

Work will be required within the railroad Right of Way, including, but not limited to, installing pavement markings over concrete panels and installing asphaltic plug joints. All workers that will be working on or near the railroad tracks must successfully complete the Railroad Roadway Worker Protection (RWP) course through Mass Coastal Railroad prior to the start of work.

The Contractor is directed to Document A00806 for Massachusetts Coastal Railroad General Conditions and MCRR Cape Lines Flagging Agreement.

RAILROAD FORCE ACCOUNT WORK (FAW)

The Force Account Work, to be performed by a Mass Coastal Railroad Contractor, is located in the area of the grade crossing and will include completion of the railroad grade crossing signal system (new gates, gate arms, and all other work needed to complete the new system). The gate assemblies at the southeast quadrant of the grade crossing will be temporarily removed by FAW as required to accommodate construction staging and will be reinstalled when no longer in conflict with vehicular traffic.

SUBSECTION 8.03 PROSECUTION OF WORK

Add/amend the following at the end of the Section:

CONTRACTUAL MILESTONES

This Contract contains the following Contractual Milestones and Durations that are to be included in the Contractor's Baseline CPM Schedule submission. The Contractor shall identify the completion of the work pertaining to each Contractual Milestone and Duration through the inclusion of a Finish Milestone in the accepted CPM Schedule using the stated description.

MS01 – Substantial Completion – The Contractor shall achieve Substantial Completion **987 Calendar Days** after Notice to Proceed. A walkthrough of the entire project scope has been performed by the Resident Engineer. A Punch List has been generated and the work required by contract, including paper work, has been completed, except for work having a contract price of less than one percent of the adjusted total contract price, including overruns, underruns and all contract amendments. All material submittals have been received by the District Materials Lab.

MS02 – Contractor Field Completion – The Contractor shall achieve Contract Field Completion **1043 Calendar Days** after Notice to Proceed. All physical contract Work is complete including punchlist and the Contractor has fully de-mobilized from the field operations.

SUBSECTION 8.06 LIMITATIONS OF OPERATIONS

Add/amend the following at the end of the Section:

This Contract contains the following Access Restraint that is to be included in the Contractor's Baseline CPM Schedule submission.

AR01 - Start Demolition of 201 Yarmouth Road. Contractor access to begin demolition of 201 Yarmouth Road will be restricted until the business has vacated the building. Access Restraint 1 shall begin immediately after Notice to Proceed and shall end **January 1, 2022**.

COLD WEATHER CONSTRUCTION

Due to the restrictions of roadway construction during summer months, construction activity, including paving, could be required during winter months. The Contractor shall take all necessary measures to ensure the pavement meets MassDOT pavement specifications. These measures may include, but are not limited to heating the subbase, truck insulation for transporting the mix, selecting a plant that minimizes transportation distance. The Contractor shall take these measures into consideration when preparing their bid; no additional payment will be made for any required measures for cold weather paving. Also, any premiums charged by the asphalt plant for special openings shall be included in the Contractor's bid.

The Contractor shall also be responsible for all snow removal required to complete their work. No additional compensation will be paid for any required snow removal.

SECTION 9.00: MEASUREMENT AND PAYMENT**SUBSECTION 9.03: Payment for Extra Work**

(page I.83) Replace Subsection 9.03B in its entirety with the following:

B. Payment for work or materials for which no price is contained in the Contract.

If the Engineer directs, the Contractor shall submit promptly in writing to the Engineer an offer to do the required work on a lump sum or unit price basis, as specified by the Engineer. The stated price, either lump sum or unit price, shall be divided so as to show that it is the sum of:

- (1) The estimated cost of direct labor, materials, and the use of equipment, plus 10 percent of this total for overhead;
- (2) Plus 13 percent of direct labor, for the actual costs of Federal Insurance Contribution Act (FICA), Federal Unemployment Tax Act (FUTA), State Unemployment Tax Act (SUTA) including workforce training and Massachusetts Employer Medical Assistance Contribution, Earned Sick Time (EST) Law (940 CMR 33.00), and Paid Family and Medical Leave (PFML) Act (458 CMR 2.00);
or, as an alternative to the above 13 percent, the Contractor may elect to use actual rates for FICA, FUTA, SUTA, EST and PFML provided the actual rates are supported with verifiable documentation and shall be subject to review by Audit Operations;
- (3) Plus the actual cost of Workmen's Compensation and Liability Insurance, Health, Welfare and Pension benefits, and such additional fringe benefits which the Contractor is required to pay as a result of Union Labor Agreements and/or is required by authorized governmental agencies;
- (4) Plus subcontractor or a Public or Private Utility costs;
- (5) Plus 10 percent of the total of (1), (2), (3) and (4);
- (6) Plus the estimated proportionate cost of surety bonds (The Contractor shall provide evidence of revised bonds according to Subsection 3.04).

Unless an agreed lump sum and/or unit price is obtained from above and is so stated in the Extra Work Order the Contractor shall accept as full payment for work or materials for which no price agreement is contained in the Contract an amount equal to the following:

- (1) The actual cost for direct labor, material (less value of salvage, if any) and use of equipment, plus 10 percent of this total for overhead;
- (2) Plus 13 percent of direct labor, for the actual costs of Federal Insurance Contribution Act (FICA), Federal Unemployment Tax Act (FUTA), State Unemployment Tax Act (SUTA), including workforce training and Massachusetts Employer Medical Assistance Contribution, Earned Sick Time (EST) Law (940 CMR 33.00), and Paid Family and Medical Leave (PFML) Act (458 CMR 2.00);
or, as an alternative to the above 13 percent, the Contractor may elect to use actual rates for FICA, FUTA, SUTA, EST and PFML provided the actual rates are supported with verifiable documentation and shall be subject to review by Audit Operations;

SECTION 9.00 (Continued)

- (3) Plus the actual cost of Workmen's Compensation and Liability Insurance, Health, Welfare and Pension benefits, and such additional fringe benefits which the Contractor is required to pay as a result of Union Labor Agreements and/or is required by authorized governmental agencies;
- (4) Plus subcontractor or a Public or Private Utility costs;
- (5) Plus 10 percent of the total of (1), (2), (3) and (4);
- (6) Plus the estimated proportionate cost of surety bonds (The Contractor shall provide evidence of revised bonds according to Subsection 3.04).

Costs incurred for traffic police, railroad flagging and permits will be reimbursed without markup for overhead or profit.

No payments will be made for general superintendence, the use of small hand tools, and manual equipment.

The Contractor shall, when requested by the Engineer, furnish itemized statements of the cost of the work ordered and give the Engineer access to all accounts, bills and vouchers relating thereto, and unless the Contractor shall furnish such itemized statements, access to all accounts, bills and vouchers, the Contractor shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer.

SECTION 4.00: SCOPE OF WORK**SUBSECTION 4.04: Changed Conditions**

(page I.20, 21) Replace the third, fourth, fifth and sixth paragraphs with the following:

If the Contractor and the Department fail to agree on an equitable adjustment to be made under this Subsection, then the Contractor shall accept as full payment for the work in dispute an amount calculated using actual costs as provided in Subsection 9.03: Payment for Extra Work.

SUBSECTION 4.06: Increased or Decreased Contract Quantities

(page I.22, 23) Replace the sixth, seventh and eighth paragraphs with the following:

To assist the Engineer in the determination of an equitable adjustment for an overrun, the Contractor shall prepare a submission and accept as full payment for work or materials an amount for an equitable adjustment in the Contract Price calculated using actual costs as provided in Subsection 9.03: Payment for Extra Work.

SECTION 8.00: PROSECUTION AND PROGRESS**SUBSECTION 8.13: Convenience Termination**

(page I.78, 79) Replace Subsection 8.13B in its entirety with the following:

B. For Construction Related Costs.

Actual costs as provided in Subsection 9.03: Payment for Extra Work.

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat.

This project has been consulted with the USFWS through the Optional Framework to Streamline Section 7 Consultation and is consistent with the Programmatic Biological Opinion under the authority of section 4(d) of the Endangered Species Act and the Final 4(d) Rule published in the Federal Register on January 14, 2016. In order to protect female northern long-eared bats and their young during the maternity roosting season, no tree cutting shall be conducted from June 1 to July 31. At the beginning of the project's first construction season, the Resident Engineer shall contact MassDOT Highway Division's Environmental Services Section to determine whether this restriction can be waived. If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, additional review may be required by the USFWS, and time of year restrictions could apply to such tree cutting.

CONTRACTOR/SUBCONTRACTOR CERTIFICATION – CONTRACT COMPLIANCE
(Revision 03-23-10)

Pursuant to 23 C.F.R. § 633.101 et seq., the Federal Highway Administration requires each contractor to “insert in each subcontract, except as excluded by law or regulation, the required contract provisions contained in Form FHWA–1273 and further requires their inclusion in any lower tier subcontract that may in turn be made. The required contract provisions of Form FHWA–1273 shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the requirements contained in the provisions of Form FHWA–1273.” The prime contractor shall therefore comply with the reporting and certification requirements provided in MassDOT's CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form (DOT-DIST-192) certifying compliance with 23 C.F.R. § 633.101 for each subcontract agreement entered into by the contractor. The contractor shall provide a fully executed original copy of said CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form to MassDOT upon execution of any subcontract agreement. Failure to comply with the reporting and certification requirement of the CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form may result in action against the prequalification status of the prime contractor with MassDOT.

EQUIVALENT SINGLE AXLE LOADS (ESALS)

The estimated traffic level to be used for SUPERPAVE HMA mixture designs for this contract, expressed in Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is a Traffic Level 2, 3.6 Million 18-kip (80-kn) ESALs.

BIDDERS LIST

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

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.

HOLIDAY WORK RESTRICTIONS

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case by case basis and where work is behind barrier and will not impact traffic

Below are the holiday work restrictions:

New Years Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Evacuation Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

Patriot's Day (State Holiday)

Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

Mother's Day

No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

Memorial Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Bunker Hill Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

Juneteenth (6/19/21)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

HOLIDAY WORK RESTRICTIONS (Continued)**Independence Day (Federal Holiday)**

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Columbus Day (Federal Holiday)

No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

Veterans' Day (Federal Holiday)

No work restrictions due to traffic concerns.

Thanksgiving Day (Federal Holiday)

No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

Christmas Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

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 7.09 – PUBLIC SAFETY AND CONVENIENCE

No work will be allowed during daytime on any roadway between Memorial Day and Labor Day for the duration of the contract. Work on roadways between Memorial Day and Labor Day shall be allowed at night during the hours approved by the Town of Barnstable. Daytime lane closures on weekends will be allowed, provided that one lane of traffic in each direction remains open to traffic. Nighttime lane closures on weekdays between 9:00PM and 5:00AM will be allowed, provided that one lane of travel in each direction remains open to traffic.

The Contractor shall attend biweekly project meetings with utility companies, railroad, town and public safety to coordinate the work schedule, staging, detours, etc. This is one of the main access points to Cape Cod Hospital, which will require advance notification (Min. 48 Hrs.) to all Cape public safety agencies, whenever access is being restricted.

COVID 19 GUIDELINES AND PROCEDURES

The Contractor shall adhere to the Governor's COVID-19 Order No. 67 dated April 29th, 2021:

<https://www.mass.gov/doc/covid-19-order-67/download>

Per Subsection 5.09 – Inspection of the Work - the Contractor is required to provide assistance to the Engineer to make a complete and detailed inspection of the work. That assistance includes furnishing equipment to perform the inspection, therefore the Contractor will be required to provide CDC compliant Personal Protective Equipment (PPE) to Department personnel field staff. The CDC compliant PPE shall consist of face masks, gloves and eye protection.

All costs associated with compliance with this provision are considered to be incidental to the contract cost and therefore the Contractor will not be entitled to any additional compensation.

MANAGEMENT AND PREPARATION OF INFILTRATION AREAS

Contractor shall take extra precaution not to compact subsoil during construction or excavation. Where possible, excavation shall be performed from outside the footprint of the infiltration area. When access across an infiltration area is unavoidable during construction or excavation of material, low ground pressure type equipment shall be used to complete the work.

Subsoil at infiltration areas shall be tilled to a minimum depth of eighteen inches prior to placement of final dressing materials, such as loam borrow or compost topsoil. Soil tilling or ripping shall occur only when the subbase is in a friable condition, not muddy or hard.

Contractor shall take every effort possible to place infiltration media or final dressing materials in a way to minimize compaction of the subsoil, infiltration media, or final dressing materials. No construction vehicles shall be allowed in the infiltration area after the media is placed unless approved by the Engineer. Loose placement of infiltration media or final dressing materials shall be accomplished by dumping from the edges and spreading from outside of the infiltration area, or some other acceptable means determined by the Engineer. Any irregularities at the design finished grade shall be worked out with hand tools.

Following approval of infiltration media or final dressing material placement, seeding should occur as soon as possible to avoid erosion and the establishment of weeds. When site conditions allow, proposed infiltration areas shall remain offline until final site stabilization is achieved. As defined in the NPDES Construction Stormwater Permit dated February 16, 2017, final site stabilization shall be considered achieved when all soil disturbing activity is completed and the exposed soils have been stabilized with a perennial vegetative cover with a uniform density of at least 70 percent over the entire site and/or by permanent non-vegetative stabilization measures such as riprap, gravel, or equivalent means to provide effective cover and to prevent soil failure.

Prior to demobilizing from the site, Contractor shall remove all accumulated sediment and silt from the sediment forebays and drainage structures.

No separate payment will be made for the management and preparation of infiltration areas, but all costs in connection therewith shall be included in the unit price bid for various items required to complete the work.

DRAINAGE STRUCTURE CONNECTIONS

Where new pipe is shown on the Drawings to be connected into an existing drainage structure to remain, the existing structures shall be first cleaned to remove all mud, debris, and other material. The existing structure wall shall be carefully and neatly cut to provide the minimum size opening required for insertion of the new pipe. The proposed pipe end shall be set or cut-off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall. Existing shaped inverts shall be reconstructed as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure.

No separate payment will be made for the cost of connecting new pipes into existing structures, or necessary alterations of existing structures, but all costs in connection therewith shall be included in the unit prices bid for the various pipe items.

Where new structures shown on the plans are to connect to existing pipes to remain, the remaining pipe shall be cleaned from the new structure to the next structure downstream. Test pits to locate and survey the existing pipe shall be performed prior to ordering structure. The existing pipe or pipes shall be carefully cut or removed to allow the installation of the new drainage system. The existing pipe end shall be cut off flush with the inside face of the proposed structure wall and the remaining space around the pipe completely filled with red brick set in cement grout for the full thickness of the structure wall.

No separate payment will be made for the cost of connecting existing pipes to new structures, but all costs in connection therewith shall be included in the unit price bid for the various structure items. If new pipe or pipe section are required to extend the existing line to and through the new structure wall, the new pipe will be paid for under the unit price per foot established under that item.

CONNECTING TO EXISTING DRAINAGE PIPES:

Where new structures shown on the plans are to connect to existing pipes to remain, the remaining pipe shall be cleaned from the new structure to the next structure downstream. Test pits to locate and survey the existing pipe shall be performed prior to ordering the structure. The existing pipe or pipes shall be carefully cut or removed to allow the installation of the new drainage system. The existing pipe end shall be cut off flush with the inside face of the proposed structure wall and the remaining space around the pipe completely filled with red brick set in cement grout for the full thickness of the structure wall.

No separate payment will be made for the cost of connecting existing pipes to new structures, but all costs in connection therewith shall be included in the unit price bid for the various structure items. If new pipe or pipe section are required to extend the existing line to and through the new structure wall, the new pipe will be paid for under the unit price per foot established under that item."

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.

NOTICE TO OWNERS OF UTILITIES

The Contractor shall make his own investigation to assure that no damage to existing structures, drainage lines, conduits, and other utilities will occur as a result of his operations.

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

Select District 5

Select the Town of BARNSTABLE, and then locate the utility.

The utility contact list is for guidance only and is not guaranteed to be complete or up to date.

Town officials are shown at website.

<https://www.mass.gov/lists/massachusetts-cities-and-towns>
and select the required Town website.

In case of damage to utilities, the Contractor shall promptly notify the City and shall, if requested, furnish manpower under the City's direction in getting access to the utility. Pipes or other structures, damaged by the operation of the Contractor, may be repaired by the City, either the municipality or the utility company, at the Contractor's expense.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in protecting or repairing property as specified in this section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefore. The following are utility owners, contact personnel and telephone numbers of utilities presumed to be affected, but the completeness of the list is not guaranteed.

NOTICE TO OWNERS OF UTILITIES (Continued)**UTILITY CONTACTS**

<u>Name</u>	<u>Contact</u>	<u>Telephone Number</u>
Cable Comcast PO Box 6505 – 5 Omni Way Chelmsford, MA 01824	Wendy Brown	978-848-5163
Gas National Grid Gas 40 Sylvan Road – 3 rd Floor-W3.244 Waltham, MA 02451	Melissa Owens	781-907-2845
Electric NSTAR Electric & Gas Company d/b/a/ Eversource Energy 157 Cordaville Road Southborough, MA 01772	Kelley-Anne Correia	508-305-7163
Telephone Verizon 385 Myles Standish Blvd Taunton, MA 02780	Karen Mealey	774-409-3160
Water Hyannis Water System P.O. Box 326 Hyannis, MA 02601	Hans Keijser	508-775-0063
Sewer Barnstable Water Pollution Control 617 Bearses Way Hyannis, MA 02601	Andrew Boule	508-790-6335
Railroad Mass Coastal Railroad 3065 Cranberry Highway East Wareham, MA 02538	Chris Podgurski	508-291-2116

NOTICE TO OWNERS OF UTILITIES (Continued)

Fire Alarm Hyannis Fire Alarm 95 High School Rd. Extension Hyannis, MA 02601	John Cosmo	508-775-1300
Department of Public Works Barnstable Town Engineer 382 Falmouth Road Hyannis, MA 02601	Daniel W. Santos, P.E.	508-790-6400
Open Cape P.O. Box 1148 Barnstable, MA 02630-2148	Gary Farrenkopf	
CapeNet LLC 1900 West Park Drive, Suite 280 Westborough, MA 01581	Shannon Silvas	508-744-5080
Barnstable Municipal Airport Boardman-Polando Field 480 Barnstable Road Hyannis, MA 02601	Katie Servis	508-775-2020

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS**GAS:**

Emergency: 1-800-233-5325

New Service: 1- 877-696-4743

Customer Support: 1-800-732-3400

EVERSOURCE EMERGENCY TELEPHONE NUMBERS**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

UTILITY POLES

If an existing, temporary or relocated pole needs to be held in place for the installation of proposed conduits, drainage, pipes, etc., the Contractor shall notify the utility owner in order for the utility owner to hold the poles securely in place. The Contractor will be solely responsible for all costs charged by the utility owner for this required service. These utility costs are incidental and shall be included in the unit price bid for the various conduit, drainage, pipes, etc., items as incidental to the work.

AIRSPACE RESTRICTIONS

The project is located within the runway protection zone of the Barnstable Municipal Airport. The Contractor shall prepare an analysis of all equipment that could intrude into the airspace to be used on the project, evaluating the equipment height in relation to restrictive airspace surfaces and submit FAA Form 7460 for each piece of equipment to be used on the project. Contractor shall put lights or flags on cranes for visibility. Contractor to coordinate with airport manager and airport tower when using equipment that could intrude into the airspace.

Form 7460-1 has been submitted for permanent structures within the project limits based on the designed structure heights. Contractor shall prepare and submit FAA Form 7460-2 for all installed utility poles, mast arms, RR signal gate arms, and the RR signal bridge. Within 30 days of NTP,

Contractor shall provide contact name for form preparer and sponsor for transferring FAA cases in order to prepare FAA Form 7460-2.

The Contractor shall determine as-built horizontal and vertical location of utility poles and mast arms for use in preparing Form 7460-2. Form 7460-2 shall be submitted within five (5) days of the structure reaching its maximum height. Contractor shall also request an Airspace Review from the Massachusetts Aeronautics Division. Mass Coastal RR will provide the Contractor with as-built information for the RR signal gate arms and the RR signal bridge for use in preparing Form 7460-2. The Barnstable Municipal Airport and MassDOT shall be copied on each submission. See Attachment A (included in Document A00885) for approximate elevations of the airspace restrictions in comparison with existing topography.

All work under this section shall be considered incidental to Item 748 – Mobilization.

NOTIFICATION OF FUNDING SOURCES FOR WORK TO BE PAID BY OTHERS

This contract contains work that shall be paid by the Town of Barnstable. The said Town shall be responsible for construction costs associated with a Non-Participating Agreement with MassDOT.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Contractor shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

- 1) Contractor's accepted Baseline Schedule
- 2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
- 3) An approved Proposal Schedule

C.1 - BASELINE SCHEDULE – UTILITY BASIS

The Contractor shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

SUBSECTION 8.14 (Continued)**C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE**

All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Contractor shall present all known information at the pre-construction conference in the form of a ‘sub-net’ schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Contractor shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Contractor shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM

If the Contractor intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contractor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Contractor shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Contractor shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS

The Contractor shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor shall continue to diligently seek the Utility Owner’s cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Contractor must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Contractor.

SUBSECTION 8.14 (Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

- 1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
- 2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Contractor shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

SECTION 722 CONSTRUCTION SCHEDULING

DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

The requirements for scheduling submissions are established based on the Project Value at the time of the bid and are designated as Type A, B, C or D. The definitions of these Schedule Requirement Types are summarized below. Complete descriptions of all detailed requirements are established elsewhere in this specification.

Type A – for all Site-Specific Contracts with a Project Value over \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Resource-Loading
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Cost-loaded CPM
- Contractor-furnished CPM software, computer and training

Type B – for all Site-Specific Contracts with a Project Value between \$10 Million and \$20 Million

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

SECTION 722 (Continued)

Type C – for all Site-Specific Contracts with a Project Value between \$3 Million and \$10 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

Type D - for all contracts with a Project Value less than \$3 Million; various locations contracts of any dollar amount; contracts with durations less than one-hundred and eighty (180) Calendar Days; and other contracts as determined by the Engineer.

- Bar chart schedule updated monthly or at the request of the Engineer (See Section 722.62.B - Bar Charts.)
- Monthly Projected Spending Report (PSR) (See Section 722.62.F - Projected Spending Reports.)

MATERIALS, EQUIPMENT, PERSONNEL**722.40 General****A. Software Requirements** (Types A, B and C)

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer’s Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer’s Field Office within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

B. Scheduler Requirements

For all schedule types, if the Contractor plans to use outside scheduling services, the scheduler shall be approved as a subcontractor by the Engineer.

For Type A, B and C Schedules the name of the Contractor’s Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

SECTION 722 (Continued)**CONSTRUCTION METHODS****722.60 General****A. Schedule Planning Session**
(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;
7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;
9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a minimum of five (5) copies of a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

B. Schedule Reviews by the Department (All Types)**1. Baseline Schedule Reviews**

The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

2. Contract Progress Schedule / Monthly Update Reviews

The Engineer will respond to each submittal within twenty one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

SECTION 722 (Continued)**722.61 Schedule Content and Preparation Requirements**
(Types A, B and C unless otherwise noted)

Each Contract Progress Schedule shall fully conform to these requirements.

A. LOGIC

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

B. ACTIVITIES

The schedules shall clearly define the progression of the Work from NTP to Contractor Field Completion (CFC) by using separate activities for each of the following items:

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements
4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. The preparation and submission of shop drawings, procedures and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable
6. The review and return of shop drawings, procedures and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting the Contract
8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor's request for validation of FBU (ready to open to traffic)
15. The Department's confirmation of completed work to allow for FBU

SECTION 722 (Continued)

16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
19. Contractor confirmation that all punchlist work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>
29. For Type A and B Contracts only: All items to be paid, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

C. EARLY AND LATE DATES

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

SECTION 722 (Continued)**D. DURATIONS**

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration to resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

E. MATERIALS ON HAND (for Types A and B only)

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

F. ACTIVITY DESCRIPTIONS

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

I. CALENDARS

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time of year (TOY) restrictions and/or area roadway restrictions.

SECTION 722 (Continued)

Examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Refer to the Project Special Provisions for specific restrictions.
- Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced. Refer to the Project Special Provisions for specific restrictions.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. FLOAT

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

K. COST AND RESOURCE LOADING (Types A and B only)

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.

SECTION 722 (Continued)

4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.
8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of- values for all Lump Sum items.

L. NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE

1. Milestones or constraint dates not specified in the Contract
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer
4. Delayed starts of follow-on trades
5. Float suppression techniques

722.62 Submittal Requirements

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

Except as stated elsewhere in this subsection, schedule submittals shall include each of the documents listed below, prepared in two formats, for distribution as follows:

- a. four (4) compact discs (CD); one (1) each for the Office of Project Controls and Performance Oversight (O-PC&PO), the Boston Construction Section Office, the District Construction Office and the Resident Engineer's Office. Additional copies shall be required if the work is performed in more than one district.
- b. two (2) hard copies plotted in color on 24" X 36" paper; one (1) copy each for the District Construction Office and the Resident Engineer's Office. No copies for the O-PC&PO and the Boston Construction Section Office. Additional copies shall be required if the work is performed in more than one district.

SECTION 722 (Continued)**A. Narratives**

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent;
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements;
3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A - Notice of Delay;
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record;
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path;
6. provide a description of any possible considerations to improve the probability of completing the project early or on-time;
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths ;
8. describe the Contractor's plan, approach, methodologies and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required;
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule;
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies and previously-approved production rates;
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 - Increased or Decreased Contract Quantities and 8.10 - Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay;
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.

SECTION 722 (Continued)**B. Bar Charts (Types A, B, C and D)**

One (1) time-scaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted and Total Float shall be shown for all activities.

A second time-scaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

Bar Charts shall be printed in color and submitted on 11" X 17" paper or, if approved by the Engineer, as a .pdf file.

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. The DASC shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection 722.20 - General:

D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start and finish dates for each completed activity.

For Unit Price pay items, in addition to the above, estimates to complete and any variance to the estimated Contract quantity shall be shown.

E. Resource Graphs (Type A only)

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

SECTION 722 (Continued)**F. Projected Spending Reports (Types B, C and D)**

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit> or consult with the District Construction Scheduler.

722.63. Progress Schedule Requirements**A. Baseline Schedule**

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

B. Interim Progress-Only Schedule Submissions

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

SECTION 722 (Continued)**C. Contract Progress Schedules / Monthly Updates** (Types A, B, C and D)

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be sixty (60) Calendar Days after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to as-built sequencing and as-built dates for completed and in-progress activities. As-built data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously-approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties; sequence, description or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule 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.

Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

D. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a bar chart format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule, and may be at a greater level of detail.

SECTION 722 (Continued)

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

Failure to submit Short-Term Construction Schedules every two (2) weeks may result in withholding of full or partial payments by the Engineer.

722.64 Impacted Schedule Requirements**A. Notice of Delay**

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within three (3) Calendar Days of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

B. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet (that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

SECTION 722 (Continued)

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fourteen (14) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to most efficiently demonstrate the schedule impacts in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resource that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates.

During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

The Engineer may request that the Contractor prepare a Proposal Schedule or a Recovery Schedule to further mitigate any delays that are shown in the accepted TEA/Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule within fourteen (14) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

SECTION 722 (Continued)

During the prosecution of the Work, should the Contractor's progress on a critical operation clearly not meet anticipated production, without cause by fault of the Department, or should a critical activity or series of activities not be staffed in accordance with the Contractor's approved Baseline Schedule resource planning, the Contractor shall be obligated to recover such delay. Recovery Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements within fourteen (14) Calendar Days of any of the cases listed above.

Recovery Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in to the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions, without additional compensation for any Contractor delays, if it is determined to be in the best interest of the Department to do so.

During the review of any Recovery Schedule, all Contract Progress Schedules shall continue to be required every month.

The Engineer may request that the Contractor prepare a Recovery Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

D. Proposal Schedules

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource-loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations, narrative and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts.

Changes represented in accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

SECTION 722 (Continued)**E. Disputes (Types A, B, C and D)**

All schedules shall be submitted, reviewed, dispositioned and accepted in the timely manner specified herein so as to provide the greatest possible benefit to the execution of this Contract.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

COMPENSATION**722.80 Method of Measurement and Basis of Payment (Types A, B, C and D)**

The Special Provisions will specify the fixed-price amount to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this lump-sum, fixed-price bid item amount in his/her bid. Failure to do so may be grounds for the rejection of the bid.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

Twenty percent (20%) of this pay item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 722.63.A.

The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of Item 100.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

The timely and accurate submission of the Baseline Schedule is critical to the Contract and the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 - Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

SECTION 722 (Continued)

No payment for any other pay item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. Late submittal of missed Contract Progress Monthly Updates will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the withholding of full or partial payments by the Engineer.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. Item 100. will be the basis for this Equitable Adjustment.

722.82 Payment Items

100. SCHEDULE OF OPERATIONS - FIXED PRICE \$ _____ LUMP SUM

SAFETY DEVICES FOR CONSTRUCTION OPERATIONS

(Supplementing Subsections 850.21 and 850.61)

Contractor shall supply site specific work safety plans for all work within the railroad right of way. The cost will be incidental to the Contract, unless, if there is a contract bid Item cover the work.

All safety signing, temporary pavement markings, reflectorized and lighted drums, and all other safety controls used for construction operations shall conform to the MASH and the MUTCD, Current Edition, for Streets and Highways including all amendments.

ITEM 112.1**DEMOLITION OF BUILDING NO. 1****LUMP SUM**

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

The work to be performed under these items shall, in general, consist of the following:

1. Pre-demolition hazardous material surveys have been conducted and is included as Attachment B (included in Document A00885).
2. Develop programs for the remediation of all hazardous materials found to be present in accordance with all-applicable local, state and federal laws and regulations.
3. Acquisition of all permits and approvals necessary for the performance of activities required to demolish the structures, including notification to the Massachusetts Department of Environmental Protection and Labor and Industries related to the proposed demolition and abatement work.

Provide all labor, materials, facilities, equipment, services, employee training, testing, permits and agreements necessary to perform abatement work with all buildings that may require abatement.

4. Coordinate with the Town of Barnstable Water and Sewer Department prior to commencement of the work to establish the details for shut off and abandonment of water services.
5. Coordinate with Eversource, Verizon, Comcast, and National Grid - Gas prior to commencement of the work to establish the details for shut off and abandonment of utility services.
6. Furnish all labor, materials and equipment necessary for the complete demolition of the building, stairs, railings, walls, fences, underground tanks, underground piping, slabs, and other similar materials at this address, maintenance of the site in a secure and safe condition and provision and placement of surface stabilization required for backfilling of foundations of the structure demolished as required to leave the site in a safe and environmentally sound condition.
7. Legal, proper and environmentally sound disposal of demolition materials, including hazardous materials.
8. During building demolition care shall be exercised to avoid damage to the adjacent railroad signal bungalow and all other structures within the project site. If necessary, Contractor shall install Support of Excavation (SOE) to protect the bungalow. Contractor shall submit plans showing procedure for railroad signal bungalow protection for approval.

ITEM 112.1 (Continued)

The Structure to be demolished is shown on the plans and further described below.

Structure No.	Location	Description
1	#201 Yarmouth Road	Two story Brick Building

RELEASE OF BUILDINGS

1. The Department assumes no responsibility for the condition of the structure on the project site.
2. The structure will not be available for demolition until it has been released to the Contractor by the Department in writing.

LAWS, ORDINANCES, PERMITS AND NOTIFICATION

The Contractor shall be responsible for obtaining all necessary permits, licenses, and approvals before any demolition begins. The Contractor must use an EPA and DEP approved sanitary landfill for disposal of debris.

The Contractor will make all necessary notifications as soon as the Department releases the structure. These notifications will describe the methods and procedures for the removal and disposal of the material. Notifications will be sent to the following agencies:

Massachusetts Department of Environmental Protection

Massachusetts Department of Labor and Industries

One copy of the notification to the state shall be on site during abatement removal.

Prior to starting any work, the Contractor shall also notify the Town of Barnstable Fire Department and obtain any other required permit(s) from the Town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

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

The bulding to be demolished is located within the runway protection zone of the Barnstable Municipal Airport. The Contractor shall prepare an analysis of all equipment that could intrude into the airspace to be used on the project, evaluating the equipment height in relation to restrictive airspace surfaces and submit FAA Form 7460 for each piece of equipment to be used on the project. The Barnstable Municipal Airport and MassDOT shall be copied on each submission.

ITEM 112.1 (Continued)

See Attachment A (included in Document A00885) for approximate elevations of the airspace restrictions in comparison with existing topography.

Inspection, testing and removal of Asbestos material are covered separately under Item 182.3.

CONSTRUCTION METHODS

All provisions of this item relating to health and safety of the workers and the public and protection of the environment are minimum standards. The Contractor is responsible for determining whether any additional and/or more stringent protective measures are necessary by legal requirements or prudent conservative practice and for implementing such measures. Nothing in this Specification shall be deemed to relieve the Contractor from any liability with respect to any such legal requirement of prudent conservative practice.

The Contractor shall at all times prosecute the work in an orderly manner keeping his activities and storage of materials and equipment sufficiently neat and confined to avoid disruption of abutting occupied properties, Department activities, surrounding construction and adjacent travel ways. The engineer shall be the sole judge of the Contractor's operations and may enforce on-site provisions, which are considered in the best interests of the Department.

The Contractor shall plan work so that the building being demolished can be properly secured. No foundations shall be left unfilled at the end of a work period. All demolished materials shall be disposed of on a daily basis.

Debris shall be removed from the site and legally disposed of by the Contractor. The Contractor shall make arrangements for disposal. No disposal shall be made on the property of Commonwealth of Massachusetts. All building debris shall be disposed of at an approved DEP Landfill according to its classification as construction debris or hazardous waste. The said waste shall not be incinerated or compacted if any Category I non-friable asbestos-containing materials are to remain in the building at the time of demolition (e.g. roofing or floor tiles).

The Contractor must satisfy himself by his own investigation and research of the site and the detail contained therein regarding all conditions affecting the work, the amount of labor, materials and equipment needed, and make his bid in sole reliance thereon.

No structure shall be demolished until regulated asbestos-containing materials (RACM) removal work has been completed. Asbestos-containing material removal work shall be coordinated with all other work under the contract, and shall be completed prior to performing any activities, which could disturb the asbestos materials or produce airborne asbestos fibers.

ITEM 112.1 (Continued)

Following demolition of the structure and removal of debris, suitable excavated material shall be furnished and placed as directed in areas where buildings have been removed. All unsuitable material from the demolished structures shall be removed from the site and the cellar holes backfilled to match adjacent ground level and to create free flow drainage surfaces as directed by the Engineer. All bituminous concrete slabs, walkways, driveways or other surfaces shall be removed and properly disposed of. All fences, signs, vent pipe, foundations and debris, etc. on the parcel on which the building that is to be demolished is located shall be removed and the parcel left in a neat and safe condition.

Removal of the building foundation shall extend to seven (7) feet below finish contour grade. Removal and disposal of all existing underground tanks (including an existing septic system and potential oil tank) and piping, whether inside or outside of the building footprint shall be included under Item 120.1. The demolition of Building No. 1 shall be completed prior to other clearing and grubbing activities or other activities which may result in disturbance of subsurface soils at this location. Payment for the removal and disposal of all other material outside of the building footprint shall be measured and paid for under item 120.1 Unclassified Excavation.

BASIS OF PAYMENT

Payment for the demolition and removal of the structure listed under Item 112.1 will be by the Contract LUMP SUM bid price, which price includes full compensation for necessary notifications, permits, insurance, all support of excavation, all back filling and materials needed to complete the demolition in a workmanlike manner as required to leave the site in a safe and environmentally sound condition and to legally dispose of all debris.

Excavation of the leaching field and removal of the septic tank shall be paid for under Item 120.1 Unclassified Excavation. Removal of abandoned railroad track shall be paid for under Item 129.5 Track Excavation.

The contractor will make his own investigation of the structure to be demolished including the materials that are part of, or may be stored in the structure. No increase will be made to the bid price due to the nature of the materials involved in the demolition. All costs for permits, dump fees, taxes, special handling of hazardous materials, etc. shall be included in the bid price of the demolition item.

The investigation, testing, categorization, tracking, handling, removal, and disposal of miscellaneous hazardous materials including lead paint, mercury, PCB containing devices, containerized household products, fuel oil, and other hazardous materials that are encountered at these addresses shall be incidental to the demolition items, with the following exceptions: Asbestos abatement will be measured and paid for under Items 182.1 and 182.3, and; contaminated soil handling and disposal will be measured and paid for under Items 181.11 through 181.14. Building demolition shall not commence until all asbestos containing materials are removed.

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

The work under this Item shall conform to the relevant provisions of Subsection 120 of the Standard Specifications and the following:

Track as called for in this Item shall consist of the pair of parallel rails, plates, spikes, frogs, switches and all other metallic appurtenances which considered part of the track system.

Disposal of ties shall be covered under item 184.1.

METHOD OF MEASUREMENT

Item 129.5 track excavation will be measured for payment by the FOOT of parallel rails measured length along the centerline of the longest rail.

BASIS OF PAYMENT

Item 129.5 will be paid for at the Contract unit price per FOOT for track removal which price shall include all labor, tools, equipment and incidental costs required to remove all track within the limits of the project as required by the Engineer.

ITEM 153. CONTROLLED DENSITY FILL - EXCAVATABLE CUBIC YARD

The work under this Item shall conform to the relevant provisions of Subsection 150 of the Standard Specifications and the following: Controlled density fill (CDF) shall be used under the control of the Engineer as shown on the plans and/or as required by the Engineer.

MATERIALS

Controlled density fill material shall conform to Section M4.08.0. The slump test shall be the “pancake” diameter type. Controlled Density Fill and shall be Type 1E – Very Flowable (Excavatable) and consist of:

1. Portland Cement - ASTM C150
2. Fly Ash - Type F
3. Water - shall be potable
4. Air-Entraining Admixture
5. No admixtures that tend to increase strength with time may be used without approval by Engineer.
6. Aggregate - ASTM C33 for the excavatable mixes, the well-graded concrete sand will make up the remaining volume of the mix to achieve the full cubic yard.

SUBMITTALS & TESTING

1. The acceptance of the mix and the supplier will be based on the range and length of experience of the supplier and the mix backup data. The primary properties are the setting times, flowability and yield. The supplier shall submit to the Contractor and then to the Engineer, documentation of his experience in his mixes and in their personnel's ability to deliver them.
2. Contractor to provide to Engineer a cold-weather procedure for reaching design strength in allowable time.
3. Contractor to provide to Engineer an anti-floating procedure including buoyancy calculations to prevent uplift in the casing pipes.
4. Contractor to perform test batches prior to construction to demonstrate set up time in cold weather prior to installation.

METHOD OF MEASUREMENT

Item 153. will be measured for payment by the CUBIC YARD of material placed within the specified limits as required by the Engineer.

BASIS OF PAYMENT

Item 153. will be paid for at the Contract unit price per CUBIC YARD of material, complete in place, which price shall include all material, labor, equipment, and incidental costs required to complete the work as described and as required by the Engineer.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Subcontractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection, required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer shall implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

ITEM 180.01 (Continued)

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer shall sign and date the daily log.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the Lump Sum Bid Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work. The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

ITEM 180.02**PERSONAL PROTECTION LEVEL C UPGRADE****HOURLY**

The work shall consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per hour, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

ITEM 180.03**LICENSED SITE PROFESSIONAL SERVICES****HOUR**

Within limited areas of the project site, soils, sediments and/or groundwater may be contaminated. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include sampling, analysis and characterization of potentially contaminated media, preparation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the Massachusetts Contingency Plan (MCP). LSP hours related to the characterization and disposal of contaminated soil and/or sediment are incidental to the disposal items. An estimate of LSP services to be provided shall be submitted to the Engineer for approval before any LSP activity begins.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the DEP shall be submitted for all work assignments listed for the LSP and environmental technicians.

The LSP shall evaluate soil and/or sediment with discoloration, odor, and presence of petroleum liquid or sheening on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect soil and/or sediment. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall adequately characterize subsurface conditions prior to backfill in areas where contaminated material has been excavated. The Engineer shall approve the locations of the testing sites prior to the sampling.

Contaminated soil, sediment and/or groundwater shall be handled in accordance with all applicable state and federal statutes, regulations and policies. The LSP shall adequately characterize contaminated media for comparison to the requirements of the MCP. The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations, and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

ITEM 180.03 (Continued)

The LSP shall maintain written records in a clear and concise format which tracks the excavation, stockpiling, analysis and reuse/disposal of all suspect contaminated soils, sediments and groundwater. These records shall be up-to-date and available to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, penalties and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, penalties and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations, and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Department before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

LABORATORY TESTING IN SUPPORT OF LSP SERVICES

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included.

In order to maintain compliance with the MCP or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

ITEM 180.03 (Continued)**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours. LSP hours related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The contractor will be reimbursed upon satisfactory written evidence of payment. The contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider. Laboratory testing related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory Testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

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

The work under these Items shall include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as “disposal” for the purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying disposal facility (ies) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

CLASSES OF CONTAMINATED SOILS

The Contractor and its LSP shall determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the MCP. Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

UNREGULATED SOIL consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants.

ITEMS 181.11 through 181.14 (Continued)

Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer in order to document legal disposal of the unregulated material.

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the item of work to which it pertains.

REGULATED SOIL consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site provided that it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

ITEMS 181.11 through 181.14 (Continued)

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

MONITORING/SAMPLING/TESTING REQUIREMENTS

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

WASTE TRACKING:

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

ITEMS 181.11 through 181.14 (Continued)

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item.

REGULATORY REQUIREMENTS

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions shall apply. The Contractor shall reimburse MassDOT for all costs it incurs, including penalties and/or for fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

SUBMITTALS

I. Summary of Sampling Results, Classification of Material and Proposed Disposal Option.

The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

ITEMS 181.11 through 181.14 (Continued)

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis program. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a baseplan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and, all analytical results.

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

II. Stockpiling, Transport, and Disposal.

At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

Excavation and Stockpiling Protocol:

Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material.

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.
2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

ITEMS 181.11 through 181.14 (Continued)**Transportation:**

The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal.

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.

DEMOLITION DEBRIS:

Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

SOIL/SEDIMENT:

Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Disposal of contaminated soil shall be measured for payment by the Ton of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under all of these items shall be incidental to the work with no additional compensation.

ITEMS 181.11 through 181.14 (Continued)

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

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

The work shall include the inspecting and testing of all materials suspected of containing asbestos. When any demolition is required to enable the inspection and testing of the suspected material it will be considered incidental to this Item and the Contractor must perform all asbestos handling and testing in accordance with the regulations stated below.

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

The Contractor shall employ the services of a Massachusetts licensed "Asbestos Inspector" to inspect the material to determine whether or not "ITEM 182.2 REMOVAL OF ASBESTOS" is required. Should the asbestos inspector determine laboratory testing is required, a state certified laboratory shall be used to perform all necessary tests.

REGULATIONS

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

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

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

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

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

Massachusetts Department of Labor and Industries Regulations, (DLI) including but not limited to:

- 453 CMR 6.00 Removal, Containment and Encapsulation of Asbestos

ITEM 182.1 (Continued)

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

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

Massachusetts Division of Industrial Safety 45 CMR 10.00

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

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

BASIS OF PAYMENT:

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

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

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

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The work shall include, but are not limited to, removal, and disposal of asbestos-containing water pipe and demolition of the building at 201 Yarmouth Road. The work to be performed shall consist of submission of all required notifications and permits, furnishing all materials, equipment and labor to perform the necessary work.

The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

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

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

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

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

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

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

Massachusetts Department of Labor and Industries Regulations, (DLI) including but not limited to:

- 453 CMR 6.00 Removal, Containment and Encapsulation of Asbestos

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

ITEM 182.2 (Continued)

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

Massachusetts Division of Industrial Safety 45 CMR 10.00

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

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

All asbestos material shall be removed and properly disposed of by a contractor or
subcontractor with a current Massachusetts Abatement Contractors License issued by the
Department of Labor and Industries. Work shall be supervised by a competent person as
required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have
completed a course at an EPA Training Center or equivalent course in asbestos abatement
procedures, have had a minimum of four years on-the-job training and meet any additional
requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be
certified by the Commonwealth as an Asbestos Abatement Supervisor and Asbestos Abatement
Project Designer as required by 453 CMR 6.00.

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

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

NOTIFICATION AND PERMITS

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

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

ITEM 182.2 (Continued)

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

STANDARD OPERATING PROCEDURES

The standard operating procedure shall ensure the following:

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

REQUIRED SUBMITTALS

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

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

ITEM 182.2 (Continued)

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

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

METHOD OF MEASUREMENT:

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

BASIS OF PAYMENT:

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

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

ITEM 182.3 ASBESTOS ABATEMENT FOR BUILDING DEMOLITION LUMP SUM**SCOPE OF WORK**

The work to be performed under these items consists of asbestos related abatement activities, and associated response actions. These activities include, but are not limited to, removal, and disposal of asbestos-containing water pipe and demolition of the building at 201 Yarmouth Road. The work to be performed shall consist of submission of all required notifications and permits, furnishing all materials, equipment and labor to perform the necessary work.

CONTRACT REQUIREMENTS

The work under these items shall consist of abatement of identified ACM from areas within the interior or on the exterior of buildings to be demolished. The Contractor must perform all ACM handling and abatement work in accordance with these specifications and the following additional requirements:

1. U. S. Department of Labor, Occupational Safety and Health Administration (OSHA) including but not limited to:
 - a. 29 CFR 1910.1001 and 29 CFR 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule.
 - b. 29 CFR 1910.134 Respiratory Protection 29 CFR 1926 Construction Industry 29 CFR 1910.02 Access to Employee Exposure and Medical Records 29 CFR 1910.1200 Hazard Communication.
 - c. 29 CFR 1910.145 Specification for Accident Prevention Signs and Tags.
2. U. S. Environmental Protection Agency, (EPA) including but not limited to:
 - a. 40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no. 134, July 12, 1985 p.28530-28540 Asbestos Abatement Projects Rule.
 - b. 40 CFR 61 Subpart A, Regulations for Asbestos.
 - c. 40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos.
3. U. S. Department of Transportation 49 CFR 172 and 173.
4. Massachusetts Division of Occupational Safety, (DOS) including but not limited to:
 - a. 453 CMR 6.00 Removal, Containment and Encapsulation of Asbestos.
5. Massachusetts Department of Environmental Protection, (DEP) including but not limited to:
 - a. 310 CMR 7.00, 7.15 Air Pollution Control Regulations.
 - b. 310 CMR 18.00 and 19.00 Solid Waste Regulations.

ITEM 182.3 (Continued)

6. Massachusetts Division of Industrial Safety 45 CMR 10.00.
7. Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments.
8. All provisions of this item relating to health and safety of the workers and the public and protection of the environment are minimum standards. The Contractor is responsible for determining whether any additional and/or more stringent protective measures are necessary by legal requirements or prudent conservative practice and for implementing such measures. Nothing in this Specification shall be deemed to relieve the Contractor from any liability with respect to any such legal requirement of prudent conservative practice.
9. The Contractor shall deliver all materials to the site in the original containers bearing the name of the manufacturer and details for proper storage and usage.
10. All materials, tools, and equipment must comply, at a minimum, with this specification, and relevant federal, state and local standards and codes.
11. All boxes and equipment shall be clean of asbestos fibers before arriving on-site and before exiting a Work Area. This cleaning, where necessary, will be performed so there will be no confusion as to the origin of any dust or debris.

EXECUTION OF WORK

An Asbestos Consulting Firm (ACF), retained and directed by the Department under a separate contract and having no affiliation with the abatement Contractor, will provide third party oversight of all abatement activity and associated response actions to determine conformance with applicable Federal, State or local regulatory requirements governing this activity.

ASBESTOS CONSULTING FIRM

The ACF will be available on-site during the handling of asbestos-containing material, at no cost to the Contractor, to provide the following services:

1. Consultation with the Department and the Contractor on the technical aspects of asbestos removal and repair.
2. Review of preparation and isolation of Work Area, personnel protection and industrial hygiene practices.
3. Testing adequacy of HEPA-filtered exhausts in maintaining negative differential pressure within all Work Areas.

ITEM 182.3 (Continued)

4. Air monitoring inside and outside the Work Area during asbestos removal to determine that acceptable low levels of fiber concentrations are maintained.
5. Visual inspection for the removal of visible asbestos and debris and testing and certifying that the Work Area is at an acceptable fiber/cc concentration following asbestos removal.
6. The air monitoring by the Asbestos Consultant Firm shall not relieve the Contractor of his obligations under all-applicable Federal and State regulations and requirements.

ADMINISTRATIVE REQUIREMENTS

Minimum administrative and supervisory requirements necessary for coordination of work on the project, include, but are not necessarily limited to, the following:

- A. The Contractor must provide a full-time Project Manager who is experienced in administration and supervision of asbestos abatement projects, including work practices, protective measures for building and personnel, disposal procedures, etc. This person shall be available to the Engineer, the District Asbestos Coordinator and the ACF as the Contractor's primary contact at all times while work is in progress.
- B. The Contractor must provide a full-time licensed supervisor for all asbestos abatement work who is experienced in the supervision of asbestos abatement projects, including work practices, protective measures for building and personnel, disposal procedures, etc. This person shall remain at the work site at all times while work is in progress. This person must have completed a course at an EPA Training Center or equivalent certificate course in supervisor asbestos abatement procedures, have a minimum of four (4) years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a competent person. This person must also be certified by the Commonwealth of Massachusetts as an Asbestos Abatement Supervisor and as required by 453 CMR 6.00. This person is the Competent Person as required by OSHA in 29 CFR 1926 for the Contractor, and is the Contractor's representative responsible for compliance with all applicable Federal, state and local regulations, particularly those relating to asbestos-containing materials.
- C. The Contractor will attend meetings, called by the Department as deemed necessary. Costs for a site meeting shall be considered incidental to the contract.
- D. The Contractor will be provided with results of any asbestos survey performed by the Department for the buildings to be demolished.

ITEM 182.3 (Continued)**ASSIGNMENT OF WORK**

No work shall be performed until specifically authorized by the Department.

CONTRACT SUBMITTALS**PRE-CONSTRUCTION SUBMITTALS**

1. Proof of certification by the Massachusetts Division of Occupational Safety of the Abatement Entity.
2. Descriptions and references of similar asbestos control work, and a list of the supervisory personnel who may be assigned to this item, if awarded, including descriptions of their experience and qualifications in asbestos control work.
3. A list of equipment available to be used. This list should include a description of all Highly Efficient Particulate Air (HEPA) filtered exhaust units including make, model number and capacity and National Institute for Occupational Safety and Health (NIOSH) certification of the respirators that will be used by the Contractor's workers.

PRE-ASSIGNMENT REQUIREMENTS**SUBMITTALS**

- A. The Contractor shall be responsible for submitting notifications and obtaining all necessary permits, licenses and approvals before any asbestos abatement can begin. The Contractor must use an EPA approved landfill for disposal of asbestos waste and must use properly placarded vehicles when transporting the asbestos waste to the landfill. The Contractor will make all necessary notifications at least ten (10) working days prior to the scheduled start date determined by the Department. Notifications will be sent to the following agencies:
 1. US Environmental Protection Agency, Region 1
 2. Massachusetts Department of Environmental Protection
 3. Massachusetts Division of Occupational Safety
- B. Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the Town or City. A copy of the notifications and permit(s) if applicable shall be provided to the Engineer and the ACF.

ITEM 182.3 (Continued)

- C. If requested, by the Engineer or District Asbestos Coordinator, the Contractor shall develop and submit to the ACF for approval a detailed Asbestos Abatement Plan. Such a plan shall include, but not be limited to, the precise personal protective equipment to be used, the location of containments and/or regulated areas including; clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades, sequencing of removal related work, disposal plan, type of wetting agents to be used, locations of local exhaust equipment and planned air monitoring strategies. The plan shall also include both fire and medical emergency response plans. This Asbestos Abatement Plan shall be submitted for approval prior to the start of any abatement activity. The Contractor and the ACF shall meet with the Engineer and the District Asbestos Coordinator to discuss, in detail, the Asbestos Abatement Plan, including work procedures and safety precautions. Once approved, the plan will be enforced as if in addition to this specification. Costs for the Asbestos Abatement Plan and meetings shall be considered incidental to the contract.
- D. The Contractor shall be responsible for installing his/her own electric panel for abatement activities. An electrician licensed by the Commonwealth of Massachusetts shall perform installation of the electrical panels.

ON-SITE RESPONSIBILITIES**GENERAL REQUIREMENTS**

- A. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the Work Area in a manner which shall not interfere with construction.
- B. Unloading, temporary storage sites, and transfer routes must be approved in advance by the Engineer or District Asbestos Coordinator.
- C. Damaged or deteriorated materials or equipment may not be used and must be promptly removed from the premises. Materials, which become contaminated with asbestos shall be packaged and legally disposed of as ACM in an EPA approved, secure landfill.
- D. Debris shall not be permitted to accumulate in the work area, and the immediate adjacent areas shall be kept clean. Debris shall be removed from the site and legally disposed of by the Contractor. No disposal shall be made on the property of Commonwealth of Massachusetts or project site. The Contractor shall make his own arrangements for disposal subject to the approval of the Engineer or District Asbestos Coordinator.

ITEM 182.3 (Continued)

- E. Contractor's electrical equipment shall be protected by ground fault circuit interrupters (GFCI), which shall be provided by the Contractor.
- F. All labor and material costs for connections to existing services, installation of GFCI, temporary lighting, and other work necessary to supply electricity will be the Contractor's responsibility and shall be considered incidental to this contract.
- G. The Contractor shall provide electricity, water and sanitary equipment.
- H. The Contractor shall coordinate all activities with Department.
- I. The Contractor shall perform air monitoring as required to meet OSHA requirements for maintenance of Time Weighted Average (TWA) fiber concentrations for types of respiratory protection provided.
- J. Workers will not be allowed to openly carry their respiratory protective equipment outside the Work Area.
- K. The Contractor shall provide access and personal protective equipment, with the exception respirators, as necessary, to Department personnel, their representatives or others having authorization to visit the Work Area.
- L. It shall be the Department's responsibility or others having authorization to visit the Work Area to provide their own respiratory protective devices, and to ensure that the necessary instructions and training requirements of OSHA Standard 29 CFR 1926.1101 have been met.

FIRE PROTECTION (As Applicable)

- A. The Contractor shall supply and maintain an adequate number of fire extinguishers (Class A, B and C) ready for immediate use, and distribute them throughout the work site.
- B. Internal combustion engines may not be operated inside any building. No gasoline or other flammable liquids may be stored inside any building nor may any flammable liquids be dispensed or handled within any building.
- C. Temporary fire exit signs shall be prominently displayed in the Work Area and to designated exits. Fire exits shall not be locked, chained or restricted in any way so as to prevent exit during an emergency. However, fire exit doorways directly outside the Work Area may be taped or covered with double 6-mil polyethylene plastic sheeting to prevent contamination outside the Work Area. The Contractor shall tape a retractable utility knife adjacent to the fire exit.

ITEM 182.3 (Continued)**SECURITY (As Applicable)**

- A. The Contractor shall control the point of entry to the Work Area to prohibit unauthorized entry and to log in all workers, and authorized/certified personnel entering and leaving the Work Area. One employee of the Contractor must remain outside of the containment area to maintain control at this point of entry.
- B. A log shall be maintained on-site noting entry and exit of all personnel. A copy of this log shall be made available to the Engineer at the completion of the Contractor's asbestos abatement work. The log shall be available for inspection by the Engineer, District Asbestos Coordinator or ACF upon request. .
- C. The Contractor shall keep the Work Area secure from unauthorized entry during the time when the Contractor is not on site.
- D. Under no circumstances shall workers appear outside of containment wearing respirators and asbestos-related protective clothing.

MATERIALS AND EQUIPMENT

- A. Negative Air Machines - The Contractor shall supply an adequate number of HEPA air filtration units to the site to produce airflow meeting Federal and State standards.
- B. Respiratory Protection Equipment - The Contractor shall supply the necessary respiratory protection equipment (approved by the National Institute for Occupational Safety and Health [NIOSH]) as required for this project in accordance with Work Area Protection specified under Project Procedures.
- C. Polyethylene Plastic Sheeting - All polyethylene plastic sheeting shall be a minimum thickness of 6-mil and be fire retardant.
- D. Surfactant (Amended Water) - All water used for removal and wet wiping of asbestos contaminated materials during cleanup operations shall be amended through the addition of a surfactant.
- E. Encapsulant - All surfaces from which asbestos-containing materials have been removed shall be sealed with an approved encapsulant, mixed and applied in accordance with manufacturer's instructions. The encapsulant must be compatible with any installation of new material or finishes. The proposed brand and product shall be submitted to the Engineer or District Asbestos Coordinator for approval.

ITEM 182.3 (Continued)

- F. Waste Containers - Provide labeled 6-mil polyethylene bags and/or fiber drums labeled with the appropriate warnings in accordance with Federal regulations and identifying the waste generator and the generator's location.
- G. Miscellaneous Material and Equipment - All other materials to be used on the project (i.e., duct tape, spray glue, expanding foam, ladders, power tools, brushes, etc.) should be in good working order and considered to be industry standard.

POST ASSIGNMENT RESPONSIBILITIES

It is a condition of final payment for this contract that the Contractor provides the Engineer with original or notarized copies of waste manifests or detailed landfill receipts signed by the landfill operator demonstrating disposed of properly. In addition the ACF shall be provided with copies of employee certifications, training, medicals and fit tests, accident reports, on-site job logs, and personal air monitoring results for inclusion in the assignment report.

BASIS OF PAYMENT

Item 182.3 will be paid for at the Contract unit price per Lump Sum, which price shall include full compensation for confirmatory surveys of structures to be demolished for asbestos identification, necessary permits, insurance, and all equipment, labor, mobilization costs, for personnel protection air monitoring and any other item related to abatement work and for materials needed to complete the abatement work in a workmanlike manner and to legally dispose of all debris. Final clearance testing in accordance with all regulations shall be provided by Mass Highway. Should initial testing fail, cost for subsequent re-cleaning and testing shall be borne by the Contractor.

All asbestos materials removed shall be disposed of as asbestos-containing waste in accordance with all applicable regulations. All other debris shall be disposed of in accordance with applicable regulations.

ITEM 184.1**DISPOSAL OF TREATED WOOD PRODUCTS****TON**

Work under this item shall include the transportation and disposal of all treated existing wood product as required by the Engineer.

The timber components of the existing structure are suspected to be treated with creosote, pentachlorophenol and/or CCA. This item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All aspects of this Item are to be completed in accordance with state and federal regulations.

COMPENSATION

Measurement and payment will be by the weight, in tons, of treated timber transported and accepted at a licensed facility. The work shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

ITEM 186.1**DISPOSAL OF RECLAIMABLE –
RECYCLABLE WASTE LIQUID****GALLON**

The work under this Item shall include the purging, removal, and disposal of any Recyclable Waste Liquid found in the septic tank located at 201 Yarmouth Road, including the associated distribution box, pipes and leaching fields. Any waste liquid encountered during the removal of the septic system should be brought to the Water Pollution Control Division Facility (in the Town of Barnstable) and treated.

METHOD OF MEASUREMENT

Item 186.1 Disposal of Reclaimable – Recyclable Waste Liquid will be measured for payment by the weight, in GALLONS (Gal), of Recyclable Waste Liquid material removed from the site and transported to and disposed of at the Water Pollution Control Division Facility in the Town of Barnstable located at 617 Bearnse's Way, Hyannis, MA 02601.

BASIS OF PAYMENT

Item 186.1 Disposal of Reclaimable – Recyclable Waste Liquid will be paid at the Contract unit price per GALLON, which price shall include all labor, materials, equipment and transportation required to purge, remove, and dispose of the Recyclable Waste Liquid. This item will also include all costs for approvals, permits, fees, and taxes required by the Water Pollution Control Division Facility.

ITEM 202.1**MANHOLE – 5 FOOT DIAMETER****EACH**

The work under this item shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

METHOD OF MEASUREMENT

Manholes with a 5 foot diameter will be measured per EACH unit, complete in place and are measured as one unit regardless of the depth of structure.

BASIS OF PAYMENT

Manhole – 5 Foot Diameter will be paid for under Item 202.1 at the Contract unit price, per EACH, complete in place, and shall include all labor, equipment, excavation, and materials required to complete the work.

<u>ITEM 205.01</u>	<u>LEACHING BASIN – PRECAST STRUCTURE</u>	<u>EACH</u>
<u>ITEM 205.1</u>	<u>LEACHING BASIN – 8 FOOT DIAMETER</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

METHOD OF MEASUREMENT

Items 205.01 and 205.1 will be measured for payment by the EACH unit, complete, in place and accepted, in accordance with the provisions of Subsection 201.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 205.01 will be paid for at the Contract unit price, per EACH, which price shall include all labor, equipment and materials required to complete the work. Excavation, precast structure, stone, filter fabric, concrete collar and welded 1/4" galvanized hardware cloth shall be incidental to the item.

Item 205.1 Leaching Basin – 8 Foot Diameter will be paid for at the Contract unit price, per EACH, which price shall include all labor, equipment and materials required to complete the work. Excavation, precast structure, stone, filter fabric, concrete collar and welded 1/4" galvanized hardware cloth shall be incidental to the item.

ITEM 210.02**SANITARY SEWER MANHOLE REMOVED****EACH**

The work under this item shall conform to the relevant provisions of Subsection 220 of the Standard Specifications, and the following:

The work under this item is including the removal and disposal of sanitary sewer manholes used for the existing sewer system.

The existing sanitary sewer manholes designated on the plans to be removed and discarded shall be removed and legally disposed of.

METHOD OF MEASUREMENT

Item 210.02 will be measured for payment by the EACH, sanitary sewer manhole removed and discarded.

BASIS OF PAYMENT

Item 210.02 will be paid for at the Contract unit price, per EACH, which price shall include all labor, equipment, proper disposal and all incidental costs required to complete the work.

<u>ITEM 210.1</u>	<u>SANITARY SEWER MANHOLE MUNICIPAL STANDARD</u>	<u>EACH</u>
<u>ITEM 210.2</u>	<u>SANITARY SEWER MANHOLE (9 TO 14 FOOT DEPTH)</u>	<u>EACH</u>
<u>ITEM 210.3</u>	<u>SANITARY SEWER MANHOLE (14 TO 18 FOOT DEPTH)</u>	<u>EACH</u>
<u>ITEM 211.</u>	<u>SPECIAL SANITARY SEWER MANHOLE</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

All sewer structures shall be installed in accordance with the plans and the Town of Barnstable Sewer Specifications, included as Appendix C (included in Document A00885).

Sanitary sewer manholes, including frames and covers, shall meet the material specifications in the Town of Barnstable Sewer Specifications.

METHOD OF MEASUREMENT

Items 210.1, 210.2, 210.3 and 211. will be measured for payment by the EACH, complete in place.

BASIS OF PAYMENT

Items 210.1, 210.2, 210.3 and 211 will be paid for at the respective Contract unit prices, per EACH, complete in place, which prices shall include all labor, equipment and materials including frame and covers required to complete the specified work.

ITEM 211.1 SANITARY SEWER FORCEMAIN CLEANOUT MANHOLE EACH**ITEM 211.2 SANITARY SEWER FORCEMAIN AIR RELEASE STRUCTURE EACH**

The work under these items shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

All sewer structures shall be installed in accordance with the plans, detail sheets, and the Town of Barnstable Sewer Specifications, included as Appendix C (included in Document A00885).

Sanitary sewer manholes, including frames and covers, shall meet the material specifications in the Town of Barnstable Sewer Specifications.

METHOD OF MEASUREMENT

Item 211.1 and Item 211.2 will be measured for payment by the EACH, complete in place.

BASIS OF PAYMENT

Item 211.1 and Item 211.2 will be paid for at the respective Contract unit prices, per EACH, complete in place, which prices shall include all labor, equipment and materials including frame and covers necessary to complete the specified work.

ITEM 220.6**SANITARY STRUCTURE REBUILT****FOOT**

The work under this item shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

Sanitary Structures Rebuilt shall include the removal and replacement of castings and precast concrete units, as well as removing and stacking existing precast concrete units, and/or furnishing and installing new precast concrete units, as required, for the structure to conform to the proposed line and grade. All new material and construction methods shall conform to the applicable specifications of Subsection 201 of the standard specifications.

METHOD OF MEASUREMENT

Sanitary Structure Rebuilt will be measured for payment by the FOOT, complete in place and in accordance with the provisions of Subsection 201.80 of the Standard Specifications.

BASIS OF PAYMENT

Sanitary Structure Rebuilt will be paid for at the Contract unit price, per FOOT and in accordance with the provisions of Subsection 220.81 of the Standard Specifications. The Contract price shall include all labor, equipment, materials, and incidental costs required to complete the work.

ITEM 222.3 FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD EACH

The work under this Item shall conform to the relevant provisions of Subsection 220 of the Standard Specifications, and the following:

The work under this Item shall consist of the furnishing and installing of Frame and Grates (or Covers) Municipal Standard at the locations on the Plans, and as required by the Engineer. Shop drawings for frame and grates on catch basins and frame and covers for manholes, which basin and manhole locations are located within Town layout shall be submitted to the Engineer for approval.

The Contractor shall submit shop drawings for approval prior to the start of construction. The castings shall meet AASHTO M306, M105, and ASTM 48 specifications. The weight of the castings shall be included on the drawings along with any pertinent information regarding the specifications. The unit shall be installed as shown on the plans, per manufacturer's requirements and as directed by the Owner.

The Contractor shall submit a proposed schedule of castings to be used for the project (along with the dimensions on the precast structure they will be placed on). Also to the Owner for his acceptance prior to ordering these materials.

Catch Basin Frames shall be three flanges at all curb inlet locations. At locations without curbing, catch basin frames shall be four flanges.

Manhole Covers shall have a 1 inch vent hole drilled in center

Frames with three and four flanges shall have a cascade grate with an open area of 300 square inches. Grate and Frame shall be material gray iron ASTM A48 CL35B and undipped coating.

Grate dimensions: 23 7/8 inches x 23 7/8 inches x 2 inches

Three flange frame dimensions: 24 1/4 inches x 24 1/4 inches at top; 8 inches depth; 25 inches x 25 inches at bottom opening; 30 5/16 inches x 34 inches from ends of flanges

Four flange frame dimensions: 24 1/4 inches x 24 1/4 inches at top; 8 inches depth; 25 inches x 25 inches at bottom opening; 34 inches x 34 inches from ends of flanges

METHOD OF MEASUREMENT

Item 222.3 Frame and Grate (or Cover) Municipal Standard will be measured for payment by the EACH in accordance with the provisions of Subsection 220.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 222.3 Frame and Grate (or Cover) Municipal Standard will be paid for at the Contract unit price. per EACH complete in place and in accordance with the provisions of Subsection 220.81 of the Standard Specifications. This unit price shall include all labor materials, equipment and transportation required to be complete.

ITEM 250.06 **6 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE** **FOOT**

ITEM 250.08 **8 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE** **FOOT**

The work under these items shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

All sewer structures shall be installed in accordance with the plans and the Town of Barnstable Sewer Specifications, included as Appendix C (included in Document A00885).

METHOD OF MEASUREMENT

Items 250.06 and 250.08 will be measured for payment by the FOOT of pipe installed, complete and accepted.

BASIS OF PAYMENT

Items 250.06 and 250.08 will be paid for at the respective Contract unit bid price per FOOT , which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

ITEM 251.04 4 INCH POLYVINYL CHOLORIDE SANITARY SEWER PIPE - FOOT
FORCEMAIN**ITEM 251.06 6 INCH POLYVINYL CHOLORIDE SANITARY SEWER PIPE - FOOT**
FORCEMAIN

The work under these items shall conform to the relevant provisions of Subsections 201 and 220 of the Standard Specifications, and the following:

All sewer structures shall be installed in accordance with the plans and the Town of Barnstable Sewer Specifications, included as Appendix C (included in Document A00885).

CONSTRUCTION METHODS

The compacted sand borrow surrounding the forcemains as shown on the plans shall be in-situ material. In locations where in-situ material is deemed unacceptable by the engineer. Item 154 Sand Borrow is to be used.

MATERIALS

Item 251.04 shall have a dimension ratio of 18 (DR 18) and conform to AWWA C900.

Item 251.06 shall have a dimension ratio of 18 (DR 18) and conform to AWWA C900.

All PVC pipe shall be green in color for wastewater use.

METHOD OF MEASUREMENT

Items 251.04 and 251.06 will be measured for payment by the FOOT of pipe installed, complete and accepted.

BASIS OF PAYMENT

Items 251.04 and 251.06 will be paid for at the respective Contract unit bid prices per FOOT, which prices shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Item 154 Sand Borrow will be paid for separately if needed.

ITEM 271.121 12 INCH AND UNDER PIPE REMOVED AND DISCARDED FOOT**ITEM 271.241 24 INCH PIPE REMOVED AND DISCARDED FOOT**

The work under these Items shall conform to the relevant provisions of Subsection 270 of the Standard Specifications and the following:

The work to be performed under these items is the removal and disposal of reinforced concrete pipe used for existing drainage system.

The existing drain pipes, item 271.121 and item 271.241, designated on the plans to be removed and discarded shall be removed and legally disposed of.

METHOD OF MEASUREMENT

Items 271.121 and 271.241 will be measured for payment by the FOOT of pipe removed and legally discarded.

BASIS OF PAYMENT

Item 271.121 and 271.241 will be paid for at the respective Contract unit prices bid per FOOT, which prices shall include all labor, tools, equipment, materials and incidental costs required to complete the work.

ITEM 303.06 6 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) FOOT

ITEM 303.08 8 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) FOOT

ITEM 303.12 12 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) FOOT

ITEM 309. DUCTILE IRON FITTINGS FOR WATER PIPE POUND

The work under these items shall conform to the relevant provisions of Subection 301 of the Standard Specifications, and the following:

All water pipes shall be installed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A - HYANNIS WATER SPECIFICATIONS (included in Document A00885). Shop drawings for all related water items shall be submitted to Town of Barnstable DPW – Water Supply Division for approval.

METHOD OF MEASUREMENT

Items 303.06, 303.08 and 303.12 will be measured for payment by the FOOT of pipe installed, complete and accepted.

Item 309 will be measured for payment by the POUND of fittings installed, complete and accepted.

BASIS OF PAYMENT

Payment for 6 Inch Ductile Iron Water Pipe (Mechanical Joint), will be at the Contract unit bid price per FOOT under Item 303.06, which price shall include all labor, equipment, materials, and incidental costs required to complete the work.

Payment for 8 Inch Ductile Iron Water Pipe (Mechanical Joint) will be at the Contract unit bid price per FOOT under Item 303.08, which price shall include all labor, equipment, materials, and incidental cots required to complete the work.

Payment for 12 Inch Ductile Iron Water Pipe (Mechanical Joint) will be at the Contract unit bid price per FOOT under Item 303.12, which price shall include all labor, equipment, materials, and incidental costs required to complete the work.

Payment for Ductile Iron Fittings For Water Pipe will be at the Contract unit bid price per POUND under Item 309, which price shall include all labor, equipment, materials, and incidental costs required to complete the work.

<u>ITEM 315.02</u>	<u>2 INCH WATER MAIN REMOVED AND STACKED</u>	<u>FOOT</u>
<u>ITEM 315.06</u>	<u>6 INCH WATER MAIN REMOVED AND STACKED</u>	<u>FOOT</u>
<u>ITEM 315.08</u>	<u>8 INCH WATER MAIN REMOVED AND STACKED</u>	<u>FOOT</u>
<u>ITEM 315.16</u>	<u>16 INCH WATER MAIN REMOVED AND STACKED</u>	<u>FOOT</u>

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, and the following:

All work shall be completed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A - HYANNIS WATER SPECIFICATIONS (included in Document A00885).

An inspector from the Town of Barnstable Water Department shall be present for the installation of the items, unless otherwise notified by the Engineer.

All water main removed and stacked to be stacked at the Hyannis Water Department, located at 47 Old Yarmouth Road, Hyannis, MA.

Removal of any 6" and 8" AC water mains is covered under Item 182.2 Removal of Asbestos.

METHOD OF MEASUREMENT

Items 315.02, 315.06, 315.08 and 315.16 will be measured for payment by the FOOT of Water main removed and stacked.

BASIS OF PAYMENT

Items 315.02, 315.06, 315.08 and 315.16 will be paid for at the respective Contract unit bid prices per FOOT, which prices shall include all labor, equipment, materials, delivery, and incidental costs required to complete the work, as required by the Engineer.

<u>ITEM 336.1</u>	<u>1 INCH PLASTIC WATER PIPE</u>	<u>FOOT</u>
<u>ITEM 336.20</u>	<u>2 INCH PLASTIC WATER PIPE</u>	<u>FOOT</u>
<u>ITEM 345.1</u>	<u>1 INCH TEMPORARY SERVICE PIPE</u>	<u>FOOT</u>
<u>ITEM 350.06</u>	<u>6 INCH GATE AND GATE BOX</u>	<u>EACH</u>
<u>ITEM 350.08</u>	<u>8 INCH GATE AND GATE BOX</u>	<u>EACH</u>
<u>ITEM 350.12</u>	<u>12 INCH GATE AND GATE BOX</u>	<u>EACH</u>
<u>ITEM 357.06</u>	<u>6 INCH GATE BOX</u>	<u>EACH</u>
<u>ITEM 357.08</u>	<u>8 INCH GATE BOX</u>	<u>EACH</u>
<u>ITEM 357.12</u>	<u>12 INCH GATE BOX</u>	<u>EACH</u>
<u>ITEM 357.16</u>	<u>16 INCH GATE BOX</u>	<u>EACH</u>
<u>ITEM 363.1</u>	<u>1 INCH CORPORATION COCK</u>	<u>EACH</u>
<u>ITEM 363.2</u>	<u>2 INCH CORPORATION COCK</u>	<u>EACH</u>
<u>ITEM 371.06</u>	<u>6 INCH COUPLING</u>	<u>EACH</u>
<u>ITEM 371.08</u>	<u>8 INCH COUPLING</u>	<u>EACH</u>
<u>ITEM 371.12</u>	<u>12 INCH COUPLING</u>	<u>EACH</u>
<u>ITEM 376.1</u>	<u>HYDRANT – EXCLUDING COST OF HYDRANT</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, and the following:

All water structures shall be installed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A-HYANNIS WATER SPECIFICATIONS (included in Document A00885). Shop drawings for all related water items shall be submitted to Town of Barnstable DPW – Water Supply Division for approval.

An inspector from the Town of Barnstable Water Department shall be present for the installation of the items, unless otherwise notified by the Engineer.

Each supplied hydrant is to be picked up by the Contractor at Town of Barnstable DPW – Water Supply Division located at 47 Old Yarmouth Road, Hyannis, MA 02601.

Items 336.1 through 350.12, 357.06 through 357.16, 363.1 & 363.2, 371.06 through 371.12, and 376.1 (Continued)**METHOD OF MEASUREMENT**

Items 336.1, 336.20, and 345.1 will be measured for payment by the FOOT of pipe installed, complete and accepted.

Items 350.06, 350.08, 350.12, 357.06, 357.08, 357.12, 357.16, 363.1, 363.2, 371.06, 371.08, 371.12, and 376.1 will be measured for payment by the EACH, complete and accepted.

BASIS OF PAYMENT

Payment for 1 and 2 Inch Plastic Water Pipe will be at the Contract unit bid price per FOOT under Items 336.1 and 336.20, which price shall include compensation for all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Payment for 1 Inch Temporary Service Pipe will be at the Contract unit bid price per FOOT under Item 345.1, which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Payment for 6, 8, and 12 Inch Gate and Gate Box will be at the Contract unit bid price per EACH under Items 350.06, 350.08, 350.12 which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Payment for 6, 8, 12, 16 Gate Box will be at the Contract unit big price per EACH under Items 357.06, 357.08, 357.12 and 357.16, which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Payment for 1 and 2 Inch Corporation Cocks will be at the Contract unit bid price per EACH under Items 363.1 and 363.2 which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Payment for 6, 8, and 12 Inch Coupling will be at the Contract unit bid price per EACH under Items 371.06, 371.08, and 371.12 respectively, which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer.

Payment for Hydrant – Excluding Cost of Hydrant will be at the Contract unit bid price per EACH under Item 376.1, which price shall include all labor, equipment, materials, and incidental costs required to complete the work as required by the Engineer. The hydrant is to be supplied to the Contractor by the Town of Barnstable with no compensation.

<u>ITEM 355.06</u>	<u>6 INCH GATE AND GATE BOX REMOVED AND STACKED</u>	<u>EACH</u>
<u>ITEM 355.08</u>	<u>8 INCH GATE AND GATE BOX REMOVED AND STACKED</u>	<u>EACH</u>
<u>ITEM 358</u>	<u>GATE BOX ADJUSTED</u>	<u>EACH</u>
<u>ITEM 358.1</u>	<u>GATE BOX REMOVED AND STACKED</u>	<u>EACH</u>
<u>ITEM 381.</u>	<u>SERVICE BOX</u>	<u>EACH</u>
<u>ITEM 381.1</u>	<u>SERVICE BOX REMOVED AND RESET</u>	<u>EACH</u>
<u>ITEM 381.2</u>	<u>SERVICE BOX REMOVED AND STACKED</u>	<u>EACH</u>
<u>ITEM 384</u>	<u>CURB STOP</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, and the following:

All work shall be completed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A - HYANNIS WATER SPECIFICATIONS (included in Document A00885). Shop drawings for service boxes and curb stops shall be submitted to Town of Barnstable DPW – Water Supply Division for approval.

An inspector from the Town of Barnstable Water Department shall be present for the installation of the items, unless otherwise notified by the Engineer.

All gate boxes are to be stacked at the Hyannis Water Department, located at 47 Old Yarmouth Road, Hyannis, MA.

Under Item 358 the Contractor shall adjust to grade gate boxes and curb stops if required and directed by the Engineer. Curb stops in driveways and HMA sidewalks or in street pavement shall have collars. Curb stops in concrete sidewalk areas are not required to have a collar.

Any gate box or curb stop damaged due to the Contractor's operations, will be replaced by the Contractor at his own expense.

Curb stops found to be inoperable due to no fault of the Contractor shall be replaced with new and paid for under Item 384.

METHOD OF MEASUREMENT

Items 355.06, 355.08, 358, 358.1, 381, 381.1, 381.2 and 384 will be measured for payment by the EACH complete and accepted.

ITEMS 355.06 – 384 (Continued)

BASIS OF PAYMENT

Items 355.06, 355.08, 358, 358.1, 381, 381.1, 381.2 and 384 will be paid for at the respective Contract unit price per Each, which prices shall include all labor, equipment, materials, and incidental costs required to complete the work, as required by the Engineer

<u>ITEM 367.0151</u>	<u>1 1/2 INCH CAST IRON PLUG</u>	<u>EACH</u>
<u>ITEM 367.021</u>	<u>2 INCH CAST IRON PLUG</u>	<u>EACH</u>
<u>ITEM 367.06</u>	<u>6 INCH CAST IRON PLUG</u>	<u>EACH</u>
<u>ITEM 367.08</u>	<u>8 INCH CAST IRON PLUG</u>	<u>EACH</u>
<u>ITEM 370.5</u>	<u>12X8 INCH TAPPING SLEEVE, VALVE AND BOX</u>	<u>EACH</u>
<u>ITEM 370.71</u>	<u>16X8 INCH TAPPING SLEEVE, VALVE AND BOX</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, and the following:

All work shall be completed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A - HYANNIS WATER SPECIFICATIONS (included in Document A00885). Shop drawings for tapping sleeve, valve and boxes shall be submitted to Town of Barnstable DPW – Water Supply Division for approval.

An inspector from the Town of Barnstable Water Department shall be present for the installation of the items, unless otherwise notified by the Engineer.

Portions of Item 367.08 applied to AC pipe shall be follow Section 02700 part 3.3 “AC PIPE LEFT IN PLACE” of the Hyannis Water System Master Specifications.

METHOD OF MEASUREMENT

Items 367.0151, 367.021, 367.06, 367.08, 370.5 and 370.71 will be measured per EACH unit installed, complete and accepted.

BASIS OF PAYMENT

Payment for 1.5, 2, 6, and 8 Inch Cast Iron Plug will be at the contract unit bid price per EACH under Items 367.0151, 367.021, 367.06, and 367.08 which price shall be considered full compensation for all labor, equipment, materials, and incidental costs required to complete the work, as required by the Engineer.

Payment for 12x8 Inch Tapping Sleeve, Valve and Box will be at the contract unit bid price per EACH under Item 370.5, which price shall be considered full compensation for all labor, equipment, materials, and incidental costs required to complete the work, as required by the Engineer.

Payment for 16x8 Inch Tapping Sleeve, Valve and Box will be at the contract unit bid price per EACH under Item 370.71, which price shall be considered full compensation for all labor, equipment, materials, and incidental costs required to complete the work, as required by the Engineer.

<u>ITEM 374.08</u>	<u>8 INCH POLYETHYLENE CASING FOR WATER PIPE</u>	<u>FOOT</u>
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<u>ITEM 374.12</u>	<u>12 INCH POLYETHYLENE CASING FOR WATER PIPE</u>	<u>FOOT</u>
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The work under these items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, and the following:

All work shall be completed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A - HYANNIS WATER SPECIFICATIONS (included in Document A00885). Shop drawings for insulation shall be submitted to Town of Barnstable DPW – Water Supply Division for approval.

An inspector from the Town of Barnstable Water Department shall be present for the installation of the items, unless otherwise notified by the Engineer.

METHOD OF MEASUREMENT

Items 374.08, and 374.12 will be measured for payment by the FOOT, complete and accepted.

BASIS OF PAYMENT

Payment for 8, 12 and 16 inch polyethylene casing for water pipe will be at the contract unit bid price per FOOT under Items 374.08, 374.12, and 374.16, which price shall be considered full compensation for all labor, equipment, materials, delivery, and incidentals necessary to complete the work, to the satisfaction of the Engineer.

ITEM 376.2 **HYDRANT – REMOVED AND RESET** **EACH**

The work under this item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications, and the following:

All work shall be completed in accordance with the plans and the Hyannis Water System Master Specifications, included as Appendix A - HYANNIS WATER SPECIFICATIONS (included in Document A00885).

An inspector from the Town of Barnstable Water Department shall be present for the installation of the items, unless otherwise notified by the Engineer.

METHOD OF MEASUREMENT

Items 376.2 will be measured for payment by the EACH hydrant removed and reset, complete and accepted.

BASIS OF PAYMENT

Payment for Hydrant – Removed and Reset will be paid for at the Contract unit bid price per EACH, which price shall include all labor, equipment, materials, delivery, and incidental costs required to complete the work as required by the Engineer.

ITEM 376.3**HYDRANT – REMOVED AND STACKED****EACH**

The work under this Item shall conform to the relevant provisions of Section 301. Of the Standard Specifications and the following:

All hydrants removed as shown on the plans and detail sheets shall be removed and stacked in a safe manner. Any materials damaged during this work due to the Contractor's negligence shall be replaced by the Contractor at no additional cost to the owner.

All hydrants are to be stacked at the Hyannis Water Department, located at 47 Old Yarmouth Road, Hyannis, MA.

METHOD OF MEASUREMENT

Items 376.3 will be measured for payment by the EACH hydrant removed, transported, stacked and accepted.

BASIS OF PAYMENT

Item 376.3 will be paid for at the Contract unit price per Each Hydrant – Removed and Stacked, which price shall include all labor, equipment, materials, delivery, and incidental costs required to complete the work, as required by the Engineer.

ITEM 470.21**HOT MIX ASPHALT BERM TYPE A - MODIFIED****FOOT**

The work under this item shall conform to the relevant provisions of Subsection 470. of the Standard Specifications and the following:

The modified bituminous concrete berm shall comply to Plate 106.1.0 of the 2017 Construction Standards with the exception of the width, which will be changed from 2'- 0" to 1'- 0".

METHOD OF MEASUREMENT

Item 470.21 will be measured for payment by the Foot of Hot Mix Asphalt Berm Type A – Modified installed, complete and accepted.

BASIS OF PAYMENT

Item 470.21 will be paid for at the Contract bid unit price per Foot of Hot Mix Asphalt Berm Type A – Modified installed, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 476.11**CEMENT CONCRETE PAVEMENT -
STAMPED AND COLORED****SQUARE YARD**

This special provision describes the construction of stamped, colored concrete for the medians along Yarmouth Road and Iyannough Road in accordance with standard specifications, as shown on the plans, and as hereinafter provided.

SURFACE PATTERN

The surface of the cement concrete pavement shall be stamped with a cobblestone pattern similar

to those provided by the following contractors:

East Coast Concrete – N. Smithfield, RI – “Old English Cobblestone”

New England Stamped Concrete Corp. – E. Freetown, MA – “Cobblestone”

Triad Associates Inc. – Haverhill, MA – “Cobblestone”

Or approved equal product approved by the Engineer

The cobblestone pattern shall resemble granite cobblestones or “Belgian block” and shall be approved by the Engineer upon delivery of samples described below.

MATERIALS

The materials shall conform to Subsection 476. and the following:

Integrally color the concrete using non-fading synthetic additives conforming to ASTM C979 at a maximum percent loading of 8% by weight of the cementitious materials in the mix. Match the concrete color in reasonably close conformance with Federal Standard 595 Color Server, FS color 36463, 36495 or 36515. The department will accept the color based on comparison to this standard.

Add integral concrete colorant according to manufacturer's instructions. Maintain mix characteristics for all colored concrete requiring a matching finish. Use the same source, brand, type, and color of portland cement, supplementary cementitious materials, aggregates and admixtures for colored concrete throughout the project. Use constant cement content, supplementary cementitious material content and water/cementitious materials ratio in the concrete mix to maintain consistent color.

Admixtures

Use admixtures designed for use and compatible with colored concrete pigments. Do not use calcium chloride or admixtures containing chlorides.

ITEM 476.11 (Continued)**Mix Approval**

The contractor shall submit colored concrete mix design and receive approval prior to placing the concrete by meeting the following:

Provide 2 foot by 2 foot samples to the Engineer for approval of the stamped pattern at the preconstruction conference. The samples will be returned to the contractor within 30 days.

Submit the concrete mix design to the Engineer establishing the mix proportions necessary to meet the final concrete characteristics.

At an Engineer-determined location on the project, place and finish a 10-foot by 10-foot by 4 inch colored concrete test panel using processes and techniques intended for use on permanent work, including curing procedures. The test panels shall demonstrate the typical texture, surface finish, color, and color intensity. Produce test panels using the same workers who will perform the contract work. Retain samples of cements, sands, aggregates and color additives used in test panels for comparison with materials used in remaining work. For an accurate representation of the desired color or color intensity, produce the colored concrete for the test panel in a minimum batch size of 2 cubic yards or in full cubic yard increments for batch size greater than 2 cubic yards. Discard excess material. Notify the Engineer 2 days in advance by providing the dates and times for test panel construction.

The Engineer will determine acceptance of the test panel color and finish by comparing the test panel to the Federal Standard color. The contractor shall produce one or more test panels until the methods and finished product has proven to be acceptable to the Engineer. Upon acceptance the test panel will act as the visual quality standard for finished work. Remove the test panel as directed by the Engineer.

Joints

Contraction and expansion joints shall be provided at the locations shown on the plans. Expansion joints will be constructed with preformed joint filler every 30 feet. Contraction joints are to be sawn and sealed, or scored, to a depth of 1" in block units of not more than 36 feet.

CONSTRUCTION

Construct colored concrete in accordance with Subsection 476. of the Standard Specifications and as follows:

ITEM 476.11 (Continued)

Produce consistent colored concrete mixes. Once colored concrete placement has started, the Engineer will not allow variations in the amounts, types, or source of materials with the exception of minor adjustments of water and air-entraining agent as necessary. Other changes require the contractor to repeat the mix approval process. Colored concrete mixes for matching colored items shall be consistent. If the contractor chooses to provide mixes with high early strength concrete, then all colored concrete for matching colored items shall be provided as high early strength concrete. Schedule colored concrete placement to minimize exposure to rapid drying conditions, wind and full sun, before curing materials are applied. Do not place colored concrete if rain, snow, or freezing temperature is forecast within 24-hours. Cover and protect adjacent construction and concrete from discoloration and spillage during placement and curing of colored concrete. Remove and replace discolored concrete as the Engineer directs. Perform finishing operations consistently to avoid discoloration in the finished colored concrete. Do not begin finishing until bleed water has left the surface.

Addition of surface water for aiding in finishing (often referred to as blessing the concrete) is not allowed. If water is added to the surface of the colored concrete once concrete is in place, the Engineer will reject the colored concrete. During final finishing and texturing apply all strokes in the same direction.

Cure colored concrete in accordance with Subsection 476. of the Standard Specifications, using the impervious coating or impervious sheeting method. Protect colored concrete from premature drying and excessive cold or hot temperatures by prompt application of curing materials. Do not allow plastic sheeting to come in contact with colored concrete. Protect the colored concrete from damage. Do not permit construction traffic or material storage on colored concrete. Exclude other foot traffic from colored concrete for at least 24 hours after placement.

METHOD OF MEASUREMENT

Item 476.11 will be measured for payment by the SQUARE YARD of Cement Concrete Pavement Stamped and Colored installed and acceptably completed.

BASIS OF PAYMENT

Item 476.11 will be paid for at the Contract bid unit price per SQUARE YARD of Cement Concrete Pavement Stamped and Colored installed, which price shall all include labor, materials, equipment and incidental costs required to complete the work, including the following: developing mix designs and providing samples and test panels; furnishing materials (including concrete masonry, colored pigments, sealers, joint and bond breakers, and retarders), hauling, preparing, placing, curing, and protecting the concrete; sawing required for construction of colored concrete; jointing and joint materials, and tie bars; and upon final acceptance of the medians, removal of the accepted test panel.

ITEM 511.2**GRANITE EDGING TYPE SB - FOREBAY****SQUARE FOOT**

The work under this item shall conform to the relevant provisions of Section 500 of the Standard Specifications and the following:

Existing granite edging shall be cleaned to remove any paint, joint mortar, mix asphalt or other undesirable material adhered to the granite face and top before setting on top of dense graded crushed stone. Edging shall be laid flat, with the face of the stone exposed.

Joints between granite edging shall be filled with stone dust or mortar to prevent movement of the stones.

Granite edging shall meet the material specifications of M9.04.2 with the minimum dimensions of Type SB.

METHOD OF MEASUREMENT

Item 511.2 will be measured for payment by the area, per SQUARE FOOT of Granite Edging Type SB-Forebay, furnished and installed, complete in place and accepted.

BASIS OF PAYMENT

Item 511.2 will be paid for at the Contract unit price per SQUARE FOOT of Granite Edging Type SB – Forebay, which price shall include furnishing, transporting, handling, and placing the specified materials, including all excavation, providing, placing, and compacting backfill material when not otherwise specified, cleaning, cutting, fitting, dressing, or stockpiling of edging; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work. Stone dust or mortar is incidental.

ITEM 669.1**FENCE REMOVED AND DISPOSED****FOOT**

The work under this Item shall conform to the relevant provisions of Section 600 of the Standard Specifications and the following:

Work under this item shall include the removal of existing fence as shown on the plans or as required by the Engineer. The work under these Items shall also include the excavation of foundations (if any), disposal of the concrete, backfilling with compacted gravel of the holes resulting from foundation excavation. As shown on the plans and as directed by the Engineer, all existing fences and posts shall be removed and discarded.

METHOD OF MEASUREMENT

ITEMS 669.1 will be measured for payment by the FOOT of fence removed and properly disposed.

BASIS OF PAYMENT

Item 669.1 will be paid for at the Contract unit price bid per FOOT, which price shall include removal and disposal of the existing fences and posts, in the locations shown on the plans, and all incidental costs required to completion the work.

ITEM 697.1**SILT SACK****EACH**

The work under this item shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Section 227 of the Standard Specifications

COMPENSATION

Silt sacks will be measured and paid at the Contract unit price per Each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 698.3**GEOTEXTILE FABRIC FOR SEPARATION****SQUARE YARD**

The work under this Item shall consist of furnishing and installing geotextile fabric as shown on the Plans or as directed by the Engineer.

The geotextile fabric shall conform to the requirements of AASHTO M 288 for fabric used for separation. Construction and installation shall be in accordance with AASHTO M 288 and 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 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.

METHOD OF MEASUREMENT

Item 698.3 will be measured for payment by the SQUARE YARD, complete in place and accepted.

BASIS OF PAYMENT

Item 698.3 will be paid for at the Contract Unit Bid Price per SQUARE YARD, which price shall include all labor, materials, equipment and incidental costs required to complete the work

ITEM 701.21**CEMENT CONCRETE
SPECIAL PEDESTRIAN CURB RAMP****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Section 600, "Highway Guard, Fences and Walls," and Section 700, "Incidental Work", and the following:

The work associated with this Item shall include the construction of the ramp at 131 Iyannough Road as shown on the Plans. The ramp shall meet the criteria of the Americans with Disability Act.

The work shall include the furnishing, fabrication and installation of aluminum hand rail along the proposed concrete ramp. Railing shall be as detailed on the plans. All hand rails rail shall be fabricated in conformance with the requirements of the latest version of 521 CMR, Rules and Regulations of the Architectural Access Board.

Cement concrete for ramp and steps shall be 4,000 psi, 1.5 inch, 565 cement concrete.

Handrails shall be the product of a company normally engaged in the manufacture of pipe railing. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.

The handrail shall be made of pipes joined together with component fittings. All components must be mechanically fastened with stainless steel hardware.

Railings shall be 1 1/2" Schedule 40 marine grade aluminum pipe alloy in accordance with Section M8.10.1. Post shall be 1 1/2" Schedule 40 aluminum pipe of the same alloy. Post spacing shall be a maximum of 6'-0".

Handrails shall be designed to withstand a 200 lb concentrated load applied in any direction and at any point on the top rail.

Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projected fittings.

The mid-rail at a corner return shall be able to withstand a 200 lb load without loosening. The manufacturer is to determine this dimension for their system and provide physical tests from a laboratory to confirm compliance.

Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, Mylar isolators or other approved material.

The hand rail shall be primed and painted in accordance with Materials Sections M7.04.07 and M7.03.02. The color shall be flat black.

ITEM 701.21 (Continued)

Furnishing and installing inserts, hardware and all other appurtenances necessary to complete attachment of hand rail to the concrete ramp shall be considered incidental to Item 701.21 and no additional compensation will be allowed. The Contractor shall submit shop drawings for approval on the proposed rail, layout and mounting prior to fabrication.

BASIS OF PAYMENT

Item 701.21 will be paid for at the Contract LUMP SUM price, complete, in place and accepted, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 703.1**CONCRETE WHEEL STOP****EACH**

The work under this Item shall conform to the relevant provisions of Section 700, “Incidental Work”, and the following:

The work associated with this item shall include the installation of concrete wheel stops as shown on the plans.

METHOD OF MEASUREMENT

Item 703.1 will be measured for payment by the EACH wheel stop furnished and installed, complete in place and accepted.

BASIS OF PAYMENT

Item 703.1 will be paid for at the Contract Unit Bid Price per EACH Concrete Wheel Stop, which price shall include all labor, materials, tools, equipment, and incidental costs required to complete the work.

<u>ITEM 707.8</u>	<u>STEEL BOLLARD</u>	<u>EACH</u>
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<u>ITEM 707.81</u>	<u>STEEL BOLLARD REMOVED AND RESET</u>	<u>EACH</u>
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The work to be done under these Items consists of furnishing and installing steel pipe bollards at locations shown on the plans.

Steel bollards shall be ASTM A120, Schedule 40, marine grade, galvanized steel pipe, 4 inches I.D. 6 feet long with a ¼ inch thick plate for the top, typical as shown on the Drawings.

All joints shall be full welded and ground flush and smooth. Arc welding procedures shall conform to the current specifications of the American Welding Society. After fabrication, all steel surfaces shall be thoroughly cleaned of all mill scale, rust, dirt, weld flux, weld spatter, and other foreign matter by power wire-brushing or sandblasting, and solvent cleaned per SSPC-SP-1, if necessary.

Primer and paint for bollards shall be suitable for application over unfinished steel for use in an exterior marine setting. Primer shall be Industrial Zinc Chromate Primer. Color shall be Gray. Contractor to submit a color chip for approval. Finish paint shall be a heavy duty maintenance enamel, and rust resistant

After cleaning steel surfaces, apply a shop coat of primer totaling a dry film thickness of 1-1/2mm minimum using manufacturer's instructions. After primer has thoroughly dried, including touch up areas required by missing, loss or cracked primer areas, apply two shop coats of finish paint, each totaling a dry film thickness of 1-1/2mm minimum using manufacturer's instructions. Finish color shall be black. Dry film hardness shall be 3H or greater. Paint shall not be applied when the air, steel, or paint temperature is below 50 degrees F. or when the humidity exceeds 70 percent.

Concrete for footings shall be 3000 PSI – 1.5 Inch - 470 lb cement concrete in accordance with the relevant provisions of Section M4.02.00 and gravel backfill shall conform to the relevant provisions of Section 150.

Payment for this Item shall be at the Contract unit price bid per each, complete in place, and shall be full compensation for excavation, furnishing and installing the steel pipe, including excavation, concrete foundation and compacted gravel backfill.

METHOD OF MEASUREMENT

Item 707.8 will be measured for payment be the EACH bollard furnished and installed, complete in place and accepted.

Item 707.81 will be measured for payment be the EACH steel bollard removed and reset, complete in place and accepted.

ITEMS 707.8 and 707.81 (Continued)**BASIS OF PAYMENT**

Item 707.8 will be paid for at the Contract Unit Bid Price per EACH Steel Bollard, which price shall include all labor, materials, tools, equipment, and incidental costs, required to complete the work.

Item 707.81 will be paid for at the Contract Unit Bid Price per EACH, Steel Bollard Removed and Reset, which price shall include all labor, materials, tools, equipment, and incidental costs, required to complete the work.

ITEM 708.1**RECONSTRUCT PLANTER****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work associated with this Item shall include removing the existing wooden timbers surrounding the planter at #225 Iyannough Road and replacing them to the location shown on the plans.

BASIS OF PAYMENT

Item 708.1 will be paid for at the Contract Unit Bid LUMP SUM Price, which price shall include all labor, materials, tools, equipment, and incidental costs, required to complete the work.

ITEM 714**MONUMENT REMOVED AND RESET****EACH**

The work under this Item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work associated with this Item shall include removal, safe storage, and resetting of the existing "William G Tsiknas Square" monument as called for on the Plans. The monument shall be safely stored until the construction at the new location is completed.

METHOD OF MEASUREMENT

Item 714 will be measured for payment by the Each monument removed and reset, complete in place and accepted.

BASIS OF PAYMENT

Item 714 will be paid for at the Contract Unit Bid Price per EACH Monument Removed and Reset, which price shall include dismantling, removing, transporting, and resetting of the monument.

ITEM 718.12**FLAGPOLE REMOVED AND DISCARDED****LUMP SUM**

This work under this item shall consist of removing and discarding the existing flagpole at the location shown on the plans.

CONSTRUCTION

The existing flagpole located in front #121 Iyannough Road shall be removed from its present location and disarded.

The existing flagpole foundation shall be removed and discarded.

BASIS OF PAYMENT

Item 718.12 will be paid for at the Contract LUMP SUM price, which price shall include all labor, materials, tools, equipment, and incidental costs, required to complete the work. No separate payment will be made for removal and disposal of the existing foundation. All costs associated with the repair for damage incurred during removal will be incidental to this item.

ITEM 734.52**SIGN POST REMOVED AND STACKED****EACH**

The work under this Item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work associated with this Item shall include removal and stacking of existing business signs. The signs shall be stacked on the property of the business.

METHOD OF MEASUREMENT

Item 734.52 will be measured for payment by the EACH sign post removed and stacked, complete in place and accepted.

BASIS OF PAYMENT

Item 734.52 will be paid for at the Contract Unit Bid Price per EACH Sign Post Removed and Stacked, which price shall include all labor materials, tools, equipment, and incidental costs, required to complete the work.

ITEM 740. ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The work under this Item shall conform to the relevant provisions of Subsection 740 of the Standard Specifications and the following:

Three computer systems and printer system meeting minimum requirements set forth below including installation, maintenance, power, paper, disks, and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor:	Intel, 3.5 GHz
System Memory (RAM):	12 GB
Hard Drive:	500 GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	8 GB
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
Video/Audio	the computer system shall be capable of allow video calling and recording:
Video camera	shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.
Audio	shall be stereo multimedia speaker system delivering premium sound.
OS:	Latest Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates
	Latest Adobe Acrobat Professional with all security updates
	Latest Autodesk AutoCAD LT
	Antivirus software with all current security updates maintained through the life of the contract.
Monitors:	Two 27" LED with Full HD resolution. Max. resolution 1920 x 1080
Flash drives:	2 (two) - 128GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740. (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (RADF) (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office and the equipment included herein including the computer system, and printer shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Department.

Compensation for this work will be made at the contract unit price per Month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

ITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN LUMP SUM

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. On February 16, 2012 (77 FR 12286), EPA issued the final NPDES Construction General Permit (CGP) for construction activity. The Contractor shall be fully responsible for compliance with the CGP. Should a fine or penalty be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits (reference to Part 9.1.1 of the 2012 CGP).

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

ITEM 756. (Continued)

Included in the CGP conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.25 inches in twenty-four hours. For multi-day storms, EPA requires that an inspection must be performed during or after the first day of the event and after the end of the event. The CGP requires that inspections be performed by a qualified individual. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The Engineer must approve the contractor's inspector. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. All Control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating condition and shall consider replacement of erosion controls for each construction season.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The Contractor is advised The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization ("immediately", i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

ITEM 756. (Continued)

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. . Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The permittee is required to use EPA's electronic NOI system or "eNOI system" to prepare and submit NOT. The electronic NOT form can be found at <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting> . If you are given approval by the EPA Regional Office to use a paper NOT, you must complete the form in Appendix K of the 2017 CGP.

COMPENSATION

Payment for all work under this Item shall be made at the Contract unit price, Lump Sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments for implementation of the Stormwater Pollution Prevention plan. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submissions of a Notice of termination (NOT) when final stabilization has been achieved.

ITEM 765.457**SEEDING – INFILTRATION BASIN MIX****SQUARE YARD**

The work under this item shall conform to the relevant provisions of Subsection 765 of the Standard Specifications and the following:

The work shall consist of planting and establishing a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

All seeding shall be done by a company having a minimum of five years of experience with native grass establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications includes, if requested, providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and proof of having completed successful native seeding projects.

Seeding shall be done within 48 hours of placement of loam and final grading. Mulch for seed shall be Compost Topdressing or hydromulch as specified below, and shall be incidental to this item.

SEEDING SEASON

Seeding seasons shall be April 1 through May 15 and October 1 through December 1 for dormant seeding. *Seeding that occurs outside of these periods, shall be increased by 50%.*

MATERIALS**Seed****Samples and Submittals**

- 1) Certificate of Materials. 60 days prior to ordering, the Contractor shall submit to the Engineer the manufacturer or supplier’s notarized Certificate of Materials. This document shall not be used as proof of purchase, proof of material delivered, or proof of material seeded, but simply to verify supplier availability of seed listed on the date certified. The species listed shall match those specified on the plans or herein, however, cultivars may vary due to availability. Substantial substitutions or changes in the mix from that specified on the plans or herein shall be approved by MassDOT Landscape Design Section.
- 2) Seed Tag Certification. All seed lots have a seed analysis tag as required by State and Federal law. The contractor shall submit seed tags for each bag of seed used on the project site or ensure that each tag is photo documented by the Engineer. Number of tags shall match number of bags sent by the supplier to meet rate of Pure Live Seed specified on the plans. Tag must include: kind and variety of seed; lot number; origin of seed; net weight; % purity; germination; dormant seed; germination test date; inert matter; weed, noxious and other crop seed; and name and address of company responsible for the analysis. Seeding may be considered unacceptable for payment if no tags are submitted.

ITEM 765.457 (Continued)

- 3) Certificate of Compliance. Prior to payment, contractor shall submit a bill of lading or a signed, dated and notarized Certificate of Compliance from the Supplier that serves as proof of purchase. This document shall include kind and variety of seed, lot number, net weight shipped, date of sale, invoice number under which seed was purchased, and name and address of Supplier or Manufacturer. All information must be included on the notarized form, including lot number and net weight shipped for specified job. This information shall match Seed Tag Certification and quantity of seed applied on the job. Seeding may be considered unacceptable for payment if information is incomplete.

- 4) Seed Sample. Contractor may be asked, prior to seeding, to submit a seed sample for testing.

Quantities specified are Pure Live Seed (PLS). Greater quantities of ordered seed may be required to achieve actual specified seeding rates. Pure Live Seed is defined as the fraction of pure seed species within the mix that, by standard seed testing practices, will germinate. This is determined by multiplying the percent of seed purity by the percent of seed germination.

Seed mix shall be a custom blend as shown on the plans or shall be as specified below. Seed cultivars shall be those that are as regional to New England or the local ecotype as possible.

Any species substitutions shall be with a species having similar characteristics and native to New England. Substantial changes in the mix shall be approved by MassDOT Landscape Design Section.

Infiltration Basin Mix

Seeding rate is 25 pounds per acre Pure Live Seed.

Botanical Name	Common Name	% PLS by Weight
<i>Elymus virginicus</i>	Virginia Wild Rye	22.0
<i>Puccinellia distans</i>	Alkaligrass	16.0
<i>Carex vulpinoidea</i>	Fox Sedge	15.0
<i>Panicum clandestinum</i>	Deer Tongue	12.0
<i>Panicum virgatum</i>	Shelter Switch Grass	10.0
<i>Poa palustris</i>	Fowl Bluegrass	10.0
<i>Agrostis stolonifera</i>	Creeping Bentgrass	5.0
<i>Agrostis perennans</i>	Upland Bentgrass	5.0
<i>Juncus tenuis</i>	Path Rush	1.0
<i>Juncus effusus</i>	Soft Rush	1.0
<i>Aster novae-angliae</i>	New England Aster	1.0
<i>Eupatorium maculata</i>	Joe-pye Weed	1.0
<i>Verbena hastata</i>	Blue Vervain	1.0
Total		100.0

ITEM 765.457 (Continued)**Fertilizer**

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

Mulch

Mulch for seeding and topdressing shall be incidental to this item. Mulch shall be:

- Compost Topdressing meeting the material and submittal requirements of Item 751.72, Compost Topdressing and as specified below under Seeding and Mulching.
OR
- Hydromulch per the manufacturer's recommendation. Mulch for hydroseeding shall be wood fiber only.

Photo Documentation

Contractor shall submit photo documentation to the Engineer and Landscape Design Section. Each photo shall be date stamped. Photos shall be submitted after the following stages of construction:

- Soil preparation
- Seed and hydromulch/compost topdressing
- Germination
- Grass establishment after one full growing season (growing season is June-September)

CONSTRUCTION**Surface Preparation**

Soil preparation and seeding shall occur only when the bed is in a friable condition, not muddy or hard. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a smooth and even finish corresponding to the required grades.

When seeding over existing or compacted soil, surface will be prepared by raking or tracking to a depth of 2 inches prior to seeding and prior to Compost Topdressing (when applicable).

Surface preparation shall be compensated for under Item 751. Loam Borrow.

Surface preparation shall be approved by the Engineer prior to seeding.

ITEM 765.457 (Continued)**Seeding over Various Substrates**

Loam: Seeding shall occur within 48 hours of site preparation to prevent loss of topsoil. Seeding shall be hydroseeding or broadcast as specified below.

Compost Topdressing: Compost Topdressing shall be applied as specified under that item. Seed should be broadcast at the same time as compost application to ensure a thin cover of compost over seed. *When seeding is done after application of Compost Topsoil the rate shall be increased by 50% and area shall be hydromulched.*

Compost Mulch over Modified Rock: Compost Mulch shall be applied as specified under that item and shall be such that only the voids in the rock are filled so that seed has an organic substrate for germination. Seed shall be broadcast after compost application. No hydromulch is required.

Seeding Methods

No seeding or surface preparation work shall be done if soils are muddy or dry and compacted.

Broadcast Seeding: Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler (e.g., sawdust, rice, kitty litter, or clean damp sand) to achieve an even distribution. Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction.

To ensure seed to soil contact with broadcasting of seed, seed shall be tracked or rolled with a weighted roller.

All broadcast seeding shall be followed by hydromulching unless seeding is done as part of Compost Topdressing and as specified above.

Hydroseeding shall include hydromulch.

Hydromulching shall be per the Standard Specifications and per the manufacturer's directions.

After seeding and mulching, water seeded areas to moisten soil to a depth of at least 2 inches.

Seed and Grass Care

During Germination: Contractor shall care for seeded areas as determined necessary by the Engineer and the MassDOT Landscape Architect. Care may include irrigation and weed control as necessary for germination.

ITEM 765.457 (Continued)

During Establishment: Following germination of seeded species, the contractor shall maintain the stand of grasses to ensure healthy growth. Work shall include mowing or weed-whacking for weed control, irrigation if necessary, and monitoring for invasive plants.

Watering shall provide uniform coverage without eroding soil or grassed surfaces. Treatment of invasive plants shall be per the direction of MassDOT Landscape Architect.

The Contractor shall provide all labor, equipment, materials, and water required for establishment. Contractor shall water all seeded areas as necessary to a depth of 2 inches or greater.

Over-seeding

If there are areas of bare ground greater than 2-3 feet in diameter, these areas shall be over-seeded with the specified mix. Over-seeding application rates and methods shall be the same as those listed above. After seeding, areas shall be mulched with straw mulch or ¼ - ½ inch Compost Topsoil and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Areas that are invaded by weeds shall be mowed as low as possible and over-seeded as directed. Soil that is compacted shall be raked or roughened prior to over-seeding. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact.

Over-seeding and mulch for over-seeding shall be incidental to this item.

ESTABLISHMENT

Native upland grasses and forbs will not look like turf grass. Many of the native grasses are bunch type grasses and will not form a uniform growth or have a sod-type appearance. However, seeded area shall show general uniform growth of the seeded species throughout the area. Areas with significant gaps of bare soil, generally greater than 2-3 feet in diameter, will require over-seeding.

A well-established stand of grasses at the end of one full growing season (June-September), as determined by the Engineer and the MassDOT Landscape Architect, will be required for acceptance. At least 80-90 percent of the grass established shall be the seeded species and any invasive or aggressive weeds (mugwort, ragweed, or knapweed) shall have been cut or otherwise managed.

ITEM 765.457 (Continued)**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 765.457 will be measured for payment by the Square Yard after one full growing season (June-September) has elapsed between seed application and inspection and upon approval of establishment by the Engineer and the MassDOT Landscape Architect.

Item 765.457 will be paid for at the Contract unit price per Square Yard upon receipt of required submittals as specified above and upon approval of established stand of grass as specified above.

This price shall include seeding, rolling to ensure seed-to-soil contact, care during germination and establishment, irrigation, mulching, over-seeding, labor, materials, equipment, photo documentation, and all incidental costs required to complete the work. Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated for under Item 751, Loam Borrow.

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.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, silt fence shall be used in addition to compost filter tubes and straw bales and shall be incidental to the 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. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

ITEM 767.121 (Continued)**Compost Filter Tube**

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales in order to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

ITEM 767.121 (Continued)**Silt Fence**

Materials and Installation shall be per Subsection 670.40 and 670.60 of the Standard Specifications and the following:

Silt 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 Subsection 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 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 silt fence, shall be removed and disposed off-site by the Contractor.

ITEM 767.121 (Continued)

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).
- Silt 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.

Silt fence, when used in conjunction with compost filter tubes or straw bales, will be incidental to this item.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Engineer at the Contractor's expense.

ITEM 767.21**AGED PINE BARK MULCH****SQUARE YARD**

Aged bark mulch shall meet the requirements of the Subsection 771 and Division III M6.04.5 of the Standard Specifications.

Aged shredded pine bark mulch shall be placed to a depth 2-3 inches (max) in locations shown on the drawings and as directed.

Measurement for this Item shall be by the Square Yard. Payment shall be for all labor and materials required to install mulch as shown on the drawings and specified herein.

ITEM 783.044**SERVICEBERRY – SHADBLOW 5-6 FEET****EACH**

The work under this item shall conform to the relevant provisions of Subsection 771 of the Standard Specifications, except as where modified herein.

Plant locations shown on the plans are approximate and shall be approved by the Town Tree Warden or MassDOT Landscape Architect prior to purchasing. Proposed locations are approximate and may be changed to adjust to constructed conditions. Final locations and quantity of trees shall be approved by the Town Tree Warden or MassDOT Landscape Architect. Not all trees or quantities may be used.

No plants shall be substituted without approval of the Town Tree Warden or MassDOT Landscape Architect.

METHOD OF MEASUREMENT

Item 783.044 will be measured for payment by the EACH tree complete in place and accepted.

BASIS OF PAYMENT

Items 783.044 will be paid for at the Contract unit price per EACH tree complete in place and accepted, which price shall include all labor, equipment, materials and incidental costs required (unless otherwise noted) to complete the work specified above and as required by the Engineer.

<u>ITEM 801.42</u>	<u>4 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)</u>	<u>FOOT</u>
<u>ITEM 801.44</u>	<u>4 INCH ELECTRICAL CONDUIT – TYPE NM (4 BANK)</u>	<u>FOOT</u>
<u>ITEM 801.62</u>	<u>6 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)</u>	<u>FOOT</u>
<u>ITEM 801.64</u>	<u>6 INCH ELECTRICAL CONDUIT – TYPE NM (4 BANK)</u>	<u>FOOT</u>
<u>ITEM 801.69</u>	<u>6 INCH ELECTRICAL CONDUIT – TYPE NM (9 BANK)</u>	<u>FOOT</u>

The work under these items shall conform to the relevant provisions of Section 800 of the standard specifications and the following:

The trench shall be excavated to the width and depth shown on the plans. All construction of duct banks including trench, excavation, and backfill shall conform to Eversource details and specifications. A representative from Eversource shall be present for all electrical conduit installed. The work must be performed by an Eversource approved contractor.

For all conduits encased in concrete, use plastic spacers to maintain conduit spacing. Spacers shall meet Eversource specifications for design and spacing.

All trench excavation activities shall comply with all appropriate OSHA standards.

Duct bank shall have 6 inch red warning tape installed above the concrete encasement as shown on the plans.

Conduits shall be blown clean using compressed air. Run mandrel thru each conduit to confirm viable pathway.

Woven polyester mule tape with minimum strength of 2500 lb tensile strength to be installed within each conduit.

PVC conduits shall be schedule 40.

Concrete encasement shall be 2,500 psi, 3/8 inch, 520 cement concrete.

Duct bank shall include 4/0 bare CU for ground as shown on the plans.

METHOD OF MEASUREMENT

Items 801.42, 801.44, 801.62, 801.64 and 801.69 will be measured for payment by the FOOT of each respective bank (i.e. double bank, 4 bank, 9 bank) furnished and installed, approved, and maintained in place.

BASIS OF PAYMENT

Items 801.42, 801.44, 801.62, 801.64 and 801.69 will be paid for at the Contract unit bid price per FOOT, which price shall include all labor equipment and materials required to complete the work specified above, including, but not limited to, excavation and backfill, conduit, warning tape, spacers, concrete encasement, 4/0 bare CU for ground.

<u>ITEM 802.42</u>	<u>4 INCH CATV CONDUIT – TYPE NM (DOUBLE)</u>	<u>FOOT</u>
<u>ITEM 803.42</u>	<u>4 INCH TELEPHONE CONDUIT – TYPE NM (DOUBLE)</u>	<u>FOOT</u>
<u>ITEM 803.43</u>	<u>4 INCH TELEPHONE CONDUIT – TYPE NM (3 BANK)</u>	<u>FOOT</u>
<u>ITEM 803.44</u>	<u>4 INCH TELEPHONE CONDUIT – TYPE NM (4 BANK)</u>	<u>FOOT</u>
<u>ITEM 803.46</u>	<u>4 INCH TELEPHONE CONDUIT – TYPE NM (6 BANK)</u>	<u>FOOT</u>
<u>ITEM 805.402</u>	<u>4 INCH CATV CONDUIT TYPE NM-PLASTIC - (UL)</u>	<u>FOOT</u>
<u>ITEM 805.403</u>	<u>4 INCH TELEPHONE CONDUIT TYPE NM-PLASTIC - (UL)</u>	<u>FOOT</u>

The work under these items shall conform to the relevant provisions of Section 800 of the standard specifications and the following:

The trench shall be excavated to the width and depth shown on the plans. All construction of duct banks including trench, excavation, and backfill shall conform to Comcast and Verizon details and specifications. All work shall be performed by a Comcast and Verizon approved contractor. A representative from Comcast and Verizon shall be present for all CATV and Telephone conduit installed.

For all conduits encased in concrete, use plastic spacers to maintain conduit spacing. Spacers shall meet Comcast and Verizon specifications for design and spacing.

All trench excavation activities shall comply with all appropriate OSHA standards.

Duct bank shall have 6 inch orange warning tape installed above the concrete encasement as shown on the plans.

Conduits shall be blown clean using compressed air. Run mandrel thru each conduit to confirm viable pathway.

Woven polyester mule tape with minimum strength of 2500 lb tensile strength to be installed within each conduit.

PVC conduits shall be Schedule 40.

Concrete encasement shall be 2,500 psi, 3/8 inch, 520 cement concrete.

ITEMS 802.42, through 803.46, 805.402 and 805.403 (Continued)**METHOD OF MEASUREMENT**

Items 802.42, 803.42, 803.43, 803.44, 803.46, 805.402 and 805.403 will be measure for payment by the FOOT of each respective bank (i.e. double bank, 3 bank, 4 bank, 6 bank) furnished and installed, approved, and maintained in place.

BASIS OF PAYMENT

Items 802.42, 803.42, 803.43, 803.44, 803.46, 805.402 and 805.403 will be paid for at the Contract unit bid price per FOOT, which price shall include all labor, equipment and materials required to complete the work specified above, including, but not limited to, excavation, backfill, conduit, warning tape, spacers, concrete encasement .

<u>ITEM 801.32</u>	<u>3 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)</u>	<u>FOOT</u>
<u>ITEM 804.2</u>	<u>2 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC - (UL)</u>	<u>FOOT</u>
<u>ITEM 804.3</u>	<u>3 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC – (UL)</u>	<u>FOOT</u>
<u>ITEM 804.4</u>	<u>4 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC – (UL)</u>	<u>FOOT</u>

The work under these Items shall conform to the relevant provisions of Section 800 of the Standard Specifications and the following:

The work shall include the furnishing and installation of 3-inch non-metallic conduit for traffic signal and lighting systems and 4-inch non-metallic conduit in accordance with the plans and as required by the Engineer. The conduit material shall be Schedule 80 polyvinyl chloride (PVC) plastic conduit. The conduit quantity may be increased or decreased by the Engineer depending upon actual conditions encountered as provided for in Section 4.06 of the Standard Specifications.

CONDUIT IN GRASS OR IN PLANTED AREAS

Where new conduits are installed in grass and planted areas, no separate payment shall be made for the excavation, sand bedding, backfill, including necessary compaction, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Items 804.2, 804.3 and 804.4.

CONDUIT UNDER SIDEWALK OR MEDIAN DRIVEWAYS

Where conduit is installed in sidewalk or paved median or asphalt driveway areas, no separate payment shall be made for the excavation, sand bedding, backfill, including necessary compaction, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Items 804.2, 804.3 and 804.4. Payment for cement concrete or asphalt pavement shall be paid for under the respective item.

CONDUIT CROSSING ROADWAYS

Where conduit is installed crossing roadways, no separate payment shall be made for the excavation, sand bedding, backfill, including necessary compaction, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Item 801.32. Payment for asphalt pavement shall be paid for under the respective item.

Trenches in existing bituminous concrete pavements not subject to full depth reconstruction shall be sawcut to an 18 inch width. The existing pavements shall be sawcut through their full depth and the pavement removed.

After conduit installation, the trench shall be backfilled and controlled density fill (CDF). CDF shall be Type 1E and shall be specified in Section M4.08.0 of the Standard Specifications. The finished grade of the CDF shall be below existing pavement surface as shown on the construction details.

ITEMS 801.32 and 804.2 through 804.4 (Continued)**METHOD OF MEASUREMENT**

Item 801.32 will be measured by the FOOT of bank (including double conduit) furnished, installed approved, and maintained in place.

Items 804.2, 804.3 and 804.4 will be measured by the FOOT of conduit furnished, installed, approved, and maintained in place.

BASIS OF PAYMENT

Items 801.32, 804.2, 804.3 and 804.4 will be paid for at the Contract unit bid price per FOOT, which price shall include all labor, equipment and materials required to complete the work specified above, including, but not limited to, excavation, backfill, conduit, warning tape, spacers, concrete encasement .

Where conduit crosses roadways, no separate payment shall be made for the sawcutting of pavement, excavation, sand bedding, controlled density fill, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Items 801.32, 804.2, 804.3 and 804.4.

<u>ITEM 807.181</u>	<u>WORK INSIDE 18 INCH STEEL PIPE CASING FOR TELEPHONE AND CATV</u>	<u>LUMP SUM</u>
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<u>ITEM 807.361</u>	<u>WORK INSIDE 36 INCH STEEL PIPE CASING FOR ELECTRIC</u>	<u>LUMP SUM</u>
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The work under this Item shall conform to the relevant provisions of Subsections 230, 301, and 801 of the Standard Specifications, and the following:

The work under Item 807.181 includes installing materials inside the existing 18 inch steel casing pipe (P-2). The materials inside include 6-4 inch pvc conduits, plastic bore spacers, and grout. In addition work includes removing existing steel plates which are welded to each end of the casing pipe, and installing permanent bulkhead on pipe. The steel plates shall be removed and discarded from the site.

The work under Item 807.361 includes installing materials inside the existing 36 inch steel casing pipe (P-3, P-9). The materials inside include 9-6 inch pvc conduits, plastic bore spacers, and grout. In addition work includes removing existing steel plates which are welded to each end of the casing pipe, and installing permanent bulkhead on pipe. The steel plates shall be removed and discarded from the site.

Removing existing steel weld plates will require an angular grinder. The edge of the casing pipes shall be smoothed and sanded in order to provide a proper fit for the permanent bulkhead. The edges of the casing pipe shall be painted with the same coating of paint used on the exterior of the casing pipes. The paint is bitumastic black paint. See plans for bulkhead details.

GROUTING MATERIALS

Grout shall be a uniform mixture of 1:6 cement:sand. Grout shall be of the non-shrink type and be on the MassDOT approved product list. Grout shall be flowable and pumpable. Grout shall have a minimum compressive strength of 2,000 psi at 28 days as determined based on the average of three tests for the same placement.

GROUTING CONSTRUCTION METHODS

All grouting operations shall be performed by a qualified Contractor with a minimum of 4 years of experience in grouting of conduit casings.

All PVC conduits shall be filled with water, capped, sealed and pressurized prior to placing any grout.

Grout shall be placed under pressure through the grout holes to fill any voids. Contractor shall use a grout tube placed through the grout hole of each spacer to fill voids. Conduit spacers shall be secured to prevent any movement during the grouting process. Grout shall start at the lowest hole in each grout panel and proceed upwards simultaneously on both sides of the pipe.

ITEMS 807.181 and 807.361 (Continued)

A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.

Grout line pressure shall be monitored at the point of injection with a minimum pressure of 40 psi and a maximum pressure of 90 psi.

CONDUIT SPACERS

Spacers shall be spaced at a maximum distance of 5 feet.

SUBMITTALS

The Contractor shall prepare and submit the following in accordance with the submittal requirements of the Standard Specifications for Construction:

- (a) Shop drawings for the conduit spacers and bulkhead.
- (b) Installation procedure for installing the PVC pipe, grout, and spacers within the existing steel casing pipe.

BASIS OF PAYMENT

Item 807.181 Work Inside 18 Inch Steel Pipe Casing for Telephone and CATV will be paid at the Contract unit price bid per LUMP SUM, which price shall include all labor, tools, equipment, excavation, materials and incidental costs including removal and disposal of existing steel plates and installation of bulkheads to complete the work.

Item 807.361 Work Inside 36 Inch Steel Pipe Casing for Electric will be paid at the Contract unit price bid per LUMP SUM, which price shall include all labor, tools, equipment, excavation, materials and incidental costs including removal and disposal of existing steel plates and installation of bulkheads to complete the work.

<u>ITEM 811.121</u>	<u>ELECTRIC MANHOLE</u>	<u>EACH</u>
<u>ITEM 811.122</u>	<u>TELEPHONE MANHOLE</u>	<u>EACH</u>
<u>ITEM 811.123</u>	<u>ELECTRIC SWITCHING ENCLOSURE</u>	<u>EACH</u>
<u>ITEM 811.201</u>	<u>ELECTRIC HANDHOLE</u>	<u>EACH</u>
<u>ITEM 811.202</u>	<u>CATV HANDHOLE</u>	<u>EACH</u>
<u>ITEM 811.203</u>	<u>TELEPHONE HANDHOLE</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 800 of the Standard Specifications, and the following:

Electric manholes, handholes and switching enclosures shall be in conformance with Eversource Standard Specifications. An Eversource approved polymer concrete electric handhole shall be provided on all proposed underground electric services. Electric handholes shall be CAT ID 9572.

Telephone manholes and handholes shall be in conformance with Verizon Standard Specifications. Telephone handhole shall be of type K2436-FP36-13PTSC.

CATV Handholes shall be in conformance with Comcast Standard Specifications and be of type K2436-FP36-13P

Handholes and manholes shall be placed on a 6" layer of ¾" crushed stone in conformance with Section M2.01.4 of the Standard Specifications.

The switching enclosure shall be placed on a 12" layer of ¾" crushed stone in conformance with Section M2.01.4 of the Standard Specifications.

A representative from Eversource shall be present for all electric hand hole, electric manhole and switching enclosure base installations. A representative from Comcast and Verizon shall be present for all CATV handhole, telephone handhole and telephone manhole installations. Utility work shall be performed by an Eversource, Comcast and Verizon approved contractor.

METHOD OF MEASUREMENT

Items 811.121, 811.122, 811.123, 811.201, 811.202 and 811.203 will be measured for payment by the EACH respective structure furnished, installed, approved, and maintained in place.

BASIS OF PAYMENT

Items 811.121, 811.122, 811.123, 811.201, 811.202 and 811.203 will be paid for at the respective Contract unit bid prices per EACH, which prices shall include all labor, equipment, including ground ring and rods for equipment grounding, and materials required to complete the work.

ITEM 812.13**LIGHT STANDARD FOUNDATION SD3.013****EACH**

The work under this Item shall conform to the relevant provisions of Subsection 801 of the Standard Specification and the following:

The work shall consist providing and installing new light standard foundations, complete in place. The foundations shall be 4000 psi (min.) cement concrete, with steel reinforcement meeting ASTM A-615, grade 60, and shall meet or exceed the minimum dimensions and reinforcing shown in the Lighting Details. The foundation dimensions shall be confirmed by manufacturer supplying the light standards. The foundations will be installed approximately ½" above finished grade and all exposed corners shall have a one-half-inch chamfer, except in sidewalks where they will be set flush with the proposed pavement. All exposed concrete surfaces shall have a hand-rubbed finish.

Foundations shall have a single 2" RGS conduit embedded in concrete for the lighting circuit and a ¾" RGS conduit embedded in concrete for a grounding conductor. The 2" conduit shall protrude far enough to allow for connection of a 2" PVC conduit with a UL approved coupling.

The anchor bolt diameter and length will be determined by the manufacturer supplying the light standards and shall be placed by template to match the light standard base. The exact bolt circle dimension is to match the anchor base to be installed on the foundation. The anchor bolt projection shall be sufficient for connection of an FHWA approved breakaway device compatible with the light standards used.

The Contractor shall prepare and submit shop drawings of the proposed light foundation to the Engineer for review and approval. The shop drawings for the proposed light foundation shall show all dimensions, concrete specifications and steel reinforcing details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT

Item 812.13 will be measured for payment by the EACH light standard foundation SD.013 complete in place.

BASIS OF PAYMENT

Item 812.13 will be paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, including all excavation, ¾" and 2" RGS conduit, concrete, reinforcing steel, formwork, backfill and incidental costs required to complete the work.

<u>ITEM 812.21</u>	<u>1 PHASE TRANSFORMER FOUNDATION</u>	<u>EACH</u>
<u>ITEM 812.23</u>	<u>3 PHASE TRANSFORMER FOUNDATION</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 800 of the Standard Specifications, and the following:

Foundations are to be constructed at the locations shown on the plans. Rigid galvanized steel bollards filled with concrete and painted safety yellow with catalyzed epoxy paint are to be installed protecting the transformer. Bollard dimensions will be approximately 42" height, and 12" diameter. Install a grounding ring and 10' ground rods providing equipment grounding for the transformer foundation per codes and Eversource requirements.

CONSTRUCTION

Install bollards plumb in the locations noted on the Drawings. in accordance with the drawings and the Utilities' requirements.

Transformer foundations shall be placed on an 18" layer of ¾" crushed stone in conformance with Section M2.01.4 of the Standard Specifications.

A representative from Eversource shall be present for all transformer foundation installations. Utility work shall be performed by an Eversource approved contractor.

METHOD OF MEASUREMENT

Items 812.21 and 812.23 will be measured for payment by the EACH unit furnished and installed, complete and accepted.

BASIS OF PAYMENT

Items 812.21 and 812.23 will be paid for at the Contract unit price per EACH, which price shall include all labor, equipment, ground ring, rods for equipment grounding, materials, and incidental costs required to complete the work. No separate payments will be made for the bollards; they will be considered incidental to the price of the foundation.

ITEM 816.01**TRAFFIC SIGNAL RECONSTRUCTION**
LOCATION NO. 1**LUMP SUM**

The work under the this Item shall conform to the relevant provisions of Section 800 of the Standard Specifications, the 2009 MUTCD and the Massachusetts Amendments, supplemented by the following:

The work to be completed under items related to traffic signal installation consists of the installation of new traffic signal equipment at the intersection of Route 28 (Iyannough Road) and Yarmouth Road, including controllers, cabinet and foundation, signal housings, signal modules, signal posts and bases, mast arm posts and foundations, video detection, pedestrian signals with countdown timers, accessible pedestrian signals and pushbuttons, service connection, conduit, wire and cable, pre-emption for emergency vehicles, pre-emption for railroad, and providing all incidental materials necessary for operating and controlling the traffic control signals, as specified and as shown on the plans.

The location of the traffic signal control location is as follows:

Location 1: Intersection of Route 28 (Iyannough Road) and Yarmouth Road

Work on Item 816.01 includes the provision of a local intersection controller and controller cabinet.

SHOP DRAWINGS

A list of the major traffic signal items required at each location is included in the Plans. Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 800. Only signal equipment listed on MassDOT's latest approved equipment list shall be used on this project.

No work shall be commenced by the Contractor until approval of the shop drawings and the manufacturer's data has been received in writing from the Engineer. Approval of these drawings shall be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans, specifications, and these special provisions.

ALL NEW MATERIALS

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer. All materials shall be new, and certain components, such as the controller and cabinet, shall be purchased from the same manufacturer/distributor and assembled by a qualified electrician/technician to ensure compatibility of components.

ITEM 816.01 (Continued)

The traffic signal controller unit (CU), malfunction management unit (MMU), detector amplifiers, and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2-1998, Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements.

FLASHING OPERATION

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in Sections 4D.28 through 4D.31 of the MUTCD.

CONTROLLER

The work at Location No. 1 shall include the furnishing and installing of a NEMA TS2 Type 1 controller and new cabinet on a new foundation.

- Surge Protection with pre-approved independent lab test verification for each device
 - AC Service (5.4.2.4) except surge capacity shall be 80 kA
 - The following lines shall have surge suppression installed according to the respective voltage:
 - 8 Pedestrian detector lines
 - 16 Loop detection lines
 - Emergency pre-emption equipment
 - Surge suppressors (except those for AC Service) shall meet the following specifications:
 - Circuit Type: 3 stage
 - Surge Capacity: 10 kA 8 x 20 μ s impulse per line
 - Resettable Fuse: Positive Temperature Coefficient (PTC)
 - Testing Param: ANSI/IEE C62.45
 - Warranty: 10 years (in writing included with above lab report)
- Document Tray
 - One (1) slide-out document tray shall be mounted below the bottom shelf.
 - Sufficient size to contain cabinet wiring diagrams and two manuals
 - Slides out on nylon rollers or ball bearings
 - Hinged cover to protect documents
 - The closed cover shall be able to support a laptop computer.
 - All cables shall be tied away to allow the tray to be opened and closed smoothly without any obstructions

ITEM 816.01 (Continued)

•Meter Socket

- Standard residential meter socket with no knock-out on top
- Rated for 125 Amps, 100 Amps continuous, 600 VAC, CU/AL rated
- Attached and electrically grounded to the cabinet
- Three power service unfused terminal connections (AC-,AC+ and ground) having the ability to connect No. 6 AWG conductor
- Bypass switch to remove meter without disrupting service

The front portion of the detector rack shall be provided with a marker strip to allow identification of detector phase assignments. In addition to the required marker strip, the Contractor shall supply and install on the upper left hand corner of the back of the cabinet door a laminated, pictorial diagram depicting the traffic detector amplifier channel assignments. The assignment information contained shall include approach name, phase, detector number, and terminal numbers.

All programmable data contained within the controller, malfunction management unit, amplifiers, and other devices shall be printed out, documented, and kept within the cabinet.

There shall be two switches for the police door: 1) Main power switch and 2) A switch for switching the controller from automatic to flashing operation and vice versa, with the controller power :off" in flashing operation.

The cabinet shall be wired with a normally closed switch connected to a user defined input to the controller for later remote monitoring of the control cabinet's door open status.

A 1/2-inch bead of silicone sealant is required to form a waterproof seal between the controller cabinet and the top of the concrete foundation.

All equipment supplied within the control cabinet shall be on the MassDOT's Traffic Signal Approved Equipment List, latest revision.

Controller shall have a security code function.

The Controller unit shall conform to the Standard Specifications, with internal time based coordination, emergency pre-emption, and programmatic capability. The controller shall be complete with a module, including modem card and physical connector, to support closed loop communication. The local system intersection controller shall include the following internal functions:

ITEM 816.01 (Continued)

- Software compatibility with the on-street master controller, central office computer, and field laptop computer
- Local time based scheduler including automatic accommodation for daylight savings time
- Local coordination control
- Local pre-emption control with at least six programmable internal pre-emption sequences
- Data uploading and downloading capability
- Process system and local intersection detector activity and accumulate samples of vehicle counts, occupancy, speed, stops, and delay
- Perform extensive failure evaluation of the controller, detectors, and communications
- Provide local control of remotely selected NEMA and special functions
- Perform local report generation with printer capability if a printer is attached, including intersection status and performance
- Controllers shall be capable of Adaptive Max. They shall operate as follows: After a phase maxes out twice in a row and on each successive max out thereafter, one step value will be added to the Adaptive Max until the value of the Dynamic Max is reached. Returning to Normal Max shall be achieved in the same fashion. After a phase gaps out twice in a row on each successive gap out thereafter one step value, and only one step value, will be subtracted from the Adaptive Max until the value of the Normal Max is reached.

Each local system intersection controller shall include an internal FSK modem to allow connection to a remote system master. An RS-232C interface shall be provided to allow printing of local reports and database. It shall also be possible to attach a dial-up modem to the RS-232C interface to allow remote control and monitoring of the local controller. A separate addressable RS-232 port shall be supplied for use with radios or other external device.

- To minimize training and simplify local programming, all local parameter access shall utilize prompting and English language displays, and all codes needed by the user, if any, shall be on the front panel or on the display screen to avoid the need for memorization or the presence of a manual.
- Terminations of all interconnect cable, lighting/surge arrestors, terminal strips, etc., shall be included with each controller.

ITEM 816.01 (Continued)**MALFUNCTION MANAGEMENT UNITS**

The malfunction management units (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian, 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU's supplied shall be configured to operate as Type 16 units.

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 2 cabinet, a NEMA TS 2 Type 1 cabinet, or a NEMA TS 1 cabinet without loss of functionality. The MMU shall be connected directly to the controller unit to support enhanced MMU monitoring of controller operations.

TESTING OF GROUNDING SYSTEM

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with the Standard Specifications.

CABINET POWER SUPPLY

A separate power supply shall be supplied and installed in each of the TS 2 cabinets. As a minimum, the power supply shall meet all requirements of Paragraph 5.3.5 of the NEMA TS 2 Standard. The unit shall be AC line powered and provide regulated DC power, unregulated

AC power, a line frequency reference for the rack mounted loop amplifiers, bus interface units, load switches and other auxiliary cabinet equipment as required.

The power supply shall be either shelf mounted or installed as part of the loop detector rack assembly.

The unit shall contain four LED indicators on the front panel to indicate the four outputs;

1. + 12 VDC +/- 1 VDC @ 2.0 amps,
2. + 24 VDC +/- 2 VDC @ 2.0 amps,
3. 12 VAC @ 250 milliamps, and
4. 60 Hz line frequency reference.

A test point terminal shall also be located on the unit's front panel for + 24VDC and logic ground testing.

ITEM 816.01 (Continued)**LOAD SWITCHES**

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 standard. All load switches shall utilize optically isolated encapsulated modular solid state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device.

Note: The controller cabinet assembly shall be initially supplied with a full complement of load switches to accommodate each available position of the backpanel.

FLASHER

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 standard and be equipped with two output indicator lights which will show flashing power out to the cabinet assembly.

FLASH TRANSFER RELAYS

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 standard.

The field electrical loading for flash operation shall be wired through the transfer relays such that the load on the 2 circuit flasher is as balanced as possible within the limitations of the signal phasing.

TRAFFIC CONTROLLER CABINET

Controller Cabinet shall conform to the NEMA TS 2 Standards, Section 7. Cabinet size shall be as shown below.

TS 2 Type 1 Configuration Table

NEMA TS 2 Cabinet Size	Nominal Cabinet Size (HxWxD)*	Load Switch Positions	Mounting	MMU (Channels)
6	55x44x26	12	Ground	16 Channel

* Approximate cabinet dimensions are provided in inches.

The cabinet shall be equipped with filter vents and two (2) thermostatic fans for forced air cooling. The cabinet shall also be wired with a normally closed switch connected to a user defined input to the controller for remote monitoring of the control cabinets' door open status (future use).

The cabinet shall be installed with the door opening positioned in order to allow general observation of the flow of traffic and the inside of the cabinet at the same time.

ITEM 816.01 (Continued)

Controller cabinet foundation shall not obstruct a sidewalk or crosswalk to maintain ADA/AAB compliance. Cement concrete for foundation shall be 4,000 psi, 3/4-inch 610 Lbs. Cement Concrete Masonry conforming to the relevant provisions of Section M4 of the Standard Specifications. Reinforcing steel shall be an ASTM A-615, Grade 60.

BUS INTERFACE UNITS

The Bus Interface Units (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 1 cabinet assembly.

At a minimum the BIU shall perform the interface function between port 1 at the controller unit, the malfunction management unit (MMU), the loop detector rack assembly, and the terminal facilities. The cabinets shall be supplied with the appropriate number of BIUs required to provide an operating traffic control signal according to the plans and these specifications.

As a minimum, two LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

SPARE EQUIPMENT

The Contractor shall provide the following spare signal equipment in the traffic signal controller cabinet listed below:

- A full complement of load switches to accommodate each available position of the back panel.
- A full complement of flash transfer relays to accommodate each available position of the back panel.
- Two (2) Bus Interface Units.
- Two (2) 2-channel loop detector amplifiers.
- One (1) TS-2 power supply.
- A 25 foot RS-232 cable for communication function with a laptop computer.

SURGE SUPPRESSION

The Contractor shall supply and install surge suppression on all outputs and inputs in the traffic signal controller cabinet in accordance with MassDOT Standards. Contractor shall contact MassDOT Electrical Systems Unit directly for requirements and/or questions.

ITEM 816.01 (Continued)**MAST ARM POLES AND FOUNDATIONS**

Mast arm poles and foundations shall be fabricated and constructed in conformance with the Standard Specifications and MassDOT Standard Drawing included in the plans. Foundations shall not obstruct a sidewalk or crosswalk to maintain ADA/AAB compliance. Cement concrete for foundation shall be 4,000 psi, 3/4-inch 610 Lbs. Cement Concrete Masonry conforming to the relevant provisions of Section M4 of the Standard Specifications. Reinforcing steel shall be an ASTM A-615, Grade 60.

The Contractor is notified that temporary utility overhead wires are in close proximity to the location of the mast arm foundations. Contractor shall ensure that the overhead wires are not disturbed during installation of the mast arms. The equipment used for installation shall be sized accordingly.

The Contractor shall be responsible for constructing the foundations in accordance with the recommendations noted on the plans, the Standard Specifications, and details based on these boring logs.

All mast arms shall be monolever Type II galvanized steel with shoe bases, unless otherwise directed. Acceptance of Type II mast arm poles will be contingent upon review and approval of shop drawings submitted by the Contractor. All shop drawings and calculations shall be stamped by a Professional Engineer registered in Massachusetts and provided to the Engineer. Long hand design calculations shall be submitted to all Type II Mast Arms.

The paint finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color, which shall be approved by the Materials Control Section of MassDOT.

MAST ARM SIGN HANGER BRACKETS

Sign hanger brackets for mast arms shall be used in all locations where a sign is to be mounted to the mast arm. Mast arm sign hanger brackets shall consist of a mast arm clamp assembly cast from 356-T6 aluminum alloy or equivalent, vertical support tube extruded from 6063 aluminum or equivalent, stainless steel bands, clamp screw, hardware, and all miscellaneous materials necessary to fix mount the sign to the mast arm.

The sign hanger bracket shall be universally adjustable capable of making horizontal, vertical and 360-degree rotational adjustments so that any sign mounted on a mast arm can be adjusted to provide proper alignment and sight perpendicular to the flow of traffic.

Vertical support tubes shall be of sufficient length to allow mounting of the sign to within 3 inches of the top and bottom of the sign.

ITEM 816.01 (Continued)**BACKPLATES**

Backplates shall be constructed of anodized half hard aluminum with a non-louvered profile. Backplates shall provide a minimum 5-inch border around the signal assembly and shall be of dull flat black color. Corners of the backplates shall be rounded with a 2½-inch radius. All backplates shall have a 3-inch yellow retroreflective border and shall be installed with all vehicle signal heads.

LABELS

All time settings, switches, harnesses, relays, terminals, and fuses shall be clearly and permanently labeled.

POSTS AND BASES

All 8-foot and 10-foot traffic signal posts shall be aluminum. The pole shall be made of 6063-T6 aluminum alloy and shall be a continuously tapered, seamless tube. Bases shall be pedestal type cast aluminum. Pole and base shall be a single unit. Cement concrete for foundation shall be 4,000 psi, 3/4-inch 565 Lbs. Cement Concrete Masonry conforming to the relevant provisions of Section M4 of the Standard Specifications. Reinforcing steel shall be an ASTM A-615, Grade 60.

The paint finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color, which shall be approved by the Materials Control Section of MassDOT.

VEHICLE SIGNAL HEADS

All vehicle signal heads shall be aluminum. All signal heads on the mast arms shall be fixed mounted, with the bottoms at the same height. All vehicle signal heads shall be 12" in diameter, unless otherwise noted on the plans. Non-louvered backplates shall be 5" provided on all signal heads as noted on the plans.

When in the judgment of the Engineer the visibility of proposed signal faces will be obstructed by trees and other vegetation, the Contractor shall clear the obstructions for proper sight distance. Any clearing necessary shall be done within the State Highway layout, as directed by the Engineer.

ITEM 816.01 (Continued)**TRAFFIC SIGNAL LED MODULE**

All signal and pedestrian displays shall be equipped with LED signal modules. All red, amber, green, and pedestrian signal housings with the exception of optically programmed and fiber optic housings and shall conform to the following where applicable:

- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Arrow Traffic Signal Supplement, Dated July 1, 2007
- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement, Dated June 27, 2005.
- ITE's Pedestrian and Countdown Signal Modules Compliant to PTCSI - Part 2 Light Emitting Diode (LED), Dated, February 2011
- On the MassDOT Traffic Signal Approved Equipment List

For an LED module to be installed on this project, the LED module shall have approval from the MassDOT Traffic Control Products Approved Equipment Committee and be included on the Traffic Control Products List prior to the date of this proposal

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits one of the following:

- A failure due to workmanship or material defects within the first 60 months of field operation.
- A greater than 40 percent light output degradation or a fall below the minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation

ACCESSIBLE PEDESTRIAN SIGNALS

Accessible pedestrian signal units shall be furnished and installed at all locations as shown on the plans. The accessible pedestrian signal /pedestrian push button shall be in accordance with Section 4E.09 to 4E.12 of the 2009 MUTCD. It shall have a locator tone to allow visually impaired pedestrians to find the push button to activate the walk signal, as well as a tactile arrow indicating the direction of travel on the crosswalk. Once the push button call has been placed, the signal will provide both an audible and a tactile response during the WALK phase of the cycle. The Audible WALK indicator shall be a rapid tick tone, repeating at 8 to 10 ticks per second.

ITEM 816.01 (Continued)

Output levels shall be 90 db @ 3 feet and be self-switching to one of two output levels depending on ambient noise conditions. The accessible pedestrian pushbutton shall be mounted at a maximum height of 42 inches above the finished sidewalk grade. The push buttons shall be oriented to be parallel to the crosswalk signal to be actuated. Traffic signal sign (R3-10e) shall be installed with each push button assembly and the cost shall be incidental to the push button assembly.

COUNTDOWN PEDESTRIAN SIGNAL**CONSTRUCTION**

The LED countdown pedestrian module shall be a single, self-contained device, not requiring on-site assembly.

The assembly of the LED countdown pedestrian module shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination, and also to match threshold ambient light conditions.

The countdown signal shall use a standard 3-wire configuration for Walk, Don't Walk, and Neutral.

The LED countdown pedestrian module shall be made of UL94VO flame retardant material or similar. The lens of the module is excluded from this requirement.

Combination hand/person pedestrian signal modules shall incorporate separate power supplies for the hand and the person icons.

COUNTDOWN FUNCTIONALITY

The countdown module shall be compatible with all types of controllers, and especially with the type of traffic signal controller that will be installed as part of this project.

The countdown timer shall continuously monitor the traffic controller for any changes in the pedestrian phase time and reprogram itself automatically, if needed. The countdown module shall be automatically set by the traffic controller based upon the pedestrian change interval only.

Per MUTCD, countdown displays shall not be used during the Walk interval or during the yellow change interval of a concurrent vehicular phase.

A steady upraised hand shall be displayed during the yellow change interval and the red clearance interval.

ITEM 816.01 (Continued)

The countdown module shall begin at the start of the flashing DON'T WALK (pedestrian change interval) and shall display the number of seconds remaining until the termination of the DON'T WALK interval, and blank out or remain dark during the steady DON'T WALK interval.

The countdown timer display shall remain synchronized with the signal indications and shall always reach zero at the same time as the flashing hand.

CHROMATICITY

The standard colors for the LED countdown pedestrian module shall be white for the Walking Person and Portland orange for the Upraised Hand Icon. The countdown numbers shall be Portland orange.

The colors for these Icons shall conform to the current version of the MUTCD Section 4E.04

The chromaticity measurements shall remain unchanged over the input line voltage range of 80VAC to 135VAC.

DISPLAY

The LED countdown pedestrian signal shall consist of a single module 16" wide with the Upraised Hand and the Walking Person graphics overlaid upon each other and two seven-segment digits for the countdown display.

The operation, shape, and size of the graphic symbols shall meet the current version of the MUTCD, Section 4E.04 and Section 4E.07.

The graphic symbols shall follow PTSCI Part 2 Section 4 for luminance, uniformity, and distribution.

The countdown numbers shall be at least 7 inches in height. The graphic symbols and the countdown numbers shall be located on a black opaque background.

The Portland orange LED shall be of the latest ALLnGa P technology and the white LED shall be of the latest GaN technology.

The individual LED light source shall be interconnected so that a catastrophic failure of a single LED will result in a total loss of not more than 5% of the signal light output.

ITEM 816.01 (Continued)**WARRANTY**

The LED module will be replaced or repaired by the manufacturer if it exhibits a failure due to workmanship or material defects within the first 60 months of field operation.

The LED module will be replaced or repaired by the manufacturer if it falls below the minimum intensity levels as established by ITE within the first 60 months of field operation.

EMERGENCY VEHICLE PRE-EMPTION

The work consists of furnishing and installing optical traffic signal pre-emption systems ready for operation, as described herein and shown on the plans. Included in the work is the furnishing and installing of traffic signal pre-emption unit and related equipment, optical detection equipment and all necessary connections to the traffic signal controller. The fire pre-emption system shall be approved by MassDOT and installed in the same cabinet as the controller.

The fire pre-emption system shall consist of a data-encoded phase selector to be installed within the existing control cabinet. This unit will serve to validate, identify, classify, and record the signal from the optical detectors located on support structures at the intersection. Upon receiving a valid signal from the detector, the phase selector shall generate a pre-empt call to the controller initiating a pre-emption operation as shown on the plans.

The phase selector shall be a rack-mounted plug-in four-channel, dual priority device. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software on a disk shall be supplied and licensed to the State as part of this contract. A hard copy of final programming data shall be left in the control cabinet. The Contractor shall supply a complete set of interface cables for phase selector to laptop connection.

Emergency vehicles equipped with optical energy emitters transmit optical energy impulses to optical detectors mounted at the intersection. When optical energy impulses are received at the intersection, control of the signals shall transfer from the local controller to show a selected display shown on the plans to assist the vehicle through the intersection without conflict. After the vehicle has passed through the intersection, control of the signals shall then return to the local controller which shall restore the appropriate timings that were in effect prior to pre-emption.

PRE-EMPTION CONFIRMATION LIGHT

A pre-emption confirmation light shall be provided and mounted as shown on the plans. It shall be located in a position where it may be visible from all pre-emption approaches to each intersection. The light shall be weather tight and consist of a double flash clear (white) strobe which shall be illuminated whenever the controller is in the emergency pre-emption phase. The indicator light shall meet ITE, NEMA, IMSA, and MassDOT standards. The light shall have a minimum diameter of 140mm and height of 170mm. It shall be capable of flashing at a rate of 60 to 75 flashes per minute. Candela intensity shall be a minimum of 1,000 for clear lenses.

ITEM 816.01 (Continued)

The Contractor shall be responsible for the proper programming of the phase selector, orientation of the optical receivers in the field, and all other work necessary to provide a complete and operating emergency pre-emption system.

RAILROAD PRE-EMPTION

The work consists of furnishing and installing interconnection with the rail-highway active warning signal system, including traffic signal pre-emption, as shown on the plans. Included in the work are the furnishing and installing railroad pre-emption unit, related equipment, and all necessary connections required to make the system fully operational. The railroad pre-emption functionality shall be approved by MassCoastal Railroad and the Engineer.

WIRING

Traffic signal cable shall be of Type 2, 14 gauge. All systems shall provide a minimum of 10 conductors for each vehicle phase, overlap phase, and pedestrian phase for controller outputs to field wiring required by the timing and sequence plan. A minimum of 5 spare conductors shall be provided in the base of each signal post, mast arm pole, and strain pole. If the run requires more than 10 conductors, the Contractor shall provide 20 conductor cable. If the run requires less than 10 conductors, the Contractor shall provide 15 conductor cable.

Openings, where cables enter the base of a cabinet, shall be sealed with an approved elastic sealing compound. The open ends of conduits entering or leaving mast arms, posts and pull boxes shall also be sealed with the approved elastic sealing compound.

GROUNDING CABLE

Grounding cable shall be bare stranded copper No. 8 AWG stranded wires.

SERVICE CONNECTIONS

A new service connection is required for this project. Service connections shown on the plans are approximate only. The Contractor shall determine exact locations from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto including installation of transformers if required. Underground power conductors shall be in a separate conduit from other services, but may be located within the same trench. All service cable shall be standard copper No. 6 AWG. All power supply cable shall be labeled.

The servicing utility will furnish connection and power at the service connection location. The utility company will connect and disconnect power as required. No work shall be done in manholes or on power poles without a representative of the servicing utility being present. The Contractor will be responsible for coordinating the utility work. The anticipated electric utility demarcation point shall be located in the Eversource handhole, to be furnished and installed by Contractor.

ITEM 816.01 (Continued)

It shall also be the Contractor's responsibility to pay all charges to the utility company for performing this work. No direct reimbursement will be made under this contract to the Contractor for payments made to the utility company, it being understood that full compensation for any payment made by the Contractor to the utility company will be included in the contract prices bid.

A temporary service connection may be required from temporary utility pole #150 / 12T to accommodate staging.

AS-BUILT TRAFFIC LAYOUT PLANS

It will be the responsibility of the Contractor to provide the Design Engineer with as-built traffic signal layout plans indicating all changes made during the construction. The plans shall indicate the location of all traffic signal equipment installed including detectors, signal posts, mast arms, strain poles, pedestrian and vehicular signal heads, controller cabinets, conduit, pull boxes, service connections and pre-emption equipment. The plans shall also indicate the final as-built timing and sequence, major item list, power-pole number and meter number.

Upon receipt of the above as-built information from the Contractor, the Design Engineer will field verify the as-built information and plans. Following field verification, the Design Engineer will prepare the as-built Traffic Signal Layouts and/or Permits for submission to MassDOT District 5 prior to the final acceptance of the project.

MISCELLANEOUS REQUIREMENTS

The actuated controllers shall have capability to pre-empt to a preselected phase by external command.

The Contractor's attention is drawn to the requirements of Section 813.60C Splicing, relative to four optional methods of splicing in signal bases, Section 813.40C Ground Electrodes relative to requirement 1 - connection to a water piping system and Section 813.61 Equipment Grounding.

All anchor bolts and bolts for holding hand hole and access covers shall be greased at the time of installation.

The Contractor shall make all necessary arrangements with the electric company for the service connections or for any main power cut off when necessary, and bear all charges incurred thereby.

ITEM 816.01 (Continued)**BASIS OF PAYMENT**

Item 816.01 will be paid for at the Contract LUMP SUM prices, which price shall include all labor, materials, equipment, and incidental costs to complete the work. The LUMP SUM price bid for this Item shall include the furnishing, installing and maintaining of an operable traffic signal system.

Conduit will be paid for separately under Item 804.3, 3 Inch Electrical Conduit Type NM – Plastic –(UL).

Pull boxes will be paid for separately under Item 811.31 Pull Box 12 X 12 Inches – SD2.031.

Handholes will be paid for separately under Items 811.22 – Electric Handhole – SD2-022.

ITEM 816.80**TRAFFIC CONTROL SIGNAL
REMOVED AND STACKED****LUMP SUM**

The work under this item shall conform to the relevant provisions of Subsection 815 of the Standard Specifications, amended as follows:

The work under this item shall include the dismantling, removal, transporting and stacking of all existing traffic signal equipment at the locations below and as directed by the Engineer including the removal and disposal of all foundations associated with the existing traffic signal equipment. The Contractor shall remove foundations to a depth of 3 feet below finished roadway surface or 1 foot below finished ground surface for areas outside of the roadway. The work also includes removal and disposal of all handholes and their castings and plugging and abandoning all conduit.

The work shall include excavating the existing foundation, disposing of concrete, backfilling all holes resulting from excavation with compacted gravel, and placing concrete or hot mix asphalt to replace the surface material.

All existing traffic signal equipment shall be carefully removed so as to avoid damaging the equipment.

Location 1: Intersection of Route 28 (Iyannough Road) with Yarmouth Road

All traffic signal equipment for Location 1 to be stacked shall be stacked at a location within MassDOT District 5 as coordinated with the District 5 Resident Engineer. The Contractor shall be responsible for the equipment, and shall replace or repair any damage due to his operations with no additional compensation. Equipment not required by the District shall be removed and discarded by the Contractor away from the site, at no additional payment.

The Contractor shall coordinate with Eversource for removal of the electric meter and existing service connection.

BASIS OF PAYMENT

Payment for item 816.80 will be at the Contract unit price per LUMP SUM. The unit price per lump sum shall be full compensation for removing and stacking all existing traffic control signal equipment at Location 1, and shall include all costs necessary to supply all labor, tools, materials and equipment required for completion of this item.

ITEM 816.81**TEMPORARY TRAFFIC CONTROL SIGNAL****LUMP SUM**

The work included under this item consist of furnishing all necessary labor, materials and equipment required to install, complete in place and ready for operation, traffic control signals and related work at the locations shown on the plans, in accordance with the plans, Section 800 of the Standard Specifications, The Manual on Uniform Traffic Control Devices, 2009 edition and as amended; and the following:

Temporary span wire poles shall have luminaires installed in conformance with relevant provisions of Subsection 820 of the Standard Specifications. The luminaire shall be installed on the bracket arms with the luminaire parallel to the roadway grade unless otherwise shown on the plans.

Span wire shall be fabricated and installed in conformance with the MassDOT Overhead Signal Structure & Foundation Standard Drawings dated December 2015.

The Contractor shall make all necessary arrangements with the electric company for the service connections or for any main power cut off when necessary, and bear all charges incurred.

The approximate layout of the temporary traffic signal control system is shown on the plans and the installed system shall fit actual field conditions. Component parts of this item include, but are not limited to, signal heads, span wires, poles, luminaires, electrical cable, conduit, pull boxes, video detection, emergency vehicle pre-emption, railroad pre-emption, and all associated appurtenances and incidentals necessary to construct, maintain, operate, and remove the temporary traffic control system to the full satisfaction of the Engineer. The traffic signal controller and cabinet are not included in this item and shall be installed in accordance with provisions of Item 816.01.

It is the intent of the Plans, Specifications and these Special Provisions to provide and maintain a complete traffic control signal system throughout the project. The Contractor will own, operate and maintain this temporary signal during the entire construction period. Following the completion of construction, the temporary traffic signal equipment shall be removed and become the property of the Contractor with the exception of the traffic signal controller and cabinet.

The controller unit shall be the permanent controller as described under Item 816.01 and shall be capable of video detection. Signal indications shall be LED. Signal supports may be wooden poles or metal poles. The system shall be live AC voltage system.

This specification establishes the performance, test, and quality requirements for Temporary Traffic Control Signal System. The system will be tested and approved prior to the deactivation of the existing signal during Stage 1B of the Temporary Traffic Control Plans.

The signal unit shall perform as specified herein:

To ensure full adaptability of the temporary traffic signal control system, the following is required.

ITEM 816.81 (Continued)**SUBMITTALS**

Contractor to submit shop drawings for the temporary traffic signal components and temporary luminaires.

MATERIALS**Poles**

The length of poles supplied shall be 40 feet. The material of the poles may either be wood or metal. Shortening as required shall be from the narrow end. Class 1 poles or better shall be used for traffic signal support poles. Wooden poles shall be either Douglas Fir or Southern Yellow Pine.

CONSTRUCTION METHODS

Span wire poles shall be handled on loading, unloading, and erecting in such a manner that they will not be damaged. Any parts that are damaged due to the Contractor's operations shall be repaired or replaced at the Contractor's expense.

Span wire poles shall be placed in the ground a minimum of 12 feet. After each pole is set in the ground, the pole shall be backfilled with select backfill. Backfill shall be free of rocks and debris, and shall be placed in layers of no more than 6 inches before layer compaction. Each layer shall be moistened and thoroughly compacted.

Span wire poles shall be ranked sufficiently to be plumb after all loads have been placed.

Span wire poles shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired.

Due to space restrictions, the span wire poles cannot be guyed. Contractor shall install span wire poles in a manner that does not require guy wires or push bracing.

VIDEO DETECTION

The Contractor shall supply and install Video Detection System. The system shall also provide full motion video output showing zones highlighted during detection for fine-tuning. All hardware and software within the traffic signal cabinet shall be NEMA TS-2 compliant.

ITEM 816.81 (Continued)

The major components of the Video Detection System are further described as follows:

- A. Prior to installation of the Video Detection System a detailed site survey shall be conducted by a factory trained and certified representative. The site survey shall ensure that the design of the camera, camera location, camera optics, and video/data interconnect is appropriate for the application.
- B. The supplier of the Video Detection System shall supervise the installation and testing of the Video Detection System and computer software. A factory certified representative from the supplier shall be on site during installation.
- C. The Video Detection System shall provide one National Television Standards Committee (NTSC) color composite video output.
- D. The Video Detection System shall provide a minimum of 20 detection zones. The system shall provide flexible, user configurable detection zone placement at any orientation within the field of view of the Video Detection System Camera. It shall be possible to overlap detection zones. It shall be possible to configure the Video Detection System to provide detection signals to the traffic signal controller which are comprised of Boolean combinations of detection zones.
- E. The Video Detection System shall provide failsafe operation whereby it places continuous vehicle calls to the traffic signal controller on all detection zones in the event it senses unacceptable video from the Video Detection System Camera.
- F. The Video Detection System shall include a configuring device and/or a Windows based computer software that provides for configuring the Video Detection System, viewing real time video, and updating the flash memory of the Video Detection System with updated application software.
- G. The Video Detection System shall provide count & presence detection performance with at least 96% accuracy under normal (day and night) conditions.
- H. The Video Detection System shall utilize FLASH memory to store the resident application software.
- I. The Video Detection System shall be comprised of a Video Detection System Camera, Video Detection System Cable, and Video Detection System Hardware.

ITEM 816.81 (Continued)**J. Video Detection System Cameras**

- 1) The Video Detection System Camera shall operate without degradation over a temperature range of -30 to 140 degrees Fahrenheit at a relative humidity of 10% to 90% condensing.
- 2) The Video Detection System Cameras shall be housed in a water resistant, dust proof NEMA-4 housing. The housing shall include a rear connector for connection of the Video Detection System Cable. The housing shall be field rotatable to allow for proper alignment between the camera and the traveled road surface.
- 3) The Video Detection System Cameras shall have a heater to prevent the formation of ice and condensation in cold weather and allow the camera to operate correctly while exposed to precipitation and direct sunlight.
- 4) The Video Detection System Cameras shall have a sunshield to protect the lens from direct sunlight and direct precipitation exposure.
- 5) The Video Detection System Cameras shall provide useable video and resolvable features in the video image when those features have luminance levels as low as 0.1 lux at night, and as high as 10,000 lux during the day. The Video Detection System Camera shall contain an automatic gain control (AGC) to provide a satisfactory image over the full range of light levels.

K. Video Detection System Cable

- 1) The Video Detection System Cable shall interconnect the Video Detection System Camera with the Video Detection System Hardware in the traffic signal control cabinet.
- 2) The Video Detection System Cable shall meet the design requirements of the Video Detection System Camera manufacturer, and shall be designed and manufactured specifically for the Video Detection System Camera supplied.
- 3) The Video Detection System Cable shall be capable of withstanding the rigors of outdoor environments, including all combinations of precipitation, heat and cold from -30 to 165 degrees Fahrenheit, and direct exposure to sunlight without exhibiting any signs of deterioration over time.
- 4) The Video Detection System Cable shall be installed with a suitable drip loop to prevent the entrance of water into the housing.

ITEM 816.81 (Continued)**L. Video Detection System Hardware**

- 1) The Video Detection System Hardware shall operate without degradation over a temperature range of -30 to 165 degrees Fahrenheit at a relative humidity of 10% to 90% condensing.
- 2) The Video Detection System Hardware shall include interface device(s) which shall be installed in the traffic control cabinet.
- 3) The interface device(s) shall be used to terminate the traffic controller cabinet end of the Video Detection System Cable.
 - a) The interface device(s) shall contain transient suppression devices for all signals transported on the Video Detection System Cable, including but not limited to video, data, and power.
 - The surge protector shall be electrically connected to the cabinet ground rod.
 - Surge protectors should have peak surge current protection of at least 10K amperes with a response time of less than 5 nanoseconds. The protector complies when a lab report from an independent test laboratory stating the product passes this specification is submitted with the shop drawings.
 - Units should be pre-approved or unconditionally warranted for at least 10 years and certified to comply with the product's published specifications by an independent laboratory.
 - b) The interface device(s) shall contain a switch or shut-off mechanism that shall allow the user to turn off AC service to all components of the Video Detection System.
 - c) The interface device(s) shall contain a connector for interfacing to an included configuring device and/or a Windows based computer in the field for the purpose of configuring the Video Detection System, viewing real time video, and for updating the flash memory of the Video Detection System with updated application software.
- 4) The Video Detection System Hardware shall include all necessary cables for interconnection to the traffic signal controller, AC power service, a modem for transport of NTSC video to the traffic operations center, and a configuring device and/or a Windows based computer in the field.

SIGNAL TIMING

Signal phasing and timing shall be programmed as shown on Contract Plans. Signal timing may be altered in the field to optimize traffic operations only with the approval of the Engineer.

ITEM 816.81 (Continued)**CONTROLLER AND CABINET**

The controller and cabinet assembly shall be installed as specified under Item 816.01.

SIGNAL HEADS

Signal heads attached to span wires shall be rigidly attached to the span wire, with the bottom of all signals at the same height, 5-inch black louvered back plates shall be provided on all signal heads as noted on the plans. All signal heads shall be equipped with 12-inch red ball or red arrow light and as noted on the plans.

TEMPORARY SIGNAL MAINTENANCE

After the Contractor has finished installing the controller and all other associated signal equipment and after the Contractor has set the signal equipment to operate as specified in the Contract Documents, the maintenance of the temporary signal shall begin and continue for the duration of the construction contract. During this period, the Contractor, under the direction of the Engineer, will make necessary adjustments and tests to ensure safe and efficient operation of the equipment.

The Contractor, under the direction of the Engineer, shall make all necessary adjustments to signal heads and signal timing to accommodate the construction staging as shown in the contract plans.

In the event of failure during this period, the Contractor shall repair or replace the malfunctioning parts or equipment, or faulty workmanship, regardless of the cause, within twenty-four (24) hours after having been notified. Failures caused by defective equipment, materials or faulty workmanship shall be corrected to the satisfaction of the Engineer.

The Contractor shall provide the Engineer with the name and telephone number of the person to be notified in the event of failures or malfunctions during the test period.

The cost of the electric energy and telephone charges consumed by the operation of the temporary traffic signal shall be borne by the Contractor. This Item also includes the removal of the temporary traffic signal system and restoration of the site.

BASIS OF PAYMENT

The LUMP SUM bid price for the temporary traffic control signal system shall be full compensation for all labor, materials, equipment, including video detection, testing and re-testing necessary or incidental to the installation, operation, maintenance and subsequently removing and disposing of a temporary signalized traffic control system to accomplish the staged construction as shown on the plans. Conduit and pull boxes will be paid for under their respective items. Traffic signal controller and cabinet shall be paid for under Item 816.01.

ITEM 821.111**HIGHWAY LIGHTING POLE (ANCHOR BASE)**
6 FOOT BRACKET (18 FOOT POLE)**EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 of the standard specifications and the following:

The work shall consist of furnishing and installing new highway lighting poles and six foot bracket arms for luminaires to be mounted at a height of 18 feet, as located and detailed on the Contract Plans.

The complete structures with all luminaires and appurtenances attached thereto shall be designed and constructed in accordance with the requirements of AASHTO “*Standard Specifications for Structural Supports for Highway Signs, Luminaires and traffic Signals*” for the following AASHTO criteria: 1.) Fatigue Category No. 1, 2.) Design Wind Speed 130 MPH, and 3.) 50 Year Design Life.

All poles shall be of the same (Davit Style) design shape; dimensionally, aesthetically, and supplied by the same manufacturer. All poles shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

The pole shall consist of a single piece, round, tapered, galvanized steel shaft painted black. The paint finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color, which will need to be approved by the Materials Control Section of MassDOT. The length of each pole assembly shall position the proposed luminaires at the mounting height above the finished grade as shown on the drawings.

Each pole shall include base plate, handhole, anchor bolts, galvanized pole top cap, breakaway couplings and base plate covers.

All materials required to mount the poles regardless of the mounting shall be replaced and provided by the Contractor.

Breakaway couplings will be provided and shall conform to all MassDOT standards and be supplied by the pole Manufacturer. When a breakaway base is used as shown on the drawings, a customized full-length aluminum base plate cover shall be provided. Breakaway couplings shall be FHWA approved.

A 4 inch X 6 inch reinforced galvanized handhole shall be included and oriented 90 degrees from the luminaire. The handhole and reinforcements shall be welded to the pole shaft at 12 inches from the bottom of the pole. Internally positioned and welded securely on the opposite pole wall from the handhole, a grounding lug, complete with grounding screw shall be provided. A galvanized cover shall be provided by the Manufacturer and secured with tamper resistant, stainless steel fasteners.

The anchor bolts shall be manufactured using a carbon steel bar and have a 90 degree bend on one end and shall be galvanized over the entire length of the bolt.

ITEM 821.111 (Continued)

Four (4) anchor bolts with galvanized nuts and washers shall be provided for each new pole foundation required for this project. The length of the anchor bolt shall be in accordance with the recommendation of the pole Manufacturer.

All materials are to be galvanized after fabrication (no exceptions will be taken). Galvanizing shall meet the requirements of M7.

All poles are to be provided with an internal vibration-dampening device secured by means of stainless steel hardware. Actual mounting height of device shall be per the recommendations of the pole manufacturer.

All lighting standards shall be set plumb, with vertical plane of arms perpendicular to the roadway centerline. The bracket arm shall be secured to the light standard shaft in accordance with manufacturer's recommendations. The bracket arm shall be oriented as shown on the Drawings. Poles shall not be installed until the control cabinet and underground wiring has been completed and tested.

The Contractor is required to provide all miscellaneous hardware required to install the above items, which are not noted on drawings or specification. All hardware, unless noted above, shall be stainless steel grade 316 or better.

The Contractor shall prepare and submit shop drawings of the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket to the Engineer for review and approval. The shop drawings for the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket shall show all dimensions, material and coating specifications and required opening details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT

Item 821.111 will be measured for payment by the Each (new highway lighting poles and six foot bracket arms for luminaires to be mounted at a height of 18 feet) furnished and installed complete, in place and accepted.

BASIS OF PAYMENT

Item 821.111 will be paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, the six foot bracket arm, all dampeners, hardware, brackets, fasteners, pull box covers, anchor bolts, breakaway devices, and all incidental costs required to complete the work.

<u>ITEM 821.112</u>	<u>HIGHWAY LIGHTING POLE (ANCHOR BASE)</u>	<u>EACH</u>
	<u>6 FOOT BRACKET (25 FOOT POLE)</u>	

The work under this Item shall conform to the relevant provisions of Subsection 820 of the standard specifications and the following:

The work shall consist of furnishing and installing new highway lighting poles and six foot bracket arms for luminaires to be mounted at a height of 25 feet, as located and detailed on the Contract Plans.

The complete structures with all luminaires and appurtenances attached thereto shall be designed and constructed in accordance with the requirements of AASHTO "*Standard Specifications for Structural Supports for Highway Signs, Luminaires and traffic Signals*" for the following

AASHTO criteria: 1.) Fatigue Category No. 1, 2.) Design Wind Speed 130 MPH, and 3.) 50 Year Design Life.

All poles shall be of the same (Davit Style) design shape; dimensionally, aesthetically, and supplied by the same manufacturer. All poles shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

The pole shall consist of a single piece, round, tapered, galvanized steel shaft painted black. The paint finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color, which will need to be approved by the Materials Control Section of MassDOT. The length of each pole assembly shall position the proposed luminaires at the mounting height above the finished grade as shown on the drawings.

Each pole shall include base plate, handhole, anchor bolts, galvanized pole top cap, breakaway couplings and base plate covers.

All materials required to mount the poles regardless of the mounting shall be replaced and provided by the Contractor.

Breakaway couplings will be provided and shall conform to all MassDOT standards and be supplied by the pole Manufacturer. When a breakaway base is used as shown on the drawings, a customized full-length aluminum base plate cover shall be provided. Breakaway couplings shall be FHWA approved.

A 4 inch X 6 inch reinforced galvanized handhole shall be included and oriented 90 degrees from the luminaire. The handhole and reinforcements shall be welded to the pole shaft at 12 inches from the bottom of the pole. Internally positioned and welded securely on the opposite pole wall from the handhole, a grounding lug, complete with grounding screw shall be provided. A galvanized cover shall be provided by the Manufacturer and secured with tamper resistant, stainless steel fasteners.

ITEM 821.112 (Continued)

The anchor bolts shall be manufactured using a carbon steel bar and have a 90 degree bend on one end and shall be galvanized over the entire length of the bolt.

Four (4) anchor bolts with galvanized nuts and washers shall be provided for each new pole foundation required for this project. The length of the anchor bolt shall be in accordance with the recommendation of the pole Manufacturer.

All materials are to be galvanized after fabrication (no exceptions will be taken). Galvanizing shall meet the requirements of M7.

All poles are to be provided with an internal vibration-dampening device secured by means of stainless steel hardware. Actual mounting height of device shall be per the recommendations of the pole manufacturer.

All lighting standards shall be set plumb, with vertical plane of arms perpendicular to the roadway centerline. The bracket arm shall be secured to the light standard shaft in accordance with manufacturer's recommendations. The bracket arm shall be oriented as shown on the Drawings. Poles shall not be installed until the control cabinet and underground wiring has been completed and tested.

The Contractor is required to provide all miscellaneous hardware required to install the above items, which are not noted on drawings or specification. All hardware, unless noted above, shall be stainless steel grade 316 or better.

The Contractor shall prepare and submit shop drawings of the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket to the Engineer for review and approval. The shop drawings for the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket shall show all dimensions, material and coating specifications and required opening details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT

Item 821.112 will be measured for payment by the EACH (new highway lighting poles and six foot bracket arms for luminaires to be mounted at a height of 25 feet) furnished and installed complete, in place and accepted.

BASIS OF PAYMENT

Item 821.112 will be paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, the six foot bracket arm, all dampeners, hardware, brackets, fasteners, pull box covers, anchor bolts, breakaway devices, and all incidental costs required to complete the work.

<u>ITEM 821.113</u>	<u>HIGHWAY LIGHTING POLE (ANCHOR BASE)</u> <u>6 FOOT BRACKET (30 FOOT POLE)</u>	<u>EACH</u>
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The work under this Item shall conform to the relevant provisions of Subsection 820 and the following:

The work shall consist of furnishing and installing new highway lighting poles and six foot bracket arms for luminaires to be mounted at a height of 30 feet, as located and detailed on the Contract Plans.

The complete structures with all luminaires and appurtenances attached thereto shall be designed and constructed in accordance with the requirements of AASHTO “*Standard Specifications for Structural Supports for Highway Signs, Luminaires and traffic Signals*” for the following AASHTO criteria: 1.) Fatigue Category No. 1, 2.) Design Wind Speed 130 MPH, and 3.) 50 Year Design Life.

All poles shall be of the same (Davit Style) design shape; dimensionally, aesthetically, and supplied by the same manufacturer. All poles shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

The pole shall consist of a single piece, round, tapered, galvanized steel shaft painted black. The paint finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color, which will need to be approved by the Materials Control Section of MassDOT. The length of each pole assembly shall position the proposed luminaires at the mounting height above the finished grade as shown on the drawings.

Each pole shall include base plate, handhole, anchor bolts, galvanized pole top cap, breakaway couplings and base plate covers.

All materials required to mount the poles regardless of the mounting shall be replaced and provided by the Contractor.

Breakaway couplings will be provided and shall conform to all MassDOT standards and be supplied by the pole Manufacturer. When a breakaway base is used as shown on the drawings, a customized full-length aluminum base plate cover shall be provided. Breakaway couplings shall be FHWA approved.

A 4 inch X 6 inch reinforced galvanized handhole shall be included and oriented 90 degrees from the luminaire. The handhole and reinforcements shall be welded to the pole shaft at 12 inches from the bottom of the pole. Internally positioned and welded securely on the opposite pole wall from the handhole, a grounding lug, complete with grounding screw shall be provided. A galvanized cover shall be provided by the Manufacturer and secured with tamper resistant, stainless steel fasteners.

ITEM 821.113 (Continued)

The anchor bolts shall be manufactured using a carbon steel bar and have a 90 degree bend on one end and shall be galvanized over the entire length of the bolt.

Four (4) anchor bolts with galvanized nuts and washers shall be provided for each new pole foundation required for this project. The length of the anchor bolt shall be in accordance with the recommendation of the pole Manufacturer.

All materials are to be galvanized after fabrication (no exceptions will be taken). Galvanizing shall meet the requirements of M7.

All poles are to be provided with an internal vibration-dampening device secured by means of stainless steel hardware. Actual mounting height of device shall be per the recommendations of the pole manufacturer.

All lighting standards shall be set plumb, with vertical plane of arms perpendicular to the roadway centerline. The bracket arm shall be secured to the light standard shaft in accordance with manufacturer's recommendations. The bracket arm shall be oriented as shown on the Drawings. Poles shall not be installed until the control cabinet and underground wiring has been completed and tested.

The Contractor is required to provide all miscellaneous hardware required to install the above items, which are not noted on drawings or specification. All hardware, unless noted above, shall be stainless steel grade 316 or better.

The Contractor shall prepare and submit shop drawings of the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket to the Engineer for review and approval. The shop drawings for

the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket shall show all dimensions, material and coating specifications and required opening details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT

Item 821.113 will be measured for payment by the EACH (new highway lighting poles and six foot bracket arms for luminaires to be mounted at a height of 30 feet) furnished and installed complete, in place and accepted.

BASIS OF PAYMENT

Item 821.113 will be paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, the six foot bracket arm, all dampeners, hardware, brackets, fasteners, pull box covers, anchor bolts, breakaway devices, and all incidental costs required to complete the work.

ITEM 821.114 **HIGHWAY LIGHTING POLE (ANCHOR BASE)** **EACH**
6 FOOT BRACKET (25 FOOT POLE – DECORATIVE)

The work under this Item shall conform to the relevant provisions of Subsection 820 of the standard specifications and the following:

The work shall consist of furnishing and installing new highway decorative light poles and six foot bracket arms for luminaires to be mounted at a height of 25 feet, as located and detailed on the Contract Plans.

The complete structures with all luminaires and appurtenances attached thereto shall be designed and constructed in accordance with the requirements of AASHTO “*Standard Specifications for Structural Supports for Highway Signs, Luminaires and traffic Signals*” for the following AASHTO criteria: 1.) Fatigue Category No. 1, 2.) Design Wind Speed 130 MPH, and 3.) 50 Year Design Life.

All decorative poles shall be a 12” fluted round tapered design; dimensionally, aesthetically, and supplied by the same manufacturer. All poles shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

The pole shall consist of a single piece, round, tapered, aluminum shaft painted black. The finish shall be a black textured corrosion resistant 4 mil polyester powder coat finish, black in color, which will need to be approved by the Materials Control Section of MassDOT. The length of each pole assembly shall position the proposed luminaires at the mounting height above the finished grade as shown on the drawings.

The 6 foot bracket shall be tapered aluminum 6063-T4, tempered to T6 after welding. The tapered arm is formed into a vertically oriented ellipse of 4” by 2 7/8” welded onto a plate and mechanically assembled to a central adaptor. The bracket end is of 2 3/8” O.D. The decorative element shall be the Bent decorative scroll. The bracket to be mounted on top of a 4” outside diameter round pole or tenon.

Base covers shall be a two piece round aluminum cover mechanically fastened with stainless steel screws.

Each pole shall include base plate, handhole, anchor bolts, GFI duplex receptacle, pole top cap, breakaway couplings and base plate covers.

All materials required to mount the poles regardless of the mounting shall be replaced and provided by the Contractor.

All exposed screws shall be complete with Ceramic primer-seal basecoat to reduce seizing of the parts and offers a high resistance to corrosion. All seals and sealing devices are made and/or lined with EPDM and/or silicone and/or rubber.

ITEM 821.114 (Continued)

Breakaway couplings will be provided and shall conform to all MassDOT standards and be supplied by the pole Manufacturer. When a breakaway base is used as shown on the drawings, a customized full-length aluminum base plate cover shall be provided. Breakaway couplings shall be FHWA approved.

A 4 inch X 6 inch reinforced handhole shall be included and oriented 90 degrees from the luminaire. The handhole and reinforcements shall be welded to the pole shaft at 12 inches from the bottom of the pole. Internally positioned and welded securely on the opposite pole wall from the handhole, a grounding lug, complete with grounding screw shall be provided. A aluminum cover shall be provided by the Manufacturer and secured with tamper resistant, stainless steel fasteners.

The anchor bolts shall be manufactured using a carbon steel bar and have a 90 degree bend on one end and shall be galvanized over the entire length of the bolt.

All poles are to be provided with an internal vibration-dampening device secured by means of stainless steel hardware. Actual mounting height of device shall be per the recommendations of the pole manufacturer.

Four (4) anchor bolts with galvanized nuts and washers shall be provided for each new pole foundation required for this project. The length of the anchor bolt shall be in accordance with the recommendation of the pole Manufacturer.

All lighting standards shall be set plumb, with vertical plane of arms perpendicular to the roadway centerline. The bracket arm shall be secured to the light standard shaft in accordance with manufacturer's recommendations. The bracket arm shall be oriented as shown on the Drawings. Poles shall not be installed until the control cabinet and underground wiring has been completed and tested.

The Contractor is required to provide all miscellaneous hardware required to install the above items, which are not noted on drawings or specification. All hardware, unless noted above, shall be stainless steel grade 316 or better.

The Contractor shall prepare and submit shop drawings of the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket to the Engineer for review and approval. The shop drawings for

the proposed Highway Lighting Pole (anchor base) 6 Foot Bracket shall show all dimensions, material and coating specifications and required opening details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

ITEM 821.114 (Continued)**METHOD OF MEASUREMENT**

Item 821.114 will be measured for payment by the EACH (new highway decorative light poles and six foot bracket arms for luminaires to be mounted at a height of 25 feet) furnished and installed complete, in place and accepted.

BASIS OF PAYMENT

Item 821.114 will be paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, the six foot bracket arm, all dampeners, hardware, brackets, fasteners, pull box covers, anchor bolts, breakaway devices, and all incidental costs required to complete the work.

ITEM 821.21**HIGHWAY LIGHTING POLE (ANCHOR BASE)**
TWIN 6 FOOT BRACKET**EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 and the following:

The work shall consist of furnishing and installing new highway lighting poles and twin six foot bracket arms for luminaires to be mounted at a height of 30 feet, as located and detailed on the Contract Plans.

The complete structures with all luminaires and appurtenances attached thereto shall be designed and constructed in accordance with the requirements of AASHTO “*Standard Specifications for Structural Supports for Highway Signs, Luminaires and traffic Signals*” for the following AASHTO criteria: 1.) Fatigue Category No. 1, 2.) Design Wind Speed 130 MPH, and 3.) 50 Year Design Life.

All poles shall be of the same (Davit Style) design shape; dimensionally, aesthetically, and supplied by the same manufacturer. All poles shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

The pole shall consist of a single piece, round, tapered, galvanized steel shaft painted black. The paint finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color, which will need to be approved by the Materials Control Section of MassDOT. The length of each pole assembly shall position the proposed luminaires at the mounting height above the finished grade as shown on the drawings.

Each pole shall include base plate, handhole, anchor bolts, galvanized pole top cap, breakaway couplings and base plate covers.

All materials required to mount the poles regardless of the mounting shall be replaced and provided by the Contractor.

Breakaway couplings will be provided and shall conform to all MassDOT standards and be supplied by the pole Manufacturer. When a breakaway base is used as shown on the drawings, a customized full-length aluminum base plate cover shall be provided. Breakaway couplings shall be FHWA approved.

A 4 inch X 6 inch reinforced galvanized handhole shall be included and oriented 90 degrees from the luminaire. The handhole and reinforcements shall be welded to the pole shaft at 12 inches from the bottom of the pole. Internally positioned and welded securely on the opposite pole wall from the handhole, a grounding lug, complete with grounding screw shall be provided. A galvanized cover shall be provided by the Manufacturer and secured with tamper resistant, stainless steel fasteners.

The anchor bolts shall be manufactured using a carbon steel bar and have a 90 degree bend on one end and shall be galvanized over the entire length of the bolt.

ITEM 821.21 (Continued)

Four (4) anchor bolts with galvanized nuts and washers shall be provided for each new pole foundation required for this project. The length of the anchor bolt shall be in accordance with the recommendation of the pole Manufacturer.

All materials are to be galvanized after fabrication (no exceptions will be taken). Galvanizing shall meet the requirements of M7.

All poles are to be provided with an internal vibration-dampening device secured by means of stainless steel hardware. Actual mounting height of device shall be per the recommendations of the pole manufacturer.

All lighting standards shall be set plumb, with vertical plane of arms perpendicular to the roadway centerline. The bracket arm shall be secured to the light standard shaft in accordance with manufacturer's recommendations. The bracket arm shall be oriented as shown on the Drawings. Poles shall not be installed until the control cabinet and underground wiring has been completed and tested.

The Contractor is required to provide all miscellaneous hardware required to install the above items, which are not noted on drawings or specification. All hardware, unless noted above, shall be stainless steel grade 316 or better.

The Contractor shall prepare and submit shop drawings of the proposed Highway Lighting Pole (anchor base) Twin 6 Foot Bracket to the Engineer for review and approval. The shop drawings for the proposed Highway Lighting Pole (anchor base) Twin 6 Foot Bracket shall show all dimensions, material and coating specifications and required opening details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 821.21 will be measured and paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, the twin six foot bracket arm, all dampeners, hardware, brackets, fasteners, pull box covers, anchor bolts, breakaway devices, and all incidental costs required to complete the work.

ITEM 823.01**HIGHWAY LIGHTING LUMINAIRE – LED -
7,633 INITIAL LUMENS, TYPE III****EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 and the following:

The work under this item shall consist of furnishing and installing LED highway lighting luminaires at the locations shown on the Plans, complete in place.

SUBMITTALS

Submittals for all lighting equipment shall be made in a timely fashion including, photometric Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting systems specified:

Shop drawings and Manufacturer's Photometric Data shall be submitted for the following:

- Each luminaire, including fabrication and assembly drawings, bill of material. Luminaire & Driver data including all Housing, Mounting, Optic, Electric and Material Specifications outlined under this Item.
- Independent Testing Laboratory Photometric Data
- Luminaire photometric data including the following:
 - Electronic .IES file submitted to the designer via email or CD for the luminaire proposed
 - Horizontal ISO Footcandle Plot for the typical luminaire displaying, at a minimum, all whole number footcandle levels based on the required 25' to 30' mounting height as noted on the drawings.

GENERAL

Luminaires and accessories shall be shipped securely packaged and labeled for safe handling in shipment and to avoid damage. Luminaires and accessories shall be stored in a secure area in original packaging in a manner to prevent soiling, physical damage, wetting, or corrosion prior to installation. The luminaire assembly shall meet 3G vibration requirements per ANSI C136.31-2010. All luminaires to be provided on the project shall be of the same manufacturer and model.

HOUSING/MOUNTING

Luminaire housing shall be fabricated from low copper content die cast 319 aluminum alloy material min. 0.100 inches thick. Finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color. Luminaire shall be suitable for wet locations per UL 1598. All hardware is to be stainless steel.

ITEM 823.01 (Continued)

Provide with bolt-on slip fitter mounts capable of attachment to a 2" (1.675" to 2.375" O.D.) diameter mounting pipe in a horizontal configuration. Housing shall have casting-integral heatsink and cooling fins for maximum heat transfer to maintain LED junction temperature assuring long LED life and efficacy. The mounting assembly shall be of the slip fit type with a minimum of 5± degrees of adjustment for leveling and shall provide an integral die cast mounting pipe stop feature.

OPTICS

Optical assembly shall produce an asymmetric forward - Type 3 distribution. Luminaires shall deliver a minimum of 7,633 initial lumens with an IES BUG Rating of B2-U0-G2 (Backlight Rating = 2, Uplight Rating = 0, Glare Rating = 2). Typical system wattage shall be 72 Watts. LEDs shall be high brightness 4000°K CCT white and 70 CRI. Optical enclosure system shall meet an IP66 rating, per ANSI C136.25-2009. Optical assembly shall be capable of operation within ambient temperature range of -40° F to 122° F.

ELECTRICAL

Typical system wattage shall be 72 Watts. 120-277 volt input power internal driver shall be field replaceable. Power supply shall have minimum power factor of .90 and <20% Total Harmonic Distortion (THD). Class "A" Sound rating shall be provided. EMC meets or exceeds FCC CFR Part 15. EMI meets or exceeds Title 47 CFR Part 15 Class A. Transient voltage complies with ANSI C62.41 Cat. A. Integral surge protector shall comply with ANSI/IEEE procedures based on ASNSI/IEEE C136.2-2015 definitions for Standard (6 kV/3kA "Basic: (120 Strikes)") and Secondary (10 kV/5 kA "Enhanced: (40 Strikes)") waveforms for location category C. Electrical components shall be accessed without tools and are to be mounted on removable power door. Provide with quick electrical disconnects to terminal block and LED board.

MATERIALS

Luminaires shall be free of light leaks and shall be designed to provide sufficient ventilation of LEDs and drivers including vent holes where required.

The luminaire nearest the lighting load center shall have a NEMA Photocell Receptacle. Wiring channels and socket mountings shall be rigid and accurately made. Stainless steel components, fasteners and mounting hardware shall be Type 316.

All LED luminaires shall be provided by one manufacture. All LED luminaires provided shall be the same model. Type, wattage and initial lumens rating indicated on the drawings or specified herein shall be provided.

ITEM 823.01 (Continued)**CONSTRUCTION METHODS**

A luminaire of the type indicated on the Drawings shall be installed on its respective lighting standard as shown. The luminaire shall be installed on the bracket arms with the luminaire parallel to the roadway grade unless otherwise shown on the plans. Pole and bracket cable shall be installed through the pole bracket arm and connected to the luminaire terminals. Adequate slack pole and bracket cable shall be left at the base of the pole to permit connections to the roadway lighting circuits. Install fuse and fuse holder at base.

Upon completion of the installation, an operating test shall be conducted, in the presence of the Engineer, to demonstrate that the roadway lighting systems and associated equipment operate in accordance with the requirements of this Section.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 823.01 will be measured and paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

No separate payment will be made for wiring from the luminaire routed inside the pole, connections with the pole inline fuse holders, and out to their respective electrical handhole or electrical junction box, splicing and connections with the main feeders, equipment grounding, inline fuses, but all costs in connection therewith shall be included in the respective Contract unit prices bid.

ITEM 823.02**HIGHWAY LIGHTING LUMINAIRE – LED -
16,903 INITIAL LUMENS, TYPE IV****EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 of the standards specifications and the following:

The work under this item shall consist of furnishing and installing LED highway lighting luminaires at the locations shown on the Plans, complete in place.

SUBMITTALS

Submittals for all lighting equipment shall be made in a timely fashion including, photometric Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting systems specified:

Shop drawings and Manufacturer's Photometric Data shall be submitted for the following:

- Each luminaire, including fabrication and assembly drawings, bill of material. Luminaire & Driver data including all Housing, Mounting, Optic, Electric and Material Specifications outlined under this Item.
- Independent Testing Laboratory Photometric Data
- Luminaire photometric data including the following:
 - Electronic .IES file submitted to the designer via email or CD for the luminaire proposed
 - Horizontal ISO Footcandle Plot for the typical luminaire displaying, at a minimum, all whole number footcandle levels based on the required 18' to 30' mounting height as noted on the drawings.

GENERAL

Luminaires and accessories shall be shipped securely packaged and labeled for safe handling in shipment and to avoid damage. Luminaires and accessories shall be stored in a secure area in original packaging in a manner to prevent soiling, physical damage, wetting, or corrosion prior to installation. The luminaire assembly shall meet 3G vibration requirements per ANSI C136.31-2010. All luminaires to be provided on the project shall be of the same manufacturer and model.

HOUSING/MOUNTING

Luminaire housing shall be fabricated from low copper content die cast 319 aluminum alloy material min. 0.100 inches thick. Finish shall be a corrosion resistant 6 mil semi-gloss polyester powder coat finish, black in color. Luminaire shall be suitable for wet locations per UL 1598. All hardware is to be stainless steel.

ITEM 823.02 (Continued)

Provide with bolt-on slip fitter mounts capable of attachment to a 2" (1.675" to 2.375" O.D.) diameter mounting pipe in a horizontal configuration. Housing shall have casting-integral heatsink and cooling fins for maximum heat transfer to maintain LED junction temperature assuring long LED life and efficacy. The mounting assembly shall be of the slip fit type with a minimum of 5± degrees of adjustment for leveling and shall provide an integral die cast mounting pipe stop feature.

OPTICS

Optical assembly shall produce an asymmetric forward – Type 4 wide roadway distribution. Luminaires shall deliver a minimum of 16,903 initial lumens with an IES BUG Rating of B3-U0-G3 (Backlight Rating = 3, Uplight Rating = 0, Glare Rating = 3). Typical system wattage shall be 141 Watts. LEDs shall be high brightness 4000°K CCT white and 70 CRI. Optical enclosure system shall meet an IP66 rating, per ANSI C136.25-2009. Optical assembly shall be capable of operation within ambient temperature range of -40° F to 122° F.

ELECTRICAL

Typical system wattage shall be 141 Watts. 120-277 volt input power internal driver shall be field replaceable. Power supply shall have minimum power factor of .90 and <20% Total Harmonic Distortion (THD). Class "A" Sound rating shall be provided. EMC meets or exceeds FCC CFR Part 15. EMI meets or exceeds Title 47 CFR Part 15 Class A. Transient voltage complies with ANSI C62.41 Cat. A. Integral surge protector shall comply with ANSI/IEEE procedures based on ASNSI/IEEE C136.2-2015 definitions for Standard (6 kV/3kA "Basic: (120 Strikes)") and Secondary (10 kV/5 kA "Enhanced: (40 Strikes)") waveforms for location category C. Electrical components shall be accessed without tools and are to be mounted on removable power door. Provide with quick electrical disconnects to terminal block and LED board.

MATERIALS

Luminaires shall be free of light leaks and shall be designed to provide sufficient ventilation of LEDs and drivers including vent holes where required.

The luminaire nearest the lighting load center shall have a NEMA Photocell Receptacle. Wiring channels and socket mountings shall be rigid and accurately made. Stainless steel components, fasteners and mounting hardware shall be Type 316.

All LED luminaires shall be provided by one manufacture. All LED luminaires provided shall be the same model. Type, wattage and initial lumens rating indicated on the drawings or specified herein shall be provided.

ITEM 823.02 (Continued)**CONSTRUCTION METHODS**

A luminaire of the type indicated on the Drawings shall be installed on its respective lighting standard as shown. The luminaire shall be installed on the bracket arms with the luminaire parallel to the roadway grade unless otherwise shown on the plans. Pole and bracket cable shall be installed through the pole bracket arm and connected to the luminaire terminals. Adequate slack pole and bracket cable shall be left at the base of the pole to permit connections to the roadway lighting circuits. Install fuse and fuse holder at base.

Upon completion of the installation, an operating test shall be conducted, in the presence of the Engineer, to demonstrate that the roadway lighting systems and associated equipment operate in accordance with the requirements of this Section.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 823.02 will be measured and paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

No separate payment will be made for wiring from the luminaire routed inside the pole, connections with the pole inline fuse holders, and out to their respective electrical handhole or electrical junction box, splicing and connections with the main feeders, equipment grounding, inline fuses, but all costs in connection therewith shall be included in the respective Contract unit prices bid.

ITEM 823.03**HIGHWAY LIGHTING LUMINAIRE – LED -
9,994 INITIAL LUMENS, TYPE III****EACH**

The work under this Item shall conform to the relevant provisions of Subsection 820 of the standard specifications and the following:

The work under this item shall consist of furnishing and installing LED highway lighting luminaires at the locations shown on the Plans, complete in place.

SUBMITTALS

Submittals for all lighting equipment shall be made in a timely fashion including, photometric Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting systems specified:

Shop drawings and Manufacturer's Photometric Data shall be submitted for the following:

- Each luminaire, including fabrication and assembly drawings, bill of material. Luminaire & Driver data including all Housing, Mounting, Optic, Electric and Material Specifications outlined under this Item.
- Independent Testing Laboratory Photometric Data
- Luminaire photometric data including the following:
 - Electronic .IES file submitted to the designer via email or CD for the luminaire proposed
 - Horizontal ISO Footcandle Plot for the typical luminaire displaying, at a minimum, all whole number footcandle levels based on the required 25' mounting height as noted on the drawings.

GENERAL

Luminaires and accessories shall be shipped securely packaged and labeled for safe handling in shipment and to avoid damage. Luminaires and accessories shall be stored in a secure area in original packaging in a manner to prevent soiling, physical damage, wetting, or corrosion prior to installation. The luminaire assembly shall meet 3G vibration requirements per ANSI C136.31-2010. All luminaires to be provided on the project shall be of the same manufacturer and model.

HOUSING/MOUNTING

Luminaire housing shall be in a round shape. The housing shall be fabricated from an injection die cast A360.1 aluminum dome, complete with a weatherproof door. Finish shall be a corrosion resistant polyester powder coat finish, black in color. Luminaire shall be suitable for wet locations per UL 1598.

ITEM 823.03 (Continued)

All hardware is to be stainless steel. Mounting adaptor shall be made of cast 356 aluminum and can be mounted on a 1.66" to 2.38" outside diameter bracket arm tubing that slip fits 6.5" long inside the adaptor. Housing shall have casting-integral heatsink and cooling fins for maximum heat transfer to maintain LED junction temperature assuring long LED life and efficacy. The luminaire is suspended by means of a decorative side-mounted cast aluminum adaptor. This adaptor accepts tubes from 1 5/8" to 3/8" (41 to 60 mm) and is adjustable to more or less 5 degrees. The adaptor shall consist of a cast aluminum decorative cover and finial.

OPTICS

Optical assembly shall be a LE3R Type III assymetric distribution with an acrylic globe complete with a house side shield and a decorative skirt. Luminaires shall deliver a minimum of 9,994 initial lumens with an IES BUG Rating of B2-U3-G2 (Backlight Rating = 2, Uplight Rating = 3, Glare Rating = 3). Typical system wattage shall be 110 Watts. LEDs shall be high brightness 4000°K CCT white and 70 CRI. Optical enclosure system shall meet an IP66 rating, per ANSI C136.25-2009. Optical assembly shall be capable of operation within ambient temperature range of -40° F to 130° F.

GLOBE

Made of one-piece seamless injection-molded acrylic borosilicate glass globe having an inner prismatic surface. Compete with a semi-prismatic house side shield and external glare softening prisms. The globe is mechanically assembled and sealed onto the lower part of the heat sink.

ELECTRICAL

Typical system wattage shall be 110 Watts. 120-277 volt input power internal driver shall be field replaceable. Power supply shall have minimum power factor of .90 and <20% Total Harmonic Distortion (THD). Class "A" Sound rating shall be provided. EMC meets or exceeds FCC CFR Part 15. EMI meets or exceeds Title 47 CFR Part 15 Class A. Transient voltage complies with ANSI C62.41 Cat. A. Integral surge protector shall comply with ANSI/IEEE procedures based on ASNSI/IEEE C136.2-2015 definitions for Standard (6 kV/3kA "Basic: (120 Strikes)") and Secondary (10 kV/5 kA "Enhanced: (40 Strikes)") waveforms for location category C. Electrical components shall be accessed without tools and are to be mounted on removable power door. Provide with quick electrical disconnects to terminal block and LED board.

ITEM 823.03 (Continued)**MATERIALS**

Luminaires shall be free of light leaks and shall be designed to provide sufficient ventilation of LEDs and drivers including vent holes where required.

The luminaire nearest the lighting load center shall have a NEMA Photocell Receptacle. Wiring channels and socket mountings shall be rigid and accurately made. Stainless steel components, fasteners and mounting hardware shall be Type 316.

All LED luminaires shall be provided by one manufacture. All LED luminaires provided shall be the same model. Type, wattage and initial lumens rating indicated on the drawings or specified herein shall be provided.

CONSTRUCTION METHODS

A luminaire of the type indicated on the Drawings shall be installed on its respective lighting standard as shown. The luminaire shall be installed on the bracket arms with the luminaire parallel to the roadway grade unless otherwise shown on the plans. Pole and bracket cable shall be installed through the pole bracket arm and connected to the luminaire terminals. Adequate slack pole and bracket cable shall be left at the base of the pole to permit connections to the roadway lighting circuits. Install fuse and fuse holder at base.

Upon completion of the installation, an operating test shall be conducted, in the presence of the Engineer, to demonstrate that the roadway lighting systems and associated equipment operate in accordance with the requirements of this Section.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 823.03 will be measured and paid for at the Contract unit price per EACH, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

No separate payment will be made for wiring from the luminaire routed inside the pole, connections with the pole inline fuse holders, and out to their respective electrical handhole or electrical junction box, splicing and connections with the main feeders, equipment grounding, inline fuses, but all costs in connection therewith shall be included in the respective Contract unit prices bid.

<u>ITEM 823.61</u>	<u>HIGHWAY LIGHTING LOAD CENTER NO. 1</u>	<u>LUMP SUM</u>
<u>ITEM 823.62</u>	<u>HIGHWAY LIGHTING LOAD CENTER NO. 2</u>	<u>LUMP SUM</u>
<u>ITEM 823.63</u>	<u>HIGHWAY LIGHTING LOAD CENTER NO. 3</u>	<u>LUMP SUM</u>

The work under these items shall conform to the relevant provisions of Subsection 820 of the Standard Specifications and the following:

This item of work shall consist of furnishing and installing 1 new highway lighting load center cabinet with all appurtenances as located and detailed on the Contract Plans. The work shall also include wiring within the cabinet and all incidentals necessary to provide a fully functional lighting system including a panel board, time clock, photoelectric controller, lighting contactor, meter socket, electric heater (500 watts minimum), exhaust fan (100 cfm minimum), override switch, internal conduit and raceways, wiring, hardware and incidentals necessary to provide a complete and operable system.

The lighting load center shall be a free-standing cabinet type component set on a concrete foundation, as depicted in the Construction Details, with a level concrete sidewalk on the door side. The cabinet shall be NEMA 3X manufactured from grade 316 Stainless Steel, connected to the foundation with a minimum of (4) stainless steel anchor bolts, 3/8" minimum diameter, placed as recommended by the cabinet manufacturer. The lighting load center shall be equipped with a single, locking door, and shall be of sufficient size to house the required components.

Installation of the foundation, constructed and reinforced as shown on the lighting details, will be incidental to this item. The foundation will be placed on a bed of 12" of Gravel Borrow Type c. The excavation, bedding material, formwork, concrete, reinforcing steel, anchor bolts, backfill and all labor and incidental materials necessary to provide a complete lighting load center foundation are included in the lump sum cost.

Each load center shall include a heater, exhaust fan, and air filter. Heater and exhaust fan shall be thermostatically controlled. The heater shall be a 500W strip heater at 240 VAC. The exhaust fan shall be a minimum 100 cfm at 120 vac and shall be supplied with zinc plated fan guard or equivalent for corrosion resistance. Heater shall operate under 50 degrees F and exhaust fan shall operate over 90 degrees F. Louvers shall be provided in the lower section of the door with a filter frame on the inside of the enclosure. Air filter shall be long life aluminum or stainless steel.

Two ground rods shall be installed a minimum of 6 feet apart.

ITEM 823.61, 823.62 and 823.63 (Continued)

The Contractor shall calculate the appropriate AIC rating for load center components based on the utility company's transformer specifications for each location or 18,000 AIC whichever is greater.

Placement of the meter socket shall be outside of the cabinet as required by Eversource Energy.

The panel board shall be 120/240 volt, 24 pole surface mounted with a 100 amp, 2 pole main breaker and copper ground bussing. Aluminum bussing is not acceptable.

Photoelectric control shall automatically operate the lighting system. The photoelectric sensor shall be affixed to the top of the nearest luminaire, included in the contract unit price.

Prior to ordering of materials, the Contractor shall submit shop drawings of the cabinet after ensuring that all required components can be accommodated within it. The AIC rating calculations for the load center components described above as well as a scaled drawing showing dimensions and layout of all proposed equipment and devices being installed within load center cabinet shall be submitted as part of the shop drawing submittal review package. Layout of equipment and devices shall comply with National Electrical Code Article: 110.26.

The Contractor shall prepare and submit shop drawings of the proposed Highway Lighting Load Center to the Engineer for review and approval. The shop drawings for the proposed Highway Lighting Load Center shall show all dimensions, material and coating specifications and required details. The shop drawings must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

All components of the highway lighting system shall be installed in accordance with the National Electrical Code and under a permit from the Town of Barnstable Electrical Inspector.

SERVICE CONNECTION

Service connections shown on the plans are approximate only. Service connection shall be underground. The Contractor shall determine exact locations from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto, including the cost to install a transformer for the new service.

BASIS OF PAYMENT

Item 823.61, 823.62 and 823.63 will be paid for at the respective Contract unit price per LUMP SUM, which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

ITEM 823.61, 823.62 and 823.63 (Continued)

No separate payment will be made for installation of the foundation, the excavation, bedding material, formwork, concrete, reinforcing steel, anchor bolts, backfill, galvanized steel conduit within the concrete foundation, extending from below and into this cabinet, grounding clamps, attachment hardware, internal wiring, the ground wires connecting the cabinet and components to the ground rods below grade, but all costs in connection therewith shall be included in the respective Contract unit prices bid.

Conduit and wiring for the service connection will be paid separately under the respective items. The concrete sidewalk adjacent to the load center will be paid separately under Item 701. Two ground rods shall be installed a minimum of 6 feet apart and will be paid separately under Item 813.72.

ITEM 824.221 RECTANGULAR RAPID FLASHING BEACON (SOLAR) LUMP SUM LOCATION NO. 1

The work under this item shall conform to the relevant provisions Section 800 of the Standard Specifications, the Plans, and the following:

DESCRIPTION

The work shall include furnishing and installing a solar-powered, pedestrian actuated, rectangular rapid flashing beacon (RRFB) system at the locations shown in the plans. RRFBs are intended to provide supplemental warning to approaching vehicles of the potential for pedestrians to be crossing in an adjacent crosswalk.

MATERIALS

An RRFB system shall, at a minimum, consist of the following items, which shall be included in the lump sum bid:

- (2) concrete foundations;
- (2) 15' traffic signal posts and pedestals;
- (2) APS pushbutton systems;
- (4) dual rectangular yellow LED beacons in NEMA enclosures;
- (2) 9"x12" R10-25 (PUSH BUTTON TO TURN ON WARNING LIGHTS) signs;
- (4) 30"x30" W11-2 (Pedestrian Warning) signs;
- (2) 24"x12" W16-7PR and (2) 24"x12" W16-7PL (Diagonal Downward Arrow) signs;
- (2) solar panels;
- (2) NEMA Type 3R or higher enclosures to house:
 - Electrical components, including wiring and solid-state circuit boards;
 - On-board user interface;
 - Battery; and
 - Frequency hopping spread spectrum (or other alternate FCC approved) wireless activation unit with a minimum 150' range; and
- All mounting and supporting hardware and wiring necessary to complete a working system.

RRFB controller and LED beacons, APS pushbutton systems, and traffic signal posts and pedestals shall be listed on the Qualified Traffic Control Equipment List. Pedestals shall be cast iron.

The light intensity of the LED beacons during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Society of Automotive Engineers (SAE) Standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January, 2005. An automatic signal dimming device shall be included to reduce the brilliance of the LED beacons during nighttime conditions.

ITEM 824.221 (Continued)

A pilot light shall be integrated into the housing of the dual rectangular yellow LED beacons, facing pedestrians in the crosswalk, to provide confirmation that the RRFB is in operation.

All signs shall be MUTCD-compliant. R10-25 signs shall have a black border and legend on a white background. W11-2 W16-7PR, and W16-7PL signs shall have a black border and legend on a fluorescent yellow-green background. All sign sheeting materials shall be per Subsection 828.41.

R10-25 signs may be integrated into the APS pushbutton system as a single unit or mounted separately on Type A aluminum.

W11-2, W16-7PR, and W16-7PL signs shall be Type A aluminum per Subsection 828.42.

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

The solar panels shall be affixed to an aluminum plate and bracket, adjustable at an angle of 45° to 60° and each assembly shall be mounted on a 360° rotatable pole cap mount to facilitate adjustment for maximum solar collection and optimal battery strength. The solar panel assemblies shall be rated for 90 mph wind conditions.

The batteries shall conform to Battery Council International specifications and have a capacity allowing up to 30 days of autonomy without sunlight and varying with ambient temperature and number of activations. The batteries shall be rated for a minimum lifespan of 3 years. Batteries shall be replaceable independently of other components.

The solar panels and battery shall have a minimum operating temperature range of -40° to 122°F (-40° to 50°C).

The Contractor shall provide shop drawings and calculations to confirm solar panel sizing and battery/solar energy storage will meet the functional requirements of the system.

FUNCTIONAL REQUIREMENTS

The RRFB system shall remain dark until pedestrian actuation.

Upon actuation, all LED beacons shall activate and flash in a rapidly flashing sequence. Each sequence shall last 800 milliseconds and there shall be 75 sequences per minute. The sequence shall be the same for each pair of LED beacons in an enclosure and shall be as follows:

1. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
2. Both RRFB indications shall be dark for approximately 50 milliseconds.

ITEM 824.221 (Continued)

3. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
4. Both RRFB indications shall be dark for approximately 50 milliseconds.
5. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
6. Both RRFB indications shall be dark for approximately 50 milliseconds.
7. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
8. Both RRFB indications shall be dark for approximately 50 milliseconds.
9. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
10. Both RRFB indications shall be dark for approximately 50 milliseconds.
11. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
12. Both RRFB indications shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be between 5 and 30 flashes per second.

All RRFBs within the system shall commence and cease operation simultaneously.

The length of the flashing cycle upon actuation and the minimum allowable time between actuations shall be per the plans. These settings shall be user-programmable through the on-board user interface. No-fee wireless (Wi-Fi, Bluetooth®, etc.) may be used as an alternative programming method.

Each APS pushbutton shall have a tactile arrow and locator tone. The tactile arrow shall be oriented to point in the direction of the crosswalk. The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals. The locator tone shall be set 2 to 5 dBA above ambient sound, shall automatically adjust intensity, but cap at a maximum volume of 100 dBA. The tone shall be audible whenever the LED modules are not active.

Upon activation of the LED modules, a speech message shall state, “Yellow lights are flashing.” This message shall be stated twice. No vibrotactile or percussive indications shall be used.

If a pushbutton is pressed before the minimum time between actuation intervals is met, a speech message shall state, “Wait,” and the locator tone shall resume until the LED modules activate.

ITEM 824.221 (Continued)**CONSTRUCTION METHODS**

No work shall commence until the shop drawings are approved.

Layout and design of the RRFB system shall conform to the plans.

Foundation installations shall be per Subsection 801.62. The top of the foundation shall be ¼” to 1” proud of the sidewalk and chamfered at 45 degrees. Gaps between the sidewalk and foundation shall be no larger than ¼” and grouted with preformed joint filler.

The Contractor shall diagnose and replace any part of the RRFB system that is found to be defective in workmanship, material, or manner of functioning within six months of final acceptance by the Engineer. This requirement does not supersede the one-year warranty period on materials specified in Subsection 815.20.

COMPENSATION

The RRFB system shall be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

ITEM 824.62**INTERNALLY ILLUMINATED BLANK OUT SIGN****EACH**

The work under this Item shall conform to the relevant provisions of Section 800 of the Standard Specifications and the following:

The internally illuminated blank out sign shall be selected from the Qualified Traffic Control Equipment list, and shall be capable of installation on a standard MassDOT aluminum traffic signal mast arm and connected to the traffic signal controller. The sign shall be installed as shown in the Contract Plans and per manufacturer specifications. The sign shall be connected to the traffic signal controller for use during railroad pre-emption. The sign functionality shall be verified during pre-emption testing at the traffic signal inspection.

The sign shall have a one-way display and utilize LEDs for illumination.

METHOD OF MEASUREMENT

Item 824.62 will be measured for payment by the EACH internally illuminated blank out sign fully furnished and installed and functioning and accepted.

BASIS OF PAYMENT

Item 824.62 will be paid for at the Contract unit price per EACH, which price shall include labor, materials, tools, equipment and all incidental costs required to complete the work.

ITEM 826.70**ELECTRIC SERVICE RISER RELOCATION****EACH**

The work under this item shall conform to the relevant provisions of Section 800 of the standard specifications and the following:

The work under this item shall consist of the removal and relocation of existing secondary electrical services which originate from overhead wires on utility poles.

New utility poles will be installed "By Others". The contractor shall supply and install a new rigid galvanized riser pipe and sweep assembly. SCH 80 PVC conduit with sand bedding, handhole (polymer concrete) with 3/4" crushed stone (M2.01.4) bedding 6" minimum below base of handhole, wiring and appurtenances as necessary per the latest edition of the National Electrical Code, Massachusetts Electrical Code, Utility Company Specifications and Local Codes/Guidelines to complete the service relocation.

The work shall include all excavation, sand bedding, backfill, compaction, and materials or any other requirements in accordance with the latest edition of the National Electrical Code, Massachusetts Electrical Code, Utility Company Specifications and Local Codes/Guidelines.

This Item consists of converting the meter on each respective address from overhead to underground. Each service connection is defined by each respective connection to the property as shown on the plans and listed below:

- 251 Iyannough Road
- 247 Iyannough Road
- 239 Iyannough Road
- 153 Iyannough Road
- Water Treatment Plant on Old Yarmouth Road
- 30 Brooks Road
- 110 #1 Mary Dunn Way
- 110 #2 Mary Dunn Way

The work associated with disconnecting power and reconnecting power to the utilities secondary power lines should be performed at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, Power Company and the property owner/tenant during construction. No additional compensation shall be given for this work outside of normal work hours if needed.

ITEM 826.70 (Continued)**METHOD OF MEASUREMENT**

Item 826.70 will be measured for payment by the EACH removal and relocation of existing secondary electrical services riser from relocated utility poles, complete and accepted.

BASIS OF PAYMENT

Item 826.70 will be paid for at the Contract unit price per EACH, which price shall include all labor, risers, sweeps, conduit, sand bedding, hand-holes with crushed stone bedding, wiring, and materials, tools and equipment, plus any related Utility charges and/or permit fees associated with the work complete in place.

The work associated with the relocation of the utility poles and the transfer of the Utilities overhead primary and secondary wiring shall be the responsibility of the respective utility companies and not be paid for under this item.

The conduit for the telephone and catv is paid for under Item 804.2

ITEM 826.71**ELECTRIC SERVICE RELOCATION****EACH**

The work under this item shall conform to the relevant provisions of Section 800 of the standard specifications and the following:

The work under this item shall consist of the removal and relocation of existing secondary electrical services, which originated from overhead utility poles and will now be originating from underground system. This item includes the installation of proposed underground secondary electrical system services.

The contractor shall supply and install SCH 80 PVC conduit with sand bedding, handhole (polymer concrete) with 3/4" crushed stone (M2.01.4) bedding 6" minimum below base of handhole, wiring and appurtenances as necessary per the latest edition of the National Electrical Code, Massachusetts Electrical Code, Utility Company Specifications and Local Codes/Guidelines to complete the service relocation.

The work shall include all excavation, sand bedding, backfill, compaction, and materials or any other requirements in accordance with the latest edition of the National Electrical Code, Massachusetts Electrical Code, Utility Company Specifications and Local Codes/Guidelines.

This Item consists of converting the meter on each respective address from overhead to underground. Each service connection is defined by each respective connection to the property as shown on the plans and listed below:

- 244 Iyannough Road
- 240 Iyannough Road
- 230 Iyannough Road
- 192 Iyannough Road
- 193 Iyannough Road
- 156 #1 Iyannough Road
- 156 #2 Iyannough Road
- 156 #3 Iyannough Road
- 140 #1 Yarmouth Road
- 140 #2 Yarmouth Road
- 165 #1 Yarmouth Road
- 165 #2 Yarmouth Road
- 202 Yarmouth Road

The work associated with disconnecting power and reconnecting power to the utilities secondary power lines should be performed at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, Power Company and the property owner/tenant during construction. No additional compensation shall be given for this work outside of normal work hours if needed.

ITEM 826.71 (Continued)**METHOD OF MEASUREMENT**

Item 826.71 will be measured per EACH unit installed, complete and accepted.

BASIS OF PAYMENT

Item 826.71 will be paid for at the Contract unit price per EACH removal and relocation of existing secondary electrical services from relocated utility poles, which price shall include all labor, conduit, sand bedding, hand-holes with crushed stone bedding, wiring, and materials, tools and equipment, plus any related Utility charges and/or permit fees associated with the work complete in place.

The conduit for the telephone and catv is paid for under Item 804.2

<u>ITEM 852.11</u>	<u>TEMPORARY PEDESTRIAN BARRICADE</u>	<u>FOOT</u>
<u>ITEM 852.12</u>	<u>TEMPORARY PEDESTRIAN CURB RAMP</u>	<u>EACH</u>

The work under these items consist of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially-closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

MATERIALS

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

The Temporary Pedestrian Curb Ramp shall provide a 48 inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

CONSTRUCTION METHODS

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60 inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

ITEMS 852.11 and 852.12 (Continued)

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

COMPENSATION

Payment for Temporary Pedestrian Barricades will be made at the Contract price per foot installed in place, including the cost of furnishing, installing, resetting, removal, and maintaining in good working condition, and all incidental costs required to complete the work.

Payment for Temporary Pedestrian Curb Ramps will be made at the Contract price per Each unit installed in place, including the cost of furnishing, installing, resetting, removal, and maintaining in good working condition, and all incidental costs required to complete the work.

ITEM 853.21**TEMPORARY BARRIER REMOVED AND RESET****FOOT**

The work under this item shall conform to the relevant provisions of Subsection 850 and shall consist of removing, transporting and resetting temporary barrier systems and limited deflection temporary barrier systems from alignments established along the roadway to new alignments in accordance with the details shown on the plans, as required by the construction and staged construction operations and as required by the Engineer for the channelization of traffic and/or work zone protection.

The work shall also include furnishing and installing all hardware and associated materials per the details and/or manufacturer's specifications. The work shall also include necessary patches and repairs caused by the temporary barrier system to damaged pavement surfaces or any adjacent longitudinal barrier once the system has been removed.

Temporary barrier systems and limited deflection temporary barrier systems shall be removed from existing locations and reset in accordance to the construction methods stated in the respective barrier items.

Damage to the pavement surface or adjacent permanent barriers caused by removing or resetting temporary barrier shall be repaired as directed by the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 853.21 will be measured and paid by the foot, in place which shall provide full compensation for removing, relocating, resetting, realigning, and transporting maintaining the temporary barrier system and/or limited deflection temporary barrier system. The Contractor will be paid for this item each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage. The Contractor will not be separately compensated for any work necessary to maintain or re-align units or replace damaged units. No payment will be made for removing and resetting barriers for the purpose of gaining access to the construction work zone. No payment will be made for removing, relocating and resetting any barriers moved for the convenience of the Contractor.

For temporary barrier systems that require anchorage systems, the cost of furnishing, installing and removing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of this Item.

ITEM 853.32 TEMPORARY BARRIER – LIMITED DEFLECTION (TL-2) FOOT

Work under this item shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of limited deflection TL-2 temporary barrier systems for channelization of traffic and/or work zone protection, as shown in the Contract Documents or as directed by the Engineer. Limited deflection temporary barrier systems shall have a maximum dynamic deflection of 6 inches. All work shall be in conformance with the specifications of the manufacturer and in close conformance with the locations, lines, and grades shown on the plan

MATERIALS

The limited deflection temporary barrier system shall be selected from the Qualified Traffic Control Equipment List. The Contractor may submit alternate materials to the Engineer for approval if the limited deflection temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO Manual on Assessing Safety Hardware (MASH) at Test Level (TL) 2 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Contractor shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all limited deflection temporary barrier systems in conformance with the relevant provisions of Section 850.69 and shall be incidental to the temporary barrier systems.

CONSTRUCTION METHODS

Limited deflection temporary barrier systems shall be placed in line with the Contract Drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor shall not place any breaks in the limited deflection temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining limited deflection barrier system.

Within the LON section, limited deflection temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-2 for those conditions.

ITEMS 853.32 (Continued)

The Contractor shall supply the Engineer instructions for installation and the manufacturer's recommended routine inspection and maintenance program.

Damage to the pavement surface caused by the limited deflection temporary barrier during installation, while in service, and/or during removal shall be repaired as required by the Engineer at the Contractor's expense

Limited deflection temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Subsection 850.70.

METHOD OF MEASUREMENT

Item 853.32 will be measured for payment by the FOOT, complete in place, and accepted.

BASIS OF PAYMENT

Payment for work under Item 853.32 will be made at the Contract price, per FOOT, for Limited Deflection Temporary Barrier installed in place, including all incidental items. This price shall include the cost of furnishing, installing, maintaining and final removal of all limited deflection temporary barrier.

For limited deflection temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the cost of the item.

Payment for temporary barrier removed and reset will be made under Item 853.21

**ITEM 853.62 TEMPORARY IMPACT ATTENUATOR UNIDIRECTIONAL, EACH
REDIRECTIVE (TL-2)**

Work under Item 853.62 shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of temporary impact attenuator systems for protection of the ends of temporary barrier and other roadside hazards in work zones. All work shall be in conformance with the specifications of the manufacturer and in close conformance with the locations, lines, and grades shown on the plans.

MATERIALS

The Contractor shall supply a temporary impact attenuator that meets the same or higher crash Test Level (TL) as the adjacent temporary barrier, unless otherwise shown on the plans. The temporary attenuator shall be listed on the Department's Qualified Traffic Control Equipment List.

The temporary impact attenuator shall be designed to fit within reasonably close tolerance of the dimensions given on the plans.

The Contractor shall supply shop drawings for the temporary attenuator and for any anchorage system and for any transitions or connections between the temporary attenuator and the adjacent barrier or other roadside hazard.

The side of the temporary attenuator that faces traffic shall include a Type 3 Object Marker that conforms to the language found in Sections 2C.64 and 2C.65 of the *Manual on Uniform Traffic Control Devices*.

Unless a separate barrier system protects it from opposing traffic, only temporary impact attenuators that are certified for bi-directional use shall be used in medians.

CONSTRUCTION METHODS

Installation means and methods shall be per the manufacturer's specifications and/or drawings.

Excavation for temporary attenuator foundations and anchorage shall be made to the required depth and to a width that will permit the installation and bracing of forms where necessary. All soft and unsuitable material shall be replaced with compacted gravel borrow.

The Contractor shall supply the Engineer instructions for installation and the manufacturer's recommended routine inspection and maintenance program. The cost of inspection and maintenance of temporary attenuators shall be considered incidental in nature.

Damaged temporary impact attenuators shall be replaced by the Contractor within 24 hours or as directed by the Engineer, at the Contractor's expense. A truck mounted attenuator that meets the same or higher TL, or other means of protecting the damaged temporary impact attenuator, shall be deployed until the repairs or replacement has been completed, at the Contractor's expense.

ITEMS 853.62 (Continued)**METHOD OF MEASUREMENT**

Item 853.62 shall be measured as a single unit each furnished and installed in place.

BASIS OF PAYMENT

Payment for work under this item will be made at the contract unit price each. This price shall include the cost of all labor and materials for furnishing, foundations and anchorages, installation, maintenance and final removal, and all incidental work necessary to complete the work as specified.

ITEM 853.8**TEMPORARY ILLUMINATION FOR WORK ZONE****DAY**

The work under this item shall conform to work shall conform to the relevant provisions of Section 850 of the standard specifications and the following:

The work under this Item shall consist of illuminating the work zone areas for the purpose of conducting nighttime work and other areas as designated by the Resident Engineer. The work shall include illumination of the median crossover when use of the crossover is required during the nighttime operations. Nighttime work will occur at all locations where operations during daytime hours will unduly hamper and delay the motoring public, as listed elsewhere in this Contract.

A. Illumination Standards**1. Lane Closure/Shift Areas**

- a. The traveled way within the lane closure/shift areas (not shoulder closures) and all cones, drums, or other physical barriers placed on the roadway for the purpose of channelizing or restricting vehicular traffic shall be illuminated to a minimum average of 2 foot candles measured on both the horizontal and vertical planes 6" (150 mm) above the surface in question.
- b. The lane closure/shift area to be illuminated shall be defined as beginning at the first reflectorized drum or other channelizing device effecting a change in travel lane width or position, continuing through the full roadway width of the transition area. A uniformity ratio (average to minimum) of 4 to 1 or better shall be maintained at all times within the illuminated transition area.

2. Crossover Roadway Areas

- a. The crossover roadways are located as shown on the plans. They shall be illuminated along the total length of the median crossover to a minimum average of 2 foot candles utilizing a diffused lighting method to eliminate glare. Light system shall employ an inflated balloon style lighting diffuser that is capable of providing light for a full 360 degrees around the fixture. The fixture shall also be capable of restricting/reducing light as needed. The crossover roadway area to be illuminated shall be defined as beginning at the start of the transition pavement markings and throughout the limits of the physical median crossover opening. A uniformity ratio (average to minimum) of 4 to 1 or better shall be maintained at all times within the crossover area.
- b. The Contractor shall conduct field measurements to determine ambient light levels at each crossover location. These findings shall be used to determine the number, type and location of fixtures needed to provide the illumination required.

ITEM 853.8 (Continued)

- c. The Contractor will be responsible for determining the required number and type of fixtures and the appropriate mounting heights needed for the lane closure/shift and crossover roadway areas. A detailed lighting plan with photometric detailing the lighting levels to be provided and types, locations and mounting heights and directionality of all lighting provided and utilized (existing) shall be designed by a registered professional engineer registered in Massachusetts and submitted to the Engineer for approval prior to implementing any crossover operations.
- d. All lighting shall be located off the traveled way or protected in accordance with MassDOT and AASHTO Standards if located within the clear zone, opposite the channelizing devices (i.e., when closing the left or high speed lanes all lighting should be placed on the right side of the roadway), whenever possible. If lighting units have to be located within the roadway it shall be protected by barrier in accordance with MassDOT and AASHTO standards. All lighting shall be aimed in such a manner as to avoid shadows on the traveled way and to prevent excessive glare to the motorist.
- e. The use of temporary portable light towers shall be limited to Balloon Diffuser Systems. These portable light towers shall be used throughout the project area for temporary work zone lighting. The use of unshielded high wattage flood lights shall not be permitted. The portable balloon light tower shall be used, relocated, and adjusted to meet the criteria in Section 850 of the Standard Specifications. Lights shall be mounted on portable or fixed poles, trailer units, tripods or staging of the Contractor's choice in a location off the traveled way or within available work areas.
- f. The lighting staging area shall be roped off to all personnel except the lighting technicians. All generators and wiring shall be within the restricted area and shall conform to the Massachusetts Electrical Code and pertinent OSHA Safety Standards.
- g. The Contractor shall furnish to the Engineer a Multi-function digital luminance meter, complete with instructions and capable of measuring from 0.01 to 200 foot candles. The illumination on the project shall be monitored at random intervals for conformance to the specifications set forth herein. Substandard illumination shall be sufficient reason for the Engineer to direct stoppage of all work until the substandard situation is corrected.

ITEM 853.8 (Continued)**B. Power Sources**

1. The contractor shall provide generators or other suitable power source of type, size, and wattage output required to adequately energize the lighting equipment specified. Generator placement and wiring shall be in compliance with the Massachusetts Electrical Code and pertinent OSHA safety standards. It shall be the Contractor's responsibility to ensure that lighting fixture and generator electrical rating are compatible.
2. The illumination on the project shall be monitored at random intervals for conformance to the specifications set forth herein. Substandard illumination in any area (traveled way, crossover, work area or equipment lighting) may be sufficient reason for the Engineer to direct stoppage of all work until the substandard situation is corrected.

SUBMITTALS

Lighting Plan: Two weeks prior to implementation, submit four copies of detailed lighting plan referenced in Illumination Standards – Crossover, Subsection C.

METHOD OF MEASUREMENT

Item 853.8 will be measured for payment by the DAY of actual use and according to subsection 850.80 of the standard specifications.

BASIS OF PAYMENT

Item 853.8 will be paid for at the Contract unit price per DAY according to subsection 850.81, which price shall include all labor, materials, equipment, hardware, brackets, fasteners, and all incidental costs required to complete the work.

ITEM 859.1 **REFLECTORIZED DRUMS WITH SEQUENTIAL** **DAY**
 FLASHING WARNING LIGHTS

The work under this Item shall conform the relevant provisions of Subsection 850 of the Standard Specifications and the following:

The work under this Item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCS.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

The first ten drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute. Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the Day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the Contract unit price per Day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

<u>ITEM 864.061</u>	<u>6 INCH REFLECTORIZED WHITE LINE (PREFORMED THERMOPLASTIC)</u>	<u>FOOT</u>
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<u>ITEM 864.062</u>	<u>6 INCH REFLECTORIZED YELLOW LINE (PREFORMED THERMOPLASTIC)</u>	<u>FOOT</u>
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The work under these items shall include installation of preformed pavement markings on concrete panels at the railroad grade crossing. All material and equipment installed shall be selected from the Qualified Traffic Control Equipment list. The work under this item shall conform to the relevant provisions of Subsection 860 of the Standard Specifications, adhere to requirements in the M7.01.18 Subsection of Division III, Materials, and the following:

APPLICATION

The materials shall be applied using the method recommended by the manufacturer and without any preheating of the pavement to a specific temperature. The pavement shall be clean, dry and free of debris. The pavement shall have a primer applied before application as per manufacturer's specifications in order to assure proper adhesion.

METHOD OF MEASUREMENT

Items 864.061 and 864.062 will be measured for payment by the FOOT using the procedure outlined in the Standard Specifications, Subsection 860.80.

BASIS OF PAYMENT

Items 864.061 and 864.062 will be paid for at the respective Contract unit bid price per FOOT, which shall include all labor, materials, and equipment required for furnishing and installing the pavement markings.

<u>ITEM 864.31</u>	<u>SLOTTED PAVEMENT MARKER</u> <u>ONE-WAY WHITE</u>	<u>EACH</u>
<u>ITEM 864.32</u>	<u>SLOTTED PAVEMENT MARKER</u> <u>ONE-WAY YELLOW</u>	<u>EACH</u>
<u>ITEM 864.35</u>	<u>SLOTTED PAVEMENT MARKER</u> <u>TWO-WAY YELLOW/YELLOW</u>	<u>EACH</u>

The work under these items shall consist of furnishing and installing one-way white, one-way yellow, and two-way yellow/yellow reflectorized markers (slotted in pavement) in accordance with the Sign and Pavement Marking plans, the relevant provisions of Traffic Standard TR.6.3 “Typical Pavement Markings for Freeways”, and the following.

Markers shall be installed along the broken white lane lines (skip lines) at the midway point between successive skip lines at 80 foot intervals on the mainline.

CONSTRUCTION METHODS

The work shall include cutting the tapered pavement slot to the dimensions shown on the typical details for the markers, application of the manufacturer’s recommended epoxy adhesive and placing the reflectorized pavement marker in the proper position within the slot so that the reflectorized face is visible and perpendicular to oncoming traffic and so that the top of the marker is set 1/8± inch below the top of the adjacent pavement. Surface preparation and installation shall be strictly in accordance with the manufacturer’s instructions.

MATERIALS

Reflectorized pavement markers shall be selected from the Qualified Traffic Control Equipment List..

METHOD OF MEASUREMENT

The number of one-way white, one-way yellow and two-way yellow/yellow reflectorized pavement markers (slotted in pavement), completely furnished and installed, will be measured by the Unit EACH as a complete installation.

BASIS OF PAYMENT

One-way white, one-way yellow, and two-way yellow/yellow reflectorized pavement markers (slotted in pavement) will be paid at the contract unit price each under Item 864.31, Item 864.32, and Item 864.35 respectively, and shall include cutting the tapered pavement slot, furnishing and installation of the reflectorized markers, including all necessary materials, labor, incidentals, and equipment to complete the work.

<u>ITEM 866.104</u>	<u>4 INCH REFLECTORIZED WHITE LINE</u> <u>(THERMOPLASTIC)</u>	<u>FOOT</u>
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<u>ITEM 867.104</u>	<u>4 INCH REFLECTORIZED YELLOW LINE</u> <u>(THERMOPLASTIC)</u>	<u>FOOT</u>
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The work under these Items shall conform to the relevant provisions of subsection 860 of the Standard Specifications and the following:

The work under these items shall consist of the application of white and yellow reflectORIZED thermoplastic pavement markings as shown on the plans.

The Contractor shall furnish all necessary labor and materials, including thermoplastic, primer, and reflectORIZED glass beads, for this work.

No thermoplastic markings shall be applied if the pavement temperature is below 55° F unless the Contractor, using an approved method, preheats the pavement to a temperature in the range of 70° to 120° F immediately prior to the application of the markings.

In no case shall any thermoplastic pavement marking be applied if the pavement or air temperature is below 40° F.

It shall also be the responsibility of the Contractor to protect the line until it is sufficiently cured to bear moving traffic without tracking on the pavement. Any lines or markings that are so tracked shall receive a second standard application of material at no additional cost to the Commonwealth.

METHOD OF MEASUREMENT

ITEMS 866.104 and ITEM 867.104 will be measured for payment by the FOOT of pavement marking installed and accepted.

BASIS OF PAYMENT

ITEMS 866.104 and ITEM 867.104 will be paid for at the respective Contract bid unit price per FOOT, which price shall include all labor, materials, and equipment required to furnish and install the pavement pavement markings.

<u>ITEM 874.4</u>	<u>TRAFFIC SIGN REMOVED AND STACKED</u>	<u>EACH</u>
<u>ITEM 877.1</u>	<u>SIGN POST REMOVED AND DISCARDED</u>	<u>EACH</u>

The work under these Items shall conform to the relevant provisions of Section 800 of the Specifications and the following:

Work under these Items shall include the dismantling of the existing roadside traffic and street name signs as shown on the plans or as directed by the Engineer. The work under these Items shall also include the excavation of foundations, disposal of the concrete, backfilling with compacted gravel of the holes resulting from foundation excavation, and placement of concrete or hot mix asphalt to replace the surface material. As shown on the plans and as directed by the Engineer, all existing sign foundations, posts and supports shall be removed and discarded. Existing roadside traffic and street name sign panels shall be removed and reset as shown on the plans and as directed by the Engineer. The work to remove, transport, stack or discard existing sign foundations, posts, supports and sign panels shall be included in these Items. The signs and sign posts are to be stacked at a location within MassDOT Highway District 5, as determined by the Engineer.

If, in the opinion of the Engineer, an existing concrete foundation will not interfere with new construction, it may be removed to a depth of 12 inches below the finished grade in sidewalk area, or 3 feet below finished grade in roadway area, the hole backfilled with gravel and compacted, and the existing surfaces restored or replaced in kind.

The existing signs shall not be removed and stacked without the permission of the Engineer. A new sign support and post assembly shall be provided for each traffic sign panel to be removed and reset.

METHOD OF MEASUREMENT

ITEMS 874.4 and ITEM 877.1 will be measured for payment by the EACH, complete in place.

BASIS OF PAYMENT

Items 874.4 and 877.1 will be paid for at the respective Contract unit prices per EACH, which prices shall include all dismantling, loading, transporting, and resetting of the signs and supports as designated above, the excavation and disposal of the existing foundations and sign posts, and resetting the signs and supports in the locations shown on the plans, and all other incidental costs required to complete the work.

Additional gravel required, HMA, cement concrete, and/or loam and seed required for backfill and restoration of surface shall be considered incidental to Item 874.4 and Item 877.1.

New sign support and post assemblies will be paid for under Items 841.7, 847.1, and 848.1.

ITEM 904.01**CONCRETE OUTLET CONTROL STRUCTURE****EACH**

The work under this item shall conform to the relevant provisions of Subsections 201, 901 and Subsection 5.02 of the Standard Specifications, Supplemental Specifications, Standard Special Provisions and the following:

The work under this Item includes installing the concrete outlet control structure. The concrete outlet control structure is located within the proposed infiltration basin.

MATERIALS

The aluminum grate shall be 5052 aluminum alloy. The precast reinforced concrete outlet control structures shall be made of 4000 PSI, 3/4 inch, 610 cement concrete and then manufacture the structure same. Epoxy coated reinforcing steel shall be grade 60.

CONSTRUCTION METHODS

All structures shall require aluminum grates as specified on the Contract Drawings.

METHOD OF MEASUREMENT

Item 904.01 will be measured for payment by the EACH structure, meeting the minimum dimensions and requirements as specified on the Contract Drawings complete in place.

BASIS OF PAYMENT

Item 904.01 will be paid for at the Contract unit price, per EACH, which price shall include the preparation of shop drawings, epoxy coated steel reinforcement, concrete, and for all labor, equipment, additional materials including but not limited to the grate, trash rack, valves, PVC pipe, and PVC cap necessary to complete the specified work.

ITEM 971.01**ASPHALTIC PLUG JOINT****CUBIC FOOT**

Contractor shall coordinate this work with Mass Coastal Railroad. The work shall include the furnishing and installation of a polymeric binder and aggregate system composed of specially blended, polymer modified asphalt and selected aggregate, placed into a prepared joint blackout as shown on the plans. The system shall provide a flexible waterproof joint capable of accommodating a total movement of up to 2 inches from maximum expansion to maximum contraction, and maintain a continuous load bearing surface. Incidental to this system shall be the placement of the non-sag joint sealer.

MATERIALS

Materials shall meet the requirements specified in the following Subsections of Division III, Materials:

Polyurethane Joint Sealer, Non-Sag	M9.14.4
Asphaltic Binder for Asphaltic Bridge Joint System	M9.17.0
Aggregate for Asphaltic Bridge Joint System	M9.17.1

CONSTRUCTION METHODS

The minimum ambient air temperature during installation shall be 40°F and rising.

The Contractor shall produce uniform and parallel surfaces in the forming and placement of the blackout area within the limit of concrete panels and finished asphalt pavement or concrete panels as detailed on the plans. The formed blackout area shall be protected by the Contractor to prevent any edge damage by any site equipment throughout the on-going construction process.

The Contractor shall produce the required gap width within the full depth of the joint as dimensioned on the plans. Immediately prior to placing any binder, the blocked out section and the joint gap shall be inspected full depth and any debris shall be removed. The binder shall be melted and heated to the application temperature in a double jacketed, hot oil, heat transfer kettle, or as recommended by the manufacturer. The kettle shall be equipped with a continuous agitation system and temperature controls that can accurately maintain the material temperatures. The horizontal and vertical surfaces of the joint blackout joint shall be coated immediately with hot binder before pouring hot binder over the floor area of the joint.

The coating shall be continuous and adhere to the surfaces. The aggregate shall be heated to a temperature of 300 to 390°F in a suitable rotating drum blending unit with a heat source attached or by a secure H.C.A. lance to remove moisture. Temperature of the aggregate shall be controlled by a hand held calibrated digital temperature sensor or other means as approved by the Engineer. The heated aggregate and polymeric binder shall be combined in the blending unit with sufficient binder to thoroughly coat each aggregate individually while avoiding an excess of binder. In no instance shall the amount of the binder added to the blending unit be less than 15% by weight.

ITEM 971.01 (Continued)

The binder used for coating is not included in the above percentage. The coated aggregate shall be placed in the blockout in layers and raked level as recommended by the joint material manufacturer. The final layer shall be raked level and compacted flush with adjacent surface. This layer shall be compacted to the point of refusal with a 1½ to 2½ ton (1½ to 2½ Mg) roller to ensure the proper density and interlocking of the aggregate in the layer. Immediately following the compaction, the surface of the joint and surrounding road shall be dried and cleaned using the H.C.A. lance. Sufficient binder shall immediately be spread over the joint and adjacent road surface to fill surface voids and seal the surface stone. The finished joint shall then be dusted with a fine, dry aggregate to prevent tackiness.

QUALITY CONTROL

The Contractor shall have sufficient mixers and personnel at the site to assure continuous and timely installation of the joint. The Contractor shall furnish Certified Test reports, Materials Certificates and Certificates of Compliance for the asphaltic polymeric binder, the aggregate, and the joint sealer.

METHOD OF MEASUREMENT

Asphaltic Plug Joint will be measured for payment by the CUBIC FOOT, as measured between curb lines complete in place. Item 971.01

BASIS OF PAYMENT

Asphaltic Plug Joint will be paid for at the Contract unit price bid per CUBIC FOOT, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Removal of existing pavement within the limits of the asphaltic plug joint shall be considered incidental to Item 971.01

END OF DOCUMENT

DOCUMENT A00802

DETAIL SHEETS

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PAVEMENT NOTES (Continued)**FULL DEPTH WIDENING LESS THAN 4'****AREA= 49 SY**

SURFACE COURSE:	1.75" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5) OVER
INTERMEDIATE COURSE:	2.5" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC-19.0)
BASE COURSE:	6" CEMENT CONCRETE BASE COURSE
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

MILL AND OVERLAY**AREA= 11,217 SY**

SURFACE COURSE:	1.5" SUPERPAVE SURFACE COURSE – 9.5 (SSC-9.5) OVER VARIABLE DEPTH LEVELING COURSE 1.5" PAVEMENT MICROMILLING
TACK COAT:	EXISTING ROADWAY WILL BE THOROUGHLY CLEANED PRIOR TO THE APPLICATION OF TACK COAT. BITUMEN FOR TACK COAT WILL BE APPLIED AT A RATE OF 0.06 TO 0.08 GAL/SY BETWEEN NEW PAVEMENT LAYERS AND AT A RATE OF 0.07 TO 0.09 GAL/SY FOR MILLED SURFACES.

PROPOSED HMA WALK**AREA= 2,064 SY**

SURFACE COURSE:	1.25" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER
INTERMEDIATE COURSE:	1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5) OVER
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED CEM. CONC. PEDESTRIAN CURB RAMP**AREA= 659 SY**

SURFACE COURSE:	4" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, ¾" 610
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED HMA DRIVEWAY APRON**AREA= 479 SY**

SURFACE COURSE:	1.5" SUPERPAVE SURFACE SOURCE 9.5 (SSC-9.5) OVER
INTERMEDIATE COURSE:	2.5" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5) OVER
SUB-BASE:	8" GRAVEL BORROW (TYPE B)

PAVEMENT NOTES**PROPOSED STAMPED AND COLORED CEM. CONC. MEDIAN****AREA= 1,082 SY**

SURFACE COURSE: 4" STAMPED CEMENT CONCRETE

SUB-BASE: 8" GRAVEL BORROW (TYPE B)

PROPOSED HMA DRIVEWAY**AREA= 2,336 SY**

SURFACE COURSE: 1.5" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER

INTERMEDIATE COURSE: 2.5" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)
OVER

SUB-BASE: 8" GRAVEL BORROW (TYPE B)

PROPOSED HMA SHARED USE PATH**AREA= 1,228 SY**SURFACE COURSE: 1.5" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER
(Included under Item 702.)INTERMEDIATE COURSE: 2.5" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)
OVER (Included under Item 702.)SUB-BASE: 8" GRAVEL BORROW (TYPE B)
(Included under Item 151.)

ITEM 101. **CLEARING AND GRUBBING**

For areas shown on plans
Station 211+00 to 212+40 LT along Yarmouth Road
Station 297+00
South of Engine House Road

ITEM 102.1 **TREE TRIMMING**

Station 297+00 along Yarmouth Road

ITEM 103. **TREE REMOVED – DIAMETER UNDER 24 INCHES**

Approx. Station
106+44 RT
201+35 RT
203+40 LT
204+45 LT
297+71 LT
297+84 LT
299+22 LT
299+90 LT

ITEM 104. **TREE REMOVED – DIAMETER 24 INCHES AND OVER**

Approx. STA.
202+80 RT
202+85 RT

ITEM 112.1 **DEMOLITION OF BUILDING NO. 1**

#201 Yarmouth Road

ITEM 119 **RODENT CONTROL**

Associated with Building Demolition.

ITEM 129.5 **TRACK EXCAVATION**

Removal of existing tracks at #201 Yarmouth Road.

ITEM 120.1 **UNCLASSIFIED EXCAVATION**

For full depth construction, temporary pavement during construction, driveways and driveway aprons, leaching facility and septic tank at #201 Yarmouth Road, and infiltration basin.

ITEM 144 **CLASS B ROCK EXCAVATION**

As required by the Engineer where rock is encountered when installing drainage pipes or other utilities.

ITEM 146 **DRAINAGE STRUCTURE REMOVED**

Station	Offset	Station	Offset
106+32.08	1.33 L	118+17.35	19.24 R
107+06.33	26.36 R	105+14.09	47.47 L
107+69.23	27.92 R	106+24.03	57.13 L
109+66.63	11.65 R	106+32.16	50.42 L
109+77.15	47.75 L	106+42.17	7.94 R
109+82.13	16.32 R	109+91.84	42.23 L
204+07.58	33.24 L	109+88.68	59.11 L
208+28.79	51.54 L	111+43.08	35.08 L
209+69.02	44.91 L	113+46.26	30.39 L
210+52.66	48.66 L	117+57.69	26.51 L
213+27.21	14.81 R	213+27.20	12.49 L
213+29.10	30.61 R	213+14.01	33.95 R
111+69.57	42.43 L	213+22.44	38.54 R
112+38.29	28.05 R		

ITEM 150.1 **SPECIAL BORROW**

To be used in areas of raising profile where existing pavement structure is removed.

ITEM 151.2 GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

To be used where in-situ material is not sufficient for use as backfill or bedding for drainage pipes and structures.

ITEM 153. CONTROLLED DENSITY FILL – EXCAVATABLE

To be used as required by Engineer.

ITEM 156. CRUSHED STONE

To be used at splash pads, for check dams, for a base if necessary for catch basins and manholes, and for bedding of gravity sewer pipes.

ITEM 182.2 REMOVAL OF ASBESTOS

For removal of any asbestos found outside of the building demolition.

ITEM 182.3 ASBESTOS ABATEMENT FOR BUILDING DEMOLITION

For asbestos removal associated with the demolition of #201 Yarmouth Road.

ITEM 184.1 DISPOSAL OF TREATED WOOD PRODUCTS

For removal of railroad ties and wooden planters.

ITEM 186.1 DISPOSAL OF RECLAIMABLE - RECYCLABLE WASTE LIQUID

For removal of the septic tank associated with the demolition of #201 Yarmouth Road.

ITEM 201 CATCH BASIN

Structure	Baseline	Station	Structure	Baseline	Station
76 CB	Yar/ Camp	213+45.65'	46 CBCI	Route 28	116+43.13'
77 CB	Yar/ Camp	213+63.65'	48 CBCI	Route 28	118+19.26'
01 CBCI	Route 28	104+43.77'	51 CBCI	Route 28	105+18.01
03 CBCI	Route 28	105+44.27'	53 CBCI	Yar/ Camp	210+00.81'
06 CBCI	Route 28	105+15.31'	54 CBCI	Yar/ Camp	209+65.84'
07 CBCI	Route 28	105+99.86'	63 CBCI	Route 28	118+20.70'
10 CBCI	Route 28	106+20.22'	70 CBCI	Yar/ Camp	212+27.26'
11 CBCI	Route 28	106+78.56	71 CBCI	Yar/ Camp	212+27.21'
13 CBCI	Route 28	109+94.52	79 CBCI	Yar/ Camp	213+45.65'
14 CBCI	Route 28	104+68.90'	80 CBCI	Yar/ Camp	213+62.86'
16 CBCI	Route 28	106+50.16	81 CBCI	Yar/ Camp	212+92.19'
17 CBCI	Route 28	106+63.43	89 CBCI	Yar/ Camp	209+19.09'
18 CBCI	Route 28	107+36.06'	90 CBCI	Route 28	102+21.76'
20 CBCI	Route 28	107+97.31'	97 CBCI	Yar/ Camp	210+62.58'
24 CBCI	Yar/ Camp	206+50'	65 CB	Route 28	110+31.86'
25 CBCI	Yar/ Camp	206+91.53'	72 CB	Yar/ Camp	212+35.23'
27 CBCI	Route 28	110+65.86'	82 CB	Yar/ Camp	213+07.49'
28 CBCI	Yar/ Camp	206+18.41'	83 CB	Yar/ Camp	212+60.29'
30 CBCI	Route 28	110+35.62'	91 CB	Route 28	101+91.62'
33 CBCI	Route 28	111+59.96'	95 CB	Route 28	104+90.73'
35 CBCI	Yar/ Camp	204+69.39'	100 CB	Route 28	100+90.20'
36 CBCI	Route 28	111+91.69'			
38 CBCI	Route 28	112+81.31'			
40 CBCI	Route 28	114+49.03'			
42 CBCI	Route 28	114+03'			
43 CBCI	Route 28	114+90.49'			
45 CBCI	Route 28	116+50.22'			

ITEM 202 **MANHOLE**

Structure	Baseline	Station
05 DMH	Route 28	105+14.23
15 DMH	Route 28	106+67.12
29 DMH	Route 28	110+34.59
34 DMH	Route 28	111+45.24
41 DMH	Route 28	114+39.62
44 DMH	Route 28	116+55.18
47 DMH	Route 28	118+24.95
52 DMH	Yar/ Camp	209+13.55
55 DMH	Route 28	105+13.91
67 DMH	Route 28	114+36.85
75 DMH	Yar/ Camp	213+11.11
88 DMH	Route 28	110+59.93
94 DMH	Route 28	105+20.03
96 DMH	Yar/ Camp	209+95.25
99 DMH	Route 28	106+56.76

ITEM 202.1 **MANHOLE – 5 FOOT DIAMETER**

Structure	Baseline	Station
04 DMH	Route 28	105+51.80
08 DMH	Route 28	106+22.28
09 DMH	Route 28	106+78.21
12 DMH	Route 28	106+01.99
19 DMH	Route 28	108+03.58
22 DMH	Route 28	109+97.42
26 DMH	Route 28	110+58.58
32 DMH	Route 28	111+64.01
37 DMH	Route 28	112+86.07
39 DMH	Route 28	113+88.99
66 DMH	Route 28	114+11.04
78 DMH	Yar/ Camp	213+45.65
94 DMH	Route 28	105+20.03
TEMP DMH	Route 28	113+98.59

ITEM 202.2 **MANHOLE (9 TO 14 FOOT DEPTH)**

Structure	Baseline	Station
23 DMH	Yar/ Camp	206+62.49'
68 DMH	Route 28	114+58.78
69 DMH	Route 28	114+88.42

ITEM 205.01 LEACHING BASIN - PRECAST STRUCTURE

Structure	Baseline	Station
57 LB	Route 28	106+69.32
58 LB	Route 28	107+94.79
60 LB	Route 28	203+86.61

TITEM 205.1 LEACHING BASIN - 8 FOOT DIAMETER

Structure	Baseline	Station
74 LB	Yar/ Camp	212+21.53
84 LB	Yar/ Camp	212+39.83

ITEM 220 DRAINAGE STRUCTURE ADJUSTED

Existing CB, CBCI, and DMH rim elevation change 6" or less

Structure	Alignment	Station	Offset
49 ADJ DMH	Route 28	119+43.60	25.88 LT
93 ADJ DMH	Route 28	102+18.77	40.91 LT
X61 CBCI ADJ	South Yarmouth	300+37.88	10.39 RT
X62 CBCI ADJ	Yarmouth and Camp	201+07.66	12.23 LT
X64 CB ADJ	Route 28	118+82.25	16.35 RT

Adjusted during staging (Structures will be adjusted twice during staging):

Station	Offset	Station	Offset
107+06.83	24.39 R	104+44.67	43.34 L
107+69.14	26.07 R	204+07.64	34.08 L
109+82.13	15.12 R	105+13.91	47.71 L
102+21.86	19.4 R	106+23.78	56.80 L
106+42.24	7.27 R	109+77.06	47.84 L
107+06.51	24.37 R	111+24.82	51.74 L
107+69.41	26.07 R	111+69.61	41.58 L
109+88.79	58.32 L	113+46.33	29.39 L
112+28.57	38.57 R	117+57.78	26.51 L
112+38.23	27.01 R		
118+17.46	18.22 R		
118+82.25	16.35 R		

ITEM 220.3 **DRAINAGE STRUCTURE CHANGE IN TYPE**

Existing CB changed to DMH

<u>Structure</u>	<u>Station</u>
02CIT	104+44.67
86 CB CIT	213+00.02
92 CIT	102+18.35

ITEM 220.7 **SANITARY STRUCTURE ADJUSTED**

Existing SMH rim elevation change 6" or less

<u>Type</u>	<u>Station</u>
SMH	202+94.25
SMH	202+93.90

ITEM 224.12 **12 INCH HOOD**

Hoods are used on proposed catch basin with manhole covers:

72 CB

83 CB

ITEM 238.10 **10 INCH DUCTILE IRON PIPE**

To be used with temporary gutter inlets used during construction.

Temp GI-1

Temp GI-2

ITEM 350.06 **6 INCH GATE AND GATE BOX**

Used at hydrants

ITEM 350.08 **8 INCH GATE AND GATE BOX**

Station 118+36

Station 501+45

ITEM 350.12 **12 INCH GATE AND GATE BOX**

Station

501+57

108+14

ITEM 357.06 **6 INCH GATE BOX**

To be used if existing gate box can't be adjusted.

ITEM 357.08 **8 INCH GATE BOX**

To be used if existing gate box cannot be adjusted.

ITEM 357.12 **12 INCH GATE BOX**

To be used if existing gate box can't be adjusted.

ITEM 357.16 **16 INCH GATE BOX**

To be used if existing gate box can't be adjusted.

ITEM 358. **GATE BOX ADJUSTED**

Station	Offset
204+23.74	8.32 L
203+50.54	2.86 L
203+01.02	9.97 L
202+97.64	6.74 L
206+72.88	31.17 R
206+80.77	16.63 R
118+67.68	22.18 R

ITEM 358.1 **GATE BOX REMOVED AND STACKED**

Station	Offset
110+93.10	28.79 R
111+80.10	12.71 R
115+55.14	31.98 L
115+75.98	16.02 R
115+93.81	21.85 R
300+57.54	16.22 L

ITEM 367.0151 **1.5 INCH CAST IRON PLUG**

Station	Offset
106+04.11	31.99 R
106+03.99	40.52 R
106+03.91	45.72 R

ITEM 367.021 **2 INCH CAST IRON PLUG**

Station	Offset
104+53.86	9.10 R
106+51.17	1.16 R
106+76.13	1.52 R
107+88.72	5.2 R
107+82.67	40.98 R
118+06.58	38.85 L

ITEM 367.06 **6 INCH CAST IRON PLUG**

Station	Offset
104+53.11	6.32 R
118+16.11	14.78 R
116+22.54	14.75 R
116+473.04	19.84 R
209+65.42	13.71 R
209+56.52	13.81 R
213+10.16	9.19 R
213+01.30	9.25 R

ITEM 367.08 **8 INCH CAST IRON PLUG**

Station
114+31
114+37
116+43
116+49
111+44
111+51

ITEM 370.5 **12 X 8 INCH TAPPING SLEEVE, VALVE AND BOX**

Station 110+90, Offset 31.96' RT

ITEM 370.71 **16 X 8 INCH TAPPING SLEEVE, VALVE AND BOX**

Station 202+58, Offset 9.66' LT

ITEM 371.06 **6 INCH COUPLING**

Station	Offset
300+54	10.00 LT
118+68	

ITEM 371.08 **8 INCH COUPLING**

Station	Offset
101+8	15.70 RT
104+84	73.93 RT
104+70	149.37 LT

ITEM 371.12 **12 INCH COUPLING**

Station	Offset
209+43.05	9.23 RT
209+70.47	9.66 RT
212+14.58	10.97 RT
212+41.98	10.23 RT
212+89.71	18.79 RT
213+16.73	27.71 RT

ITEM 376.1 **HYDRANT – EXCLUDING COST OF HYDRANT**

Station	Offset
115+72	33.05 R

ITEM 376.2 **HYDRANT – REMOVED AND RESET**

Station	Offset	Station	Offset
111+80.72	20.73 R	112+48.86	36.10 R
104+54.28	22.89 R	105+30.24	55.77 R
206+81.36	36.02 R	206+81.46	40.99 R

ITEM 376.3 **HYDRANT - REMOVED AND STACKED**

Station
115+93.72

ITEM 381.1 **SERVICE BOX REMOVED AND RESET**

As required by the Engineer.

ITEM 381.2 **SERVICE BOX REMOVED AND STACKED**

Station	Offset
201+76.40	15.73 R
202+53.37	18.15 R
203+24.13	19.49 R

ITEM 384. **CURB STOP**

Station	Offset	Station	Offset
115+54.66	40.06 L	106+03.67	50.22 R
116+46.22	38.01 L	107+77.93	50.26 R
118+06.58	38.25 L		
203+22.05	35.16 R		
202+53.36	33.95 R		
201+76.12	25.09 R		
300+55.89	24.21 L		

ITEM 451. **HMA FOR PATCHING**

For permanent patching trenches in milled areas, patching test pit locations, HMA drives and permanent repair of delaminated areas exposed by milling operations

ITEM 470. **HOT MIX ASPHALT BERM**

<u>From Station</u>	<u>To Station</u>
117+32.85	117+42.91
118+82.33	119+60.03
109+60.	110+00.
400+71.48	401+37.94

ITEM 476.11 **CEMENT CONCRETE PAVEMENT -STAMPED AND COLORED**

All Medians

ITEM 482.5 **SAWCUTTING ASPHALT PAVEMENT FOR BOX WIDENING**

<u>Start Station</u>	<u>End Station</u>	<u>Start Station</u>	<u>End Station</u>
101+20	102+32	201+00	202+00
101+20	102+32	201+00	202+00
116+20	117+52	211+00	212+91
116+20	119+60	213+33	213+76
		214+18	214+45
		211+00	212+65

ITEM 506**GRANITE CURB TYPE VB – STRAIGHT**

From Station	To Station	From Station	To Station	From Station	To Station
101+48.1	101+52.04	114+42.89	114+93.53	206+02.99	206+24.21
101+89.65	101+93.6	114+42.89	114+93.53	206+82.01	207+08.04
102+31.23	102+55.34	115+34.81	115+95.32	207+35.03	208+23.51
103+09.07	103+50.42	115+34.81	115+95.32	207+35.04	208+31.37
101+48.1	101+52.04	116+40.15	117+11.37	208+60.27	208+66.93
101+89.65	101+93.6	117+51.2	118+22.3	208+60.27	208+66.93
102+31.23	102+55.34	117+51.2	118+22.3	208+98.82	212+30.22
103+02.28	103+31.19	104+02.82	104+60.07	212+50.59	212+62.83
103+31.25	103+57.18	104+03.24	104+61.51	213+41.93	213+67.49
104+01.59	104+22.91	105+24.45	108+52.48	214+41.33	214+44.5
105+62.35	107+07.83	105+72.68	106+72.59	204+16.4	204+62.58
106+86.56	107+14.56	106+72.59	108+52.34	204+16.41	204+62.05
107+62.58	108+12.81	108+54.84	108+54.98	204+64.37	204+64.9
109+27.	109+38.62	109+35.07	109+60.06	204+74.78	204+75.27
111+04.07	112+84.45	109+32.48	109+32.81	204+77.6	204+83.6
111+26.78	111+70.69	109+35.34	109+60.19	204+77.12	204+83.53
113+83.72	114+52.01	109+62.5	109+62.72	206+00.29	210+60.78
114+88.66	116+88.44	109+72.8	109+72.92	206+00.32	208+09.66
117+30.40	117+39.43	109+75.45	109+86.18	208+09.66	209+08.97
117+85.71	119+53.83	109+75.38	109+85.78	209+08.97	210+60.96
101+20.1	101+60.97	110+86.93	110+89.29	501+35.81	501+45.31
101+20.10	101+61.09	110+84.86	110+90.04	300+00	300+66
101+91.95	102+94.47	110+91.51	110+92.54	300+00.28	300+45.84
101+91.86	102+94.38	111+01.83	111+02.64		
103+32.93	103+51.94	111+04.65	112+25.41		
103+33.02	103+52.03	111+05.14	112+25.3		
103+84.02	104+23.15	201+00.09	202+08.42		
103+90.44	104+36.68	203+43.38	204+66.36		
105+67.39	106+59.58	206+14.69	210+03.84		
107+17.41	108+37.34	210+03.84	211+02.68		
109+46.05	109+69.5	211+02.68	212+38.77		
111+19.16	111+49.95	212+44.31	212+65.12		
111+19.16	111+49.95	200+99.91	201+52.86		
111+92.63	113+61.54	201+88.56	202+43.39		
112+90.94	113+61.54	202+68.93	203+53.65		
113+96.38	114+05.95	203+83.89	204+26.86		
113+96.38	114+05.95	203+84.29	204+08.89		

ITEM 506.1 **GRANITE CURB TYPE VB – CURVED**

Proposed vertical granite curbing with a radius less than or equal to 100'.

From Station	To Station		From Station	To Station	
104+22.91	104+45.35	Left	204+75.09	204+77.56	Median
105+31.71	105+62.35	Left	204+83.34	204+83.4	Median
109+45.66	109+53.27	Left	205+88.12	205+88.34	Median
109+70.53	109+73.85	Left	205+88.99	205+91.49	Median
110+65.62	110+83.56	Left	205+89.02	205+91.52	Median
104+42.62	104+71.25	Right	205+97.52	206+00.02	Median
105+24.01	105+40.75	Right	205+97.55	2+06.05	Median
105+40.75	105+65.73	Right	210+54.4	210+54.64	Median
109+80.8	110+04.64	Right	400+80.45	401+32.24	Right
110+90.2	110+96.76	Right	500+64.31	500+77.16	Right
111+10.85	111+19.08	Right	501+01.85	501+13.36	Right
104+02.82	104+03.24	Median	501+45.31	501+82.48	Right
104+60.07	104+61.51	Median	501+45.31	501+82.48	Right (BSW)
105+22.75	105+24.45	Median	501+68.04	501+78.76	Left
105+22.75	105+72.69	Median	300+45.84	301+03.45	Right
108+51.13	108+54.13	Median	300+55.79	300+65.54	Left
108+51.13	108+54.13	Median	301+01.18	301+10.02	Left
109+32.81	109+35.34	Median			
109+32.48	109+35.07	Median			
109+60.05	109+62.	Median			
109+60.19	109+62.21	Median			
109+73.31	109+75.43	Median			
109+73.43	109+75.39	Median			
109+85.78	109+86.16	Median			
110+84.88	110+86.93	Median			
110+89.2	110+91.51	Median			
110+90.04	110+92.54	Median			
111+01.83	111+04.65	Median			
111+02.64	111+05.14	Median			
112+25.3	112+25.41	Median			
202+08.42	202+40.64	Left			
203+12.71	203+43.38	Left			
206+00.39	206+14.69	Left			
204+16.27	204+16.31	Median			
204+61.46	204+64.13	Median			
204+62.42	204+64.77	Median			
204+74.56	204+76.99	Median			

ITEM 509. **GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS – STRAIGHT**

Pedestrian Curb Ramps:

WCR 3 LT	WCR 14 LT
WCR 4 RT	WCR 22 LT
WCR 6 RT	WCR 24 LT
WCR 10 LT	WCR 27 LT
WCR 10 RT	WCR 27 RT
WCR 13 RT	WCR 32 LT
	WCR 34 RT

Driveway Transitions:

Drive D1 LT	Drive D13 RT
Drive D1 RT	Drive D14 LT
Drive D2 LT	Drive D14 RT
Drive D2 RT	Drive D15 LT
Drive D3 LT	Drive D15 RT
Drive D3 RT	Drive D16 LT
Drive D4 LT	Drive D16 RT
Drive D4 RT	Drive D17 LT
Drive D5 LT	Drive D17 RT
Drive D5 RT	Drive D18 LT
Drive D6 LT	Drive D18 RT
Drive D6 RT	Drive D19 LT
Drive D7 LT	Drive D19 RT
Drive D7 RT	Drive D20 LT
Drive D8 LT	Drive D20 RT
Drive D8 RT	Drive D21 LT
Drive D9 LT	Drive D21 RT
Drive D9 RT	Drive D22 LT
Drive D10 LT	Drive D22 RT
Drive D10 RT	Drive D23 LT
Drive D11 LT	Drive D23 RT
Drive D11 RT	Drive D24 LT
Drive D12 LT	Drive D24 RT
Drive D12 RT	Drive D25 LT
Drive D13 LT	Drive D25 RT

ITEM 509.1 **GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS – CURVED**

	Radius		Radius
WCR 1 LT	40	WCR 18 RT	44
WCR 1 RT	40	WCR 19 LT	77
WCR 2 LT	30	WCR 19 RT	80
WCR 2 RT	30	WCR 20 LT	50
WCR 5 LT	35	WCR 20 RT	50
WCR 5 RT	35	WCR 21 LT	35
WCR 6 LT	35	WCR 21 RT	35
WCR 7 LT	17	WCR 23 LT	35
WCR 8 RT	40	WCR 23 RT	35
WCR 9 LT	42	WCR 24 RT	35
WCR 9 RT	42	WCR 25 RT	17
WCR 11 RT	15	WCR 26 LT	12
WCR 12 LT	15	WCR 28 RT	65
WCR 15 LT	50	WCR 29 LT	6
WCR 16 LT	35	WCR 30 RT	6
WCR 16 RT	35	WCR 31 LT	36.63
WCR 17 RT	11.2	WCR 33 LT	8
WCR 18 LT	44	WCR 34 RT	8.5

ITEM 514. **GRANITE CURB INLET - STRAIGHT**

Required for proposed CBCI, adjusted CBCI, and rebuilt CBCI where the radius is greater than 160 feet.

ITEM 515. **GRANITE CURB INLET – CURVED**

<u>CBCI</u>	<u>Radius</u>
03	40
06	60
07	35
14	50
16	35
18	15
36	35

ITEM 580. **CURB REMOVED AND RESET**

<u>From Sta</u>	<u>To Sta</u>	<u>From Sta</u>	<u>To Sta</u>
107+58.15	108+40.18	207+12.85	207+67.82
108+73.26	108+86.42	207+91.31	208+25.83
110+67.19	111+17.52	208+99.5	212+89.16
111+45.91	111+66.25	206+89.49	207+83.32
111+73.54	112+86.91	207+90.96	208+44.96
		208+78.4	209+24.22

ITEM 581. **CURB INLET REMOVED AND RESET**

Existing vertical granite curb inlet that will be removed and reused on the project.

ITEM 595. **CURB INLET REMOVED AND DISCARDED**

Station 109+82.13

ITEM 597. **EDGING REMOVED AND DISCARDED**

From Sta	To Sta
105+81.58	106+32.09
107+09.55	107+61.18
109+49.12	109+95.67
110+96.54	111+66.17
111+68.19	112+03.22
204+41.78	204+87.83

ITEM 645.172 **72 INCH CHAIN LINK FENCE (PTR) VINYL COATED (LINE POST OPT.)**

Surrounding BMP

ITEM 650.072 **72 INCH CHAIN LINK GATE WITH GATE POSTS**

114+48 to 144+44 Left (Gate for fence around BMP)

ITEM 653.072 **72 INCH CHAIN LINK FENCE CORNER OR INTERMEDIATE BRACE POST**

Surrounding BMP

ITEM 666. **CHAIN LINK FENCE REMOVED AND RESET**

For use where utilities and redundant water line crosses fences.

ITEM 669. **FENCE REMOVED AND STACKED**

Station
112+50
204+00

ITEM 669.1 **FENCE REMOVED AND DISPOSED**

<u>Start Station</u>	<u>End Station</u>
105+29	106+70
206+95	207+00

ITEM 698.3 **GEOTEXTILE FABRIC FOR SEPARATION**

To be used under splash pads and stone check dam.

ITEM 707.81 **STEEL BOLLARD REMOVED AND RESET**

Engine House Road (Station 500+71), for installation of electric conduit.

ITEM 710.3 **BOUND - LETTERED GRANITE**

<u>Station</u>	<u>Offset</u>	
108+43.6	65.5'	Left
108+43.7	72.6'	Left
109+44.1	72.0'	Left
112+22.3	43.7'	Left
112+45.2	34.0'	Right

ITEM 710.4 **BOUND - PLAIN GRANITE**

Station	Offset	Station	Offset
106+23.3	63.6'	104+30.4	23.9'
110+92.5	54.7'	105+66.7	31.0'
110+96.5	54.0'	107+15.	42.0'
113+57.9	37.3'	109+86.2	42.0'
113+71.9	45.8'	111+18.	33.1'
113+75.2	37.2'	112+45.2	33.9'
114+52.	72.1'	112+92.5	33.9'
114+63.4	37.9'	114+66.5	33.0'
201+59.2	21.6'	115+28.5	32.2'
202+08.2	23.8'	118+25.1	22.1'
202+26.3	95.2'	201+12.5	18.7'
202+30.9	90.8'	202+60.	33.8'
203+60.	38.5'	204+08.7	33.0'
204+63.7	41.9'	205+96.3	35.0'
211+09.8	36.0'	207+31.9	35.0'
212+61.2	19.1'	208+04.9	32.0'
212+61.3	33.7'		

ITEM 714. **MONUMENT REMOVED AND RESET**

Remove and Reset Monument at Station 203+08.

ITEM 715. **RURAL MAIL BOX REMOVED AND RESET**

Station
114+50
202+69

ITEM 718.12 **FLAGPOLE REMOVED AND DISCARDED**

At 121 Iyannough Road

ITEM 765.457 **SEEDING - INFILTRATION BASIN MIX**

To be used for entire infiltration basin footprint including side slopes to elevation 27.50

ITEM 767.121 **SEDIMENT CONTROL BARRIER**

Used at length of Infiltration Basin and outfall replacement

ITEM 767.21 **AGED PINE BARK MULCH**

To be used at #230 Iyannough Road.

ITEM 767.31 **STRAW MULCH**

To be used at infiltration basin

ITEM 801.42 **4 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE)**

From Station	To Station
102+40	107+82
202+00	203+30
201+20	202+00

ITEM 801.44 **4 INCH ELECTRICAL CONDUIT - TYPE NM (4 BANK)**

From Station	To Station
206+32	206+96
206+95	206+95
107+80	107+80
298+00	301+52

ITEM 801.64 **6 INCH ELECTRICAL CONDUIT – TYPE NM (4 BANK)**

Trench
Trench A5
Trench A6
Trench A7
Trench A10
Trench A11
Trench E2

ITEM 801.69 **6 INCH ELECTRICAL CONDUIT - TYPE NM (9 BANK)**

Trench
Trench A1
Trench A2
Trench A8
Trench A9
Trench E1

ITEM 802.42 **4 INCH CATV CONDUIT - TYPE NM (DOUBLE)**

Trench
Trench A1
Trench A2
Trench A4
Trench A5
Trench A6
Trench A7
Trench A8
Trench A9
Trench A10
Trench A11
Trench C1

ITEM 803.42 **4 INCH TELEPHONE CONDUIT - TYPE NM (DOUBLE)**

Trench
Trench A9

ITEM 803.44 **4 INCH TELEPHONE CONDUIT - TYPE NM (4 BANK)**

Trench
Trench A6
Trench A7
Trench A8
Trench A10
Trench A11
Trench T1

ITEM 803.46 **4 INCH TELEPHONE CONDUIT - TYPE NM (6 BANK)**

Trench A1
Trench A2

ITEM 804.2 **2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL)**

For lighting conduit, traffic signal conduit and telephone conduit.

ITEM 804.3 **3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL)**

For lighting conduit, traffic signal conduit and rail signal conduit.

ITEM 804.4 **4 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC -(UL)**

5 Feet per electric handhole

From Station	To Station
206+01.09	206+07.55
206+07.55	206+11.55
107+87.94	108+48.64
297+99.92	29+03.88
206+93.72	206+93.72

ITEM 805.402 **4 INCH CATV CONDUIT TYPE NM - PLASTIC -(UL)**

Trench A3
Trench A12

ITEM 805.403 **4 INCH TELEPHONE CONDUIT TYPE NM - PLASTIC -(UL)**

Trench A3
Trench A4
Trench A5

ITEM 806.6 **6 INCH ELECTRICAL CONDUIT TYPE RM - GALVANIZED STEEL**

For electrical risers

296+92.83	201+69.27
297+42.82	216+22.39
201+19.24	216+72.37

ITEM 807.181 **WORK INSIDE 18 INCH STEEL PIPE CASING FOR TELEPHONE AND CATV**

Includes all work involved with inside of existing 18" steel casing pipe.

ITEM 807.361 **WORK INSIDE 36 INCH STEEL PIPE CASING FOR ELECTRIC**

Includes all work involved with inside of both existing 36" steel casing pipes.

ITEM 811.121 **ELECTRIC MANHOLE**

Station	Station
105+20	203+20
107+80	210+50
109+70	212+60
206+95	

Yarmouth Road North
Engine House Road

ITEM 811.122 **TELEPHONE MANHOLE**

Station
105+30
108+00
108+70
206+80
204+30
210+40
212+50

ITEM 811.123 **ELECTRIC SWITCHING ENCLOSURE**Station

203+00

203+10

Yarmouth Road North

Engine House Road

ITEM 811.201 **ELECTRIC HANDHOLE**

<u>STA</u>	<u>OFF</u>	<u>SIDE</u>
205+99.67	76.57	LT
206+07.04	76.55	LT
206+21.74	90.91	LT
206+93.45	72.78	LT

ITEM 811.202 **CATV HANDHOLE**

<u>STA</u>
105+65.5
107+91.01
109+67.76
109+50
209+70.8
215+61.27
203+32.03
207+02.9
210+48.26
212+06.5

ITEM 811.203 **TELEPHONE HANDHOLE**Station

215+46

ITEM 811.22 **ELECTRIC HANDHOLE - SD2.022**

Station	Offset	Station	Offset	Station	Offset
101+99.65	27.1	108+7.21	30.33	203+40.21	36.39
103+11.60	38.28	109+59.75	30.28	203+29.01	31.52
103+41.50	25.62	109+47.83	70.74	204+18.60	31.18
104+23.90	23.33	109+64.51	43.14	204+65.47	40.99
104+31.87	49.46	109+97.44	48.24	206+1.66	6.85
400+63.24	40.6	110+68.06	71.06	206+3.90	31.3
104+56.12	25.65	110+96.67	42.05	206+28.10	7.04
501+69.15	21.66	111+5.36	51.66	208+0.77	6.55
501+70.99	19.08	112+39.15	32.46	209+79.98	9.36
501+10.56	29.05	112+81.72	39.54	210+38.51	6.64
105+48.29	21.37	113+70.68	37.69	210+49.93	36.58
105+35.31	64.27	114+90.44	31.69	211+12.45	25.53
106+6.86	61.66	116+76.14	26.31	212+36.21	20.08
106+17.43	23.33	118+19.73	21.16	212+35.68	21.31
106+60.77	25.62	202+4.68	25.28	213+64.82	18.23
107+20.50	30.99	300+65.11	18.32	109+65.95	30.3
108+5.94	63.61	203+10.66	45.95	109+65.93	42.2
				109+97.77	48.6
				206+7.59	6.1
				206+3.35	77.9

ITEM 812.10 **LIGHT STANDARD FOUNDATION SD3.010**

Station	Offset
101+99.65	29.94
103+10.21	41.47
104+26.29	25.59
400+66.51	42.76

ITEM 812.13 **LIGHT STANDARD FOUNDATION SD3.013**

Station	Station	Station	Station
101+50	108+08	112+39	208+06
102+84	108+14	113+68	209+82
104+14	109+45	114+94	212+47
104+21	109+63	116+76	211+11
105+26	204+58	118+84	213+61
105+18	206+31	202+91	212+34
106+08	203+30	203+30	111+08
106+13	111+10	202+03	

ITEM 813.40 **WIRE TYPE 8 NO. 10 DIRECT BURIAL**

For general purpose lighting and ground

ITEM 813.42 **WIRE TYPE 8 NO. 6 DIRECT BURIAL**

For general purpose lighting and ground

ITEM 813.46 **WIRE TYPE 8 NO. 1/0 DIRECT BURIAL**

For general purpose lighting and ground

ITEM 813.72 **GROUND ROD 10 FEET. LONG**

For use at all light poles, handholes, and LLCs

ITEM 816.01 **TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO. 1**

Route 28 and Yarmouth Road

ITEM 816.80 **TRAFFIC CONTROL SIGNAL REMOVED AND STACKED**

Route 28 and Yarmouth Road

ITEM 816.81 **TEMPORARY TRAFFIC CONTROL SIGNAL**

Route 28 and Yarmouth Road

ITEM 821.111 **HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET
(18 FOOT POLE)**

Sta. 102+00

Sta. 103+10

Sta. 104+26

Sta. 400+67

ITEM 821.112 **HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET
(25 FOOT POLE)**

Sta. 105+35
Sta. 501+73
Sta. 501+07
Sta. 106+13
Sta. 106+08
Sta. 108+09
Sta. 108+14

ITEM 821.113 **HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET
(30 FOOT POLE)**

Sta. 109+46	Sta. 114+92
Sta. 109+63	Sta. 116+78
Sta. 109+97	Sta. 118+21
Sta. 205+89	Sta. 211+17
Sta. 111+06	Sta. 212+34
Sta. 110+99	Sta. 212+48
Sta. 112+40	Sta. 213+67
Sta. 113+72	

ITEM 821.21 **HIGHWAY LIGHTING POLE (ANCHOR BASE) TWIN 6 FOOT
BRACKET**

Sta. 206+30
Sta. 208+05
Sta. 209+82

ITEM 823.01 **HIGHWAY LIGHTING LUMINAIRE – LED – 7,633 INITIAL LUMENS,
TYPE III.**

Sta. 501+07
Sta. 211+17
Sta. 212+34
Sta. 212+48
Sta. 213+67

ITEM 823.02 **HIGHWAY LIGHTING LUMINAIRE – LED – 16,903 INITIAL LUMENS, TYPE IV.**

Sta. 102+00	Sta. 109+63
Sta. 103+10	Sta. 109+97
Sta. 104+26	Sta. 110+99
Sta. 400+67	Sta. 111+06
Sta. 501+73	Sta. 112+40
Sta. 105+35	Sta. 205+89
Sta. 106+08	Sta. 206+30 (2)
Sta. 106+13	Sta. 114+92
Sta. 108+09	Sta. 208+05 (2)
Sta. 108+11	Sta. 209+82 (2)
Sta. 109+46	Sta. 113+72

ITEM 823.03 **HIGHWAY LIGHTING LUMINAIRE – LED – 9,994 INITIAL LUMENS, TYPE III**

Sta. 113+73
 Sta. 116+78
 Sta. 118+21

ITEM 824.221 **RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOCATION NO. 1**

For mid-block crossing on Yarmouth Road

ITEM 824.62 **INTERNALLY ILLUMINATED BLANK OUT SIGN**

R3-1 and R3-2 blank-out signs

ITEM 826.70 **ELECTRIC SERVICE RISER RELOCATION**

Stations and Offset shown at HH location.

Station	Offset
102+39.71	55.02 LT
107+84.77	85.67 LT
207+04.32	41.79 LT
213+20.11	406.90 LT
215+77.09	904.91 LT
214+36.33	106.92 RT

ITEM 826.71 **ELECTRIC SERVICE RELOCATION**

Stations and Offset shown at HH location.

Station	Offset
103+36.11	56.11 LT
107+88.25	52.84 RT
300+04.51	21.57 LT
201+51.37	25.72 LT
203+85.55	32.58 RT
206+90.91	43.01 RT

ITEM 829. **ROADSIDE GUIDE SIGN (G) - ALUMINUM PANEL (TYPE B)**MA-D1-7-1
MA-D1-7-2
MA-D1-7-3**ITEM 841.7** **SUPPORTS FOR GUIDE SIGN (D6 WITH D8 – SPECIAL DESIGN) STEEL**

Support used for the MA-D1-7 signs

ITEM 847.1 **SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY – STEEL**

Sign 1	Sign 2	Sign 3	# of Assemblies
R1-1			1
R3-17			4
R3-7L			1
R3-7R			2
R3-8d			1
R3-17			5
R4-11			4
R4-4			1
R4-7			6
R8-8			1
R10-7			3
W2-1			1
W2-2			1
W4-2			3
W10-1			2
W10-2L			1
W10-2R			1
MA-M1-5	M3-1		1
MA-D3-1	MA-D3-3		1
MA-D3-4	R1-1		1
MA-D3-5	R1-1		1
R3-2	R4-7		1
R3-7L	R4-7		3
R3-17	R3-17aP		4
R3-17	R3-17bP		5
M4-5	M1-4	M5-1R	1

ITEM 848.1 **SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL**

Sign 1	Sign 2	Sign 3	Total SF
R8-8	R10-6L		11.00
R8-8	R10-6R		11.00
MA-M1-5	M3-3	W4-2	15.00

ITEM 852.11 **TEMPORARY PEDESTRIAN BARRICADE**

Used in Stage 5 for temporary pedestrian accommodations along northeast corner within work zone

ITEM 853.32 **TEMPORARY BARRIER - LIMITED DEFLECTION (TL-2)**

Used in Stages 1B, 1C, 2, and 3A.

ITEM 853.62 **TEMPORARY IMPACT ATTENUATOR UNIDIRECTIONAL, REDIRECTIVE (TL-2)**

Used in Stages 1B, 1C, 2, and 3A.

ITEM 854.1 **PAVEMENT MARKING REMOVAL**

Existing pavement markings will be removed where existing markings conflict with temporary pavement markings.

ITEM 864.061 **6 INCH REFLECTORIZED WHITE LINE (PREFORMED THERMOPLASTIC)**

For use across concrete railroad grade crossing panels.

ITEM 864.062 **6 INCH REFLECTORIZED YELLOW LINE (PREFORMED THERMOPLASTIC)**

For use across concrete railroad grade crossing panels.

ITEM 874.4 **TRAFFIC SIGN REMOVED AND STACKED**

	Number of signs		
W10-1	3	Yarmouth Port	1
R3-7	3	Hyannis Center	1
R4-7	5	Route 28 North	1
M3-3	1	Route 28 South	1
M1-5	2		
W4-2	1		
R3-2	2		
W3-3	2		
NO LEFT TURN AHEAD	1		
R5-1	3		
R1-1	6		
M3-1	1		
W2-1	1		
Route 28	1		

ITEM 903 **3000 PSI, 1.5 IN. 470 CEMENT CONCRETE**

For concrete thrust blocks and used at plugging abandoned pipes.

ITEM 904.01 **CONCRETE OUTLET CONTROL STRUCTURE**

At infiltration basins.

ITEM 986. **MODIFIED ROCK FILL**

To be used for the stone weir and splash pads.

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DOCUMENT A00806

RAILROAD SPECIAL PROVISIONS

MASSACHUSETTS COASTAL RAILROAD

MASSACHUSETTS COASTAL RAILROAD, LLC	
CONTRACT GENERAL CONDITIONS.....	A00806-3 through 36
AGREEMENT FOR PROVISION OF FLAGGING SERVICES (CAPE LINES)	A00806-37 through 46
MASSACHUSETTS COASTAL RAILROAD LLC – HOURLY RATES.....	A00806-47 through 48

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MASSACHUSETTS COASTAL RAILROAD, LLC

CONTRACT GENERAL CONDITIONS

1. ARTICLE 1 - DEFINITIONS:

Wherever used in the Contract Documents the following terms, or pronouns in place of them, are used, the intent and meaning, unless a different intent or meaning is clearly indicated, shall be interpreted as set forth below.

The titles and headings of the Sections, Subsections and Articles herein are intended for convenience of reference and shall not be considered as having bearing on their interpretation.

Terms not defined below shall have their ordinary accepted meanings within the context which they are used. "Webster's Third New International Dictionary of the English Language, Unabridged, Copyright 1961", or subsequent revision thereof, shall provide ordinarily accepted meanings. Words which have a well-known technical or trade meaning when used to describe Work, materials or equipment shall be interpreted in accordance with such meaning.

Addenda: All clarifications, corrections, or changes issued graphically or in writing by the Railroad after the Invitation to Bid but prior to the opening of Bids.

Application for Payment: The form provided by the Railroad which is used by the Contractor in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

Approved or Approval: Means written approval by the Railroad or its authorized representative as defined in paragraph 2.1.

Award: The acceptance, by the Railroad, as approved by the Owner, of the successful Bid.

Bid: The offer of a Bidder, on the prescribed form to perform the Work in accordance with the Contract Documents at the prices quoted.

Bidder: Any individual, firm, corporation or any acceptable combination thereof, or joint venture submitting a Bid for the Work.

Calendar Day: Every day shown on the calendar, beginning and ending at midnight.

Change Order: A written order by the Railroad, approved by the Owner, directing changes to the Contract within its general scope.

Conditions of the Contract: Those portions of the Contract Documents which define the rights and responsibilities of the contracting parties and of others involved in the Work. The Conditions of the Contract include General Conditions, Special Conditions and any other Conditions specified in the Invitation to Bid.

Contract: The Contract Documents form the Contract between the Railroad and the Contractor for the Work to be performed. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral.

Contract Documents: The Contract form, Addenda, the bidding requirements and Contractor's bid (including all appropriate bid tender forms), the General and Special Conditions of the Contract and all other Contract requirements, the Technical Specifications, and other supporting documentation furnished by the Railroad to the Contractor, together with all Change Orders and documents approved by the Railroad and Owner for inclusion, modifications and supplements issued on or after the Effective Date of the Contract.

Contractor: The individual, firm, partnership, corporation, or combination thereof, private, municipal or public, including joint ventures, which as an independent contractor, has entered into Contract with the Massachusetts Coastal Railroad, LLC., as Party or Parties of the Second Part, and who is referred to throughout the Contract Documents by singular number.

Contract Amount: The total monies payable by the Railroad to the Contractor under the terms of the Contract Documents.

Contract Time: The number of Calendar Days or the date specified in the Contract and authorized time extensions which identify how much time the Contractor is allowed to achieve Final Completion.

Consultant: A person, firm, agency or corporation retained by the Railroad or the Owner to prepare Contract Documents, perform construction administration services, inspect the Work, or perform other Project related services.

Defective: An adjective which refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to the Railroad's approval of final payment.

Directive: A written communication to the Contractor from the Railroad, or, under circumstances specified in these General Conditions, the Owner, interpreting or enforcing a Contract requirement or ordering commencement and/or cessation of an item of Work.

Drawings: The drawings which show the character and scope of the Work to be performed and which have been furnished by the Railroad and are by reference made a part of the Contract Documents. (Not applicable to this contract.)

Effective Date of the Contract: The date on which the Contract is fully executed by both Contractor and the Railroad.

Final Completion: The Work (or specified part thereof) progressed to the point that all Work is complete, including final acceptance/commissioning, as determined by the Railroad and the Owner.

General Requirements: Sections of the Contract Documents which contain administrative and procedural requirements as well as requirements for temporary facilities.

Holidays: The Railroad recognizes the following Holidays:

New Year's Day - January 1

Memorial Day - Last Monday in May

Independence Day - July 4

Labor Day - First Monday in September

Thanksgiving Day - Fourth Thursday in November

Christmas Day - December 25

If any holiday listed above falls on a Saturday, Saturday and the preceding Friday are both considered as holidays. If the holiday should fall on a Sunday, Sunday and the following Monday are both considered as holidays.

Install: Means to build into the Work, ready to be used in complete and operable condition and in compliance with the Contract Documents.

Notice of Award: The written notice by the Railroad, approved by Owner, to all Bidders identifying the apparent successful Bidder and establishing the Railroad's intent to execute the Contract when all conditions required for execution of the Contract are met.

Notice to Proceed: A written notice to the Contractor to begin the Work and establishing the date on which the Contract Time begins.

Owner: Massachusetts Department of Transportation (MassDOT).

Project: The total construction, of which the Work performed under the Contract Documents, is the whole or a part.

Project Schedule: The schedule for the Project shall be prepared by the Contractor in conformance with the provisions of the Contract Documentation and submitted to the Railroad for approval.

Program Manager: The authorized representative of the Railroad who is responsible for administration of the Contract. This includes the Chief Engineer.

Railroad: Massachusetts Coastal Railroad, LLC.

Railroad Officer: The person authorized to enter into and administer the Contract on behalf of the Railroad and who has authority to make findings, determinations and decisions with respect to the Contract and, when necessary, to modify or terminate the Contract.

Regulatory Requirements: All laws, rules, regulations, ordinances, codes and/or orders applicable to the Work and the Work's impact upon the Railroad operation.

Request for Bid: The announcement inviting Bids for Work to be performed and/or materials to be furnished.

Shop Drawings: All Drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a supplier and submitted by the Contractor to illustrate material, equipment, fabrication, or erection for some portion of the Work.

Technical Specifications: Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative and procedural details applicable thereto.

Subcontractor: An individual, firm, or corporation to whom the Contractor sublets part of the Contract. However, the Contractor remains responsible for the work of the Contract.

Substantial Completion: Although not fully completed, the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Railroad as evidenced by its written notice, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to Substantial Completion thereof.

Unit Price Work: Work to be paid for on the basis of unit prices.

Work: Work is the act of, and the result of, performing services, furnishing labor, furnishing and incorporating materials and equipment into the Project and performing other duties and obligations, all as required by the Contract Documents. Such Work, however incremental, will culminate in the entire completed Project, or the various separately identifiable parts thereof.

2. ARTICLE 2 – AUTHORITIES AND LIMITATIONS:

2.1 RAILROAD’S AUTHORITY AND LIMITATIONS:

- 2.1.1 The Railroad alone shall have the power to bind the Railroad and to exercise the rights, responsibilities, authorities and functions vested in the Railroad by the Contract Documents, except that the Railroad shall have the right to designate in writing authorized representatives, in addition to and/or in lieu of the Program Manager, to act for the Railroad.
- 2.1.2 The Contractor shall perform the Work in accordance with any written order (including but not limited to instruction, direction, interpretation or determination) issued by an authorized representative in accordance with the authorized representative’s authority to act for the Railroad.
- 2.1.3 The Contractor assumes all the risk and consequences of performing the Work in accordance with any order (including but not limited to instruction, direction, interpretation or determination) of anyone not authorized to issue such order, and of any order not in writing.
- 2.1.4 The term “Railroad” when used in the text of these General Conditions or other Contract Documents following this section shall also mean any duly authorized representative of the Railroad when authorized in accordance with Paragraph 2.1.1.

2.2 EVALUATION BY RAILROAD

- 2.2.1 The Railroad will decide all questions which may arise as to:
 - 2.2.1.1 Quality and acceptability of materials furnished;
 - 2.2.1.2 Quality and acceptability of Work performed;
 - 2.2.1.3 Compliance with the Project Schedule;
 - 2.2.1.4 Interpretation of Contract Documents
 - 2.2.1.5 Acceptable fulfillment of the Contract on the part of the Contractor

2.3 MEANS & METHODS

- 2.3.1 The means, methods, techniques, sequences or procedures of construction, or safety precautions and the program incident thereto, and the failure to perform or furnish the Work in accordance with the Contract Documents are the sole responsibility of the Contractor.

2.4 VISITS TO SITE

- 2.4.1 The Railroad will make visits to the site(s), any off-site fabrication sites and approved remote storage sites at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents.

ARTICLE 2 – Authorities and Limitations (continued):

- 2.4.2 Such observations or the lack of such observations shall in no way relieve the Contractor from his duty to perform the Work in accordance with the Contract Documents.

2.5 OWNER’S AUTHORITY AND LIMITATIONS

- 2.5.1 The Owner alone shall have the power to exercise the rights, responsibilities, authorities and functions vested in the Owner, by virtue of the Owner’s ownership of the railroad property, including the real property and improvements thereon, and by virtue of a certain contracts between the Owner and the Railroad, including, without limitation, the License and Operating Agreement by and between Massachusetts Department of Transportation (formerly the Executive Office of Transportation and Public Works (“MassDOT”) and the Massachusetts Coastal Railroad, LLC (“Mass Coastal Railroad” or “MCRR” or the “Railroad”) dated September 27, 2007, and the terms and conditions set forth in the contract between MassDOT and MCRR regarding repairs and improvements to certain MassDOT-owned rail lines and properties dated March 4, 2014 (as amended) (the “2014-2015 SE Lines Contract”) (collectively, the “MassDOT / MCRR Agreements”).
- 2.5.2 By virtue of the above referenced MassDOT / MCRR Agreements and otherwise, the Owner is and shall remain a third party beneficiary of the Contract.
- 2.5.3 The Owner and its representatives shall have the right to enter upon the Work site, to inspect the Work and related materials and equipment for compliance with the Contract Documents and the Owner’s requirements, and to otherwise exercise the Owner’s rights with respect to the railroad property, improvements thereto, the MassDOT / MCRR Agreements, and the Project.
- 2.5.4 The Owner and its representatives shall coordinate with the Railroad and its Program Manager and/or other Railroad representatives in the exercise of the Owner’s rights with respect to the Project, and shall, in general, exercise its rights through the Railroad.
- 2.5.5 In the event that Railroad is unable or fails to properly exercise its rights and authority with respect to the Project or the Contract, or the Railroad is unable or fails to meet its obligations with respect to the Project or the Contract, then the Owner shall have the right, but not the obligation, following written notification to the Railroad and the Contractor, to assume all of the rights and obligations of the Railroad pursuant to the Contract.
- 2.5.6 The Owner shall have no obligations to, or direct contractual relationship with the Contractor, unless and until the Owner assumes the obligations of the Railroad as aforesaid.
- 2.5.7 The Owner’s rights hereunder shall survive the termination or expiration of the Contract.

3. ARTICLE 3 – CONTRACT DOCUMENTS - INTENT, AMENDING:**3.1 INCOMPLETE CONTRACT DOCUMENTS**

- 3.1.1 The execution of the Contract by the Contractor is considered a representation that the Contractor examined the Contract Documents to make certain that all sheets and pages were provided and that the Contractor is satisfied as to the conditions to be encountered in performing the Work.
- 3.1.2 The Railroad expressly denies any responsibility or liability for a Bid submitted on the basis of an incomplete set of Contract Documents.

3.2 COPIES OF CONTRACT DOCUMENTS

- 3.2.1 The Railroad shall furnish to the Contractor up to two copies of the Contract Documents.

3.3 SCOPE OF WORK

- 3.3.1 The Contract Documents comprise the entire Contract between the Railroad and the Contractor concerning the Work.
- 3.3.2 The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the current practices regarding the Work of the Project. If a conflict or question arises within the Contract Documents, the Program Manager's interpretation will govern.

3.4 INTENT OF CONTRACT DOCUMENTS

- 3.4.1 It is the intent of the Contract Documents to describe a functionally complete Project to be constructed in accordance with the Contract Documents.
- 3.4.2 Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied, without any adjustment in Contract Amount or Contract Time, whether or not specifically called for.
- 3.4.3 Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the requirements of any governmental authority, whether such reference be specific or by implication, shall mean the edition stated in the Contract Documents or, if not stated, the latest standard specification, manual, code or requirements in effect at the time of advertisement for the Project (or, in the Effective Date of the Contract if there was no advertisement).
- 3.4.4 However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the Railroad and the Contractor, or any of their subcontractors, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the Railroad or any of the Railroad's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

ARTICLE 3 – Contract Documents - Intent, Amending (continued):

- 3.4.5 Unless otherwise specified in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Any question or conflict within regard to interpretation will be resolved by the Program Manager.

3.5 DISCREPANCY IN CONTRACT DOCUMENTS

- 3.5.1 Before undertaking the Work, the Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures, and dimensions shown thereon and all applicable field measurements.
- 3.5.2 Work in the area by the Contractor shall imply verification of figures, dimensions and field measurements.
- 3.5.3 If, during the above study or during the performance of the Work, the Contractor finds a conflict, error, discrepancy or omission in the Contract Document, or a discrepancy between the Contract Documents and any standard specification, manual, code, or regulatory requirement which affects the Work, the Contractor shall promptly report such discrepancy in writing to the Railroad.
- 3.5.4 The Contractor shall obtain a written interpretation or clarification from the Railroad before proceeding with any Work affected thereby.
- 3.5.5 However, the Contractor shall not be liable to the Railroad for failure to report any conflict, error or discrepancy in the Contract Documents unless the Contractor had actual knowledge thereof or should reasonably have known thereof.

3.6 DISCREPANCY – ORDER OF PRECEDENCE

- 3.6.1 When conflicts, errors, or discrepancies within the Contract Documents exist, the order of precedence from most governing to least governing will be as follows:
 - 3.6.1.1 Scope of Work and Specifications
 - 3.6.1.2 General Conditions
- 3.6.2 The Contractor shall not take advantage of any apparent error or omission in the Contract Documents. If the Contractor discovers an error or omission, the Railroad shall be promptly notified. The Railroad will make corrections and interpretation as necessary to fulfill the intent of the Contract.

3.7 CLARIFICATIONS AND INTERPRETATIONS

- 3.7.1 The Railroad will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as the Railroad may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

4. ARTICLE 4 – LANDS AND PHYSICAL CONDITIONS:

4.1 VISIT TO SITE

- 4.1.1 The execution of the Contract by the Contractor is considered a representation that the Contractor has visited and carefully examined the site and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the Contract Documents.

4.2 UTILITIES

- 4.2.1 The Contractor shall have full responsibility for:
 - 4.2.1.1 Reviewing and checking all information and data concerning utilities.
 - 4.2.1.2 Locating all underground utilities shown or indicated in the Contract Documents which are affected by the Work.
 - 4.2.1.3 Coordination of the Work with the owners of all utilities during construction.
 - 4.2.1.4 Safety and protection of all utilities.
 - 4.2.1.5 Repair of any damage to utilities resulting from the Work.

5. ARTICLE 5 – INSURANCE:

5.1 INSURANCE REQUIREMENTS

- 5.1.1 In addition to any other forms of insurance or bonds required under the Contract, and except to the extent that any of the requirements of this Article are expressly waived in writing by Railroad, the Contractor shall, at its sole cost and expense, obtain, carry and maintain throughout the life of this Contract, insurance not less than the amounts and coverage herein specified, and the Railroad and the Owner shall be named as an additional named insureds under the insurance coverage so specified, with respect to the performance of the Work. Provided, however, that the Owner need not be an additional insured on the Railroad Protective Liability insurance policy referenced herein.
- 5.1.2 There shall be no right of subrogation against the Railroad, the Owner or their agents performing work in connection with the Work, and this waiver of subrogation shall be endorsed upon the policies.
- 5.1.3 Insurance shall be placed with the companies licensed to do business in the Commonwealth of Massachusetts and these policies providing coverage there under shall contain provisions that no cancellation or material changes in the policy shall become effective except upon 30 days prior written notice thereof to the Railroad, the Owner and any other co-insureds.
- 5.1.4 Prior to commencement of the Work, the Contractor shall furnish certificates to the Railroad, in duplicate, evidencing that the insurance policy provisions required hereunder are in force.
- 5.1.5 Acceptance by the Railroad of deficient evidence of insurance does not constitute a waiver of Contract insurance requirements.
- 5.1.6 The Contractor shall furnish the Railroad with certified copies of policies upon request. The minimum coverages and limits required are as follows:
 - 5.1.6.1 Worker's Compensation insurance in accordance with the statutory coverages required by the Commonwealth of

- Massachusetts and Employers' Liability insurance with limits not less than One Million Dollars (\$1,000,000) for bodily injury by accident, each accident; One Million Dollars (\$1,000,000) for bodily injury by disease, policy limit; and One Million Dollars (\$1,000,000) for bodily injury by disease, each employee, and, where applicable, insurance in compliance with any other statutory obligations.
- 5.1.6.2 Public Liability or Commercial General Liability insurance with limits not less than Two Million Dollars (\$2,000,000) per occurrence and Six Million Dollars (\$6,000,000) aggregate for Bodily Injury and Property Damage, including coverage for Premises and Operations Liability, Products and Completed Operations Liability, Contractual Liability, Broad Form Property Damage Liability and Personal Injury Liability. Coverage shall not contain any exclusions of Explosion, Collapse, or Underground conditions. An umbrella policy may be utilized to satisfy the required limits of liability under this section.
- 5.1.6.3 Commercial Automobile Liability on all owned, non-owned, hired and rented vehicles used in connection with the work to be performed hereunder, with limits of liability of not less than Two Million Dollars (\$2,000,000) Combined Single Limit for Bodily Injury and Property Damage per each accident or loss.
- 5.1.6.4 5.1.6.4 Railroad Protective Liability Insurance (ISO-RIMA FORM) with a limit of not less than Two Million Dollars (\$2,000,000) per occurrence, combined single limit for bodily injury and/or property damage, for all damages arising out of bodily injuries to or death of all persons and for damage to or destruction of property, including the loss of use thereof. Such insurance shall also contain an aggregate of not less than Six Million Dollars (\$6,000,000) for damages arising out of more than one occurrence.
- 5.1.6.5 If Work involves use of watercraft, Protection and Indemnity insurance with limits not less than \$5,000,000 per occurrence. Hull and Machinery coverage is to be carried on the vessel for the full current market value. This coverage requirement may be waived at the discretion of the Railroad if the Contractor self-insures the equipment and will waive all rights of recovery against the Railroad in writing.
- 5.1.6.6 Where applicable, Professional Liability insurance with limits of not less than \$1,000,000 per claim and \$2,000,000 aggregate, subject to a maximum deductible \$10,000 per claim.
- 5.1.6.7 If Contractor is engaged for Environmental Abatement or Remediation work , or if Contractor's work will involve use, treatment, storage, removal or transport of Hazardous materials at, to, or from the site, Contractor must obtain Contractor's Pollution Liability or equivalent coverage in an amount not less than \$1,000,000 per occurrence or the limit carried by Contractor, whichever is greater, and shall provide continuous protection after policy expiration (without a "sunset clause") for all occurrences during the term of this Agreement. If Contractor's work presents a pollution exposure potential, including but not limited to plumbing services, HVAC, window and roof repair/replacement, painting, excavation, or if contractor uses hazardous chemicals or

substances, Contractor must carry a Contractor's Pollution Liability policy with limits not less than \$1,000,000 per occurrence, and \$2,000,000 in the aggregate for bodily injury and property damage. Such insurance shall be made available solely for the Services hereunder. The insurance policy shall cover the liability of the Contractor during the process of removal, storage, transport and disposal of hazardous waste and contaminated soil and/or asbestos abatement. The policy shall include coverage for on-Site and off-Site bodily injury and loss of, damage to, or loss of use of property, directly or indirectly arising out of the discharge, dispersal, release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gas, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water course or body of water, whether it be gradual or sudden and accidental. The policy shall also include defense and clean-up costs. Contractor shall comply with all policy warranties, and shall do nothing to invalidate coverage.

5.1.6.8 All insurance policies as described above are required to be written on an "occurrence" basis. In the event occurrence coverage is not available, the Contractor agrees to maintain "claims made" coverage for a minimum of two years after Project Completion.

5.1.6.9 In the event of loss or damage to the Owner's real property or improvements thereto which is caused by the act or omission of the Contractor or its agents, insurance payments shall be made to the Commonwealth of Massachusetts or MassDOT, at the Owner's election, and the Owner shall reimburse Railroad from the proceeds of such payments for appropriate, documented costs incurred by Railroad in repairing such damage.

5.2 NOT USED

5.3 NOT USED

5.4 NOT USED

5.5 INDEMNIFICATION

5.5.1 The Contractor shall indemnify, save harmless, and defend the Railroad, the Owner and their respective agents and employees from any and all claims or actions for injuries or damages sustained by any person or property arising directly or indirectly from the Work or the contractor's performance of this Contract; provided, however, that this provision has no effect if, but only if, the sole proximate cause of the injury or damage is the negligence of the Railroad or its agents. Provided further, that the Owner shall have no liability for the Railroad's negligent acts or failures to act.

5.5.2 Contractor shall assume all responsibility for any and all loss or damage arising out of the acts or omissions of the Contractor, the officers, directors, agents, and employees of Contractor, and of all sub-contractors of the Contractor, with respect to any act or omission not authorized by this Contract on the part of Contractor or any person or agent employed by it. Except as provided herein, Contractor shall not be entitled to claim or receive from Railroad or Owner any sum whatsoever for any work provided herein by reason or on account of any delay caused in the Project.

5.5.3 Contractor shall be responsible for and shall protect, indemnify, defend and hold harmless the Railroad (including Railroad's parent companies, affiliates, and subsidiaries), the Owner, and the officers, directors, employees, agents (including Consultants) and subsidiary agencies of the Owner (including without limitation MassDOT and the Massachusetts Bay Transportation Authority ("MBTA") (hereinafter "Indemnified Persons"), from and against any and all claims, losses,

damages, liability, costs, or actions (including but not limited to attorneys' fees) which such Indemnified Person may suffer or which such Indemnified Person may be held liable for, by reason of injury (including death) to any person or persons, or damage to any property arising out of or resulting from, directly or indirectly, the acts or omissions of the Contractor, excepting to the extent such losses, damages, liability, costs or actions are caused by the negligence of the Indemnified Person.

- 5.5.4 Contractor shall be responsible for and shall protect, indemnify, defend and hold harmless the Indemnified Persons from and against any and all claims, losses, damages, liability, costs, or actions (including but not limited to attorney's fees) arising out of or resulting from, directly or indirectly, the performance of all or any part of the Contract; the use of any equipment, explosives, materials, or chemicals by Contractor hereunder; the performance of the Work of the Project; or claims or actions which may be attributable to any defect in the equipment used or arising from the material or any article used therein or from the design, testing, or use thereof or from any maintenance, storage, service, repair, overhaul, or testing of the equipment, materials, or chemicals used, regardless of when such defect shall be discovered, excepting to the extent such losses, damages, liability, costs or actions are caused by the negligence of the Indemnified Person.
- 5.5.5 Without limiting the generality of the foregoing, it is the clear intent of the Parties that the Indemnified Persons be indemnified and defended for any and all products liability, strict liability or strict products liability and/or the negligence of an Indemnified Person. Contractor shall protect, indemnify, defend and hold harmless such Indemnified Persons and their parties, excepting to the extent such losses, damages, liability, costs or actions are caused by the negligence of the Indemnified Person.
- 5.5.6 Furnishing of insurance by the Contractor as required herein shall not limit the Contractor's liability hereunder, but shall be additional security therefore.

6. ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES:

6.1 SUPERVISION OF WORK

- 6.1.1 The Contractor shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- 6.1.2 All Work under this Contract shall be performed in a skillful and workmanlike manner. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.
- 6.1.3 The Contractor shall keep on the Work at all times during its progress a competent resident superintendent.
- 6.1.4 The superintendent will be the Contractor's representative at the site and shall have full authority to act and sign documents on behalf of the Contractor.
- 6.1.5 All communications given to the superintendent shall be as binding as if given to the Contractor.
- 6.1.6 The Contractor shall cooperate with the Railroad in every way possible.
- 6.1.7 RWP: All employees of the Contractor shall be required to attend a 4-hour railroad Roadway Worker Protection course (RWP) at no cost to the Project. See Paragraph 6.14.

6.2 CHARACTER OF WORKERS

- 6.2.1 The Contractor shall provide a sufficient number of competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents.
- 6.2.2 The Contractor shall at all times maintain good discipline and order at the site.
- 6.2.3 The Railroad may, in writing, require the Contractor to remove from the Work any employee the Railroad deems incompetent, careless, or otherwise detrimental to the progress of the Work, but the Railroad shall have no duty to exercise this right.

6.3 CONTRACTOR TO FURNISH

- 6.3.1 Unless otherwise specified in the Contract Documents, the Contractor shall furnish and assume full responsibility for all materials, equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.4 MATERIALS AND EQUIPMENT

- 6.4.1 All materials and equipment shall be of specified quality and new, except as otherwise provided in the Contract Documents. If required by the Railroad or the Owner, the Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment.

6.5 ANTICIPATED SCHEDULES

- 6.5.1 The construction of this project shall be planned and recorded with a suitable Project Schedule methodology. The Project Schedule shall be used for coordination and monitoring of all Work under the Contract including all activity of subcontractors, manufacturers, supplies, utility companies and review activity of the Railroad. Within a reasonable time prior to the preconstruction conference, the Contractor shall submit for Railroad's approval, a detailed initial Project Schedule. The Project Schedule shall meet the requirements set forth below. The construction time for the entire project shall not exceed the specified Contract Time. Following the Railroad's and the Owner's review, if revisions to the proposed Project Schedule are required, the Contractor shall do so promptly. The Project Schedule must be finalized within 14 days of the Notice to Proceed.
- 6.5.2 The Project Schedule shall be presented to the Railroad and shall include a description of major project activities, the duration of each of the project activities, the resources required for each of the project activities, and the progress payment values assigned to the completed work including:
 - 6.5.2.1 Labor, showing workdays per week, holidays, shifts per day, men per shift, and hours per shift;
 - 6.5.2.2 Equipment, including the number of units of each type equipment and materials.
- 6.5.3 Before proceeding with any Work on site, the Contractor shall prepare, submit, and receive the Railroad's approval of a preliminary Project Schedule. The preliminary Project Schedule shall provide a detailed breakdown of activities scheduled for the first 14 days of the project and summary of activities for Work beyond 14 days. Said preliminary Project Schedule shall include mobilization, submittals, procurement, and construction.
- 6.5.4 No Work may be pursued at the site without an approved preliminary Project Schedule or an approved Project Schedule. A finalized Project Schedule with detailed breakdown of activities for the entire contract period shall be submitted prior to the first progress payment and accepted prior to application of the second progress payment.

6.6 ADJUSTING SCHEDULES

- 6.6.1 Job site progress meetings will be held weekly by the Railroad and the Contractor for the purpose of updating the Project Schedule, reviewing the progress of the Work, determining upcoming work activities and resolving problems and issues related to the Work.
- 6.6.2 The Contract Time will be adjusted only for causes specified in this Contract.

6.7 NOT USED

6.8 NOT USED

6.9 SUBSTITUTE MEANS AND METHODS

- 6.9.1 If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, the Contractor may furnish or utilize substitute means, method, sequence, technique or procedure of construction acceptable to the Railroad and the Owner, if the Contractor submits sufficient information to allow the Railroad and the Owner to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents.

6.10 CONTRACTOR DAILY REPORTING

- 6.10.1 Contractor shall prepare and submit to the Railroad within two business days of each completed work shift a "Daily Activities Report" which is to include: 1. A summary of all activity on each job site; 2. A list of all manpower on site (by craft and job assignment) including Foremen and other supervisory staff on site; 3. A list of all equipment on each job site; 4. A list of all materials delivered to site and/or removed from site and used on site during the work period; 5. Weather conditions (beginning of work shift and mid-shift); and any other information the Railroad may require to have an accurate record of daily work activity.

6.11 USE OF PREMISES

- 6.11.1 The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project limits and approved remote storage sites, lands and areas, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.
- 6.11.2 The Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the Work.
- 6.11.3 Should any claim be made against the Railroad or the Owner by any such owner or occupant because of the performance of the Work, the Contractor shall defend, indemnify and hold the Railroad, the Owner, and their agents harmless therefrom.

6.12 RECORD DOCUMENTS

- 6.12.1 The Contractor shall maintain in a safe place at the site one record copy of all Technical Specifications, Addenda, field memos, work orders, Change Orders, supplemental agreements, and written interpretations and clarifications in good order and annotated to show all changes made during construction.
- 6.12.2 Upon completion of the Work, two (2) sets of the annotated record documents, samples and Shop Drawings shall be delivered to the Railroad.
- 6.12.3 Record documents shall accurately record variations in the Work which vary from requirements shown or indicated in the Contract Documents.

6.12.4 The Contractor shall furnish, upon completion of the work and as a condition for receiving final payment, as-built plans for all Work, specifically “as-built” plans providing “as-built” information for all plans contained within the Contract Documents originally issued and/or updated by MCRR or MassDOT.

6.12.5 **NOT USED**

6.12.6 **NOT USED**

6.13 SAFETY AND PROTECTION

6.13.1 The Contractor alone shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

6.13.2 The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.13.2.1 All employees on the Work and other persons and organizations who may be affected thereby; All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.13.2.2 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

6.13.3 In the performance of this Contract, the Contractor shall comply with all applicable federal, state, and local laws governing safety, health, and sanitation. The Contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the Railroad may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the Work covered by the Contract.

6.13.4 The Contractor shall notify owners of adjacent property and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property.

6.13.5 All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor, supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor with no change in Contract Amount or Contract Time except damage or loss attributable to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God, or the public enemy or governmental authorities.

6.13.6 The Contractor’s duties and responsibilities for the safety and protection of the Work shall continue until Final Completion except as otherwise expressly provided in connection with Substantial Completion.

6.13.7 The Contractor shall designate a responsible safety representative at the site. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Railroad.

6.14 WORKER SAFETY ON RAILROAD PROPERTY

6.14.1 The safety of personnel, property, rail operations, and the public is of paramount importance in the prosecution of the Work pursuant to this Contract. As

reinforcement and in furtherance of overall safety measures to be observed by Contractor (and not by way of limitation), the following special safety rules shall be followed while working for the Railroad on the railroad property. Further railroad safety information may be obtained in the Special Conditions.

- 6.14.2 In the event Contractor or its subcontractor will be performing construction or other activities on or in close proximity to a railroad track, the Contractor shall be responsible for compliance with the Federal Railroad Administration's Roadway Worker Protection ("RWP") regulations (49 CFR 214, Subpart C). Under 49CFR 214, Subpart C, railroad Contractors are responsible for the training of their employees on these regulations. All RWP related Work shall be conducted in strict compliance with the RWP safety standards set forth in 49 CFR 214, Subpart C and the Contractor will be required to have all of its personnel who will be on or in close proximity to a railroad track to attend all and any RWP safety classes conducted by the Railroad for the benefit of the Contractor's employees at cost of \$125.00 per person.
- 6.14.3 In the event Contractor will be performing construction or other activities on a railroad bridge, the provisions of 49 CFR 214 Subpart B regarding Bridge Worker Safety shall apply. All bridge related Work shall be conducted in strict compliance with the Safety Standards set forth in 49 CFR 214.
- 6.14.4 Contractor shall arrange with Railroad to keep itself informed on the time of arrival of all trains and shall stop any of Contractor's or subcontractor's operations which might be or cause a hazard to the safe passage of the train past the Work site from 10 minutes before the expected arrival of the train until it has passed or at any other time as directed by the flagman.
- 6.14.5 Railroad flag protection is required before any activity can occur on or near a railroad operating facility such as a track, yard, bridge or shop building. For incidental work, such as surveying or inspection, a Railroad qualified flagman will provide a safety briefing prior to the commencement of the Work to discuss how and when protection from train traffic is to be provided. For any activity involving a disturbance or potential disturbance to the track, track embankment, or any railroad facility, the Railroad may require a specific Railroad Safety Plan prior to startup. Projects which involve activities which cross the tracks or are longitudinal to the tracks will require a specific Railroad Safety Plan and a training course administered by the Railroad for Contractor's project supervisors prior to the initiation of Work on Railroad property.
- 6.14.6 The Contractor shall arrange for Railroad flag protection when performing any Work within 20 feet of any track. All Work within 20 feet of the track shall cease when a train passes and all Contractor employees shall maintain a distance of at least 20 feet from the track until the train has safely passed. In addition, any Work that could come within 20 feet of the track will cease when a train passes. For example, crane or pile driving activities shall stop when trains pass when the maximum boom and suspended load radius can come within 20 feet of the tracks. Pile driving shall not be done when trains are passing the Work site. Vehicles and other construction equipment shall not be operated or parked closer than 20 feet from any track without Railroad flag protection.
- 6.14.7 Track outages require Railroad's prior approval. Prior to a proposed track outage, the Contractor shall submit a closure plan to Railroad for approval. The plan will describe the Work to be accomplished, the equipment, manpower and other

resources required, and the schedule. Once approved by Railroad, the Contractor shall follow the plan. Railroad reserves the right to assume control of the Work to reestablish rail service if the schedule is not met. Contractor shall bear all costs and damages which may result from failure to meet the closure schedule

- 6.14.8 Whenever a Railroad flagperson /Employee-in-Charge (EIC) is required for performance of the Work, he or she will be provided by the Railroad at no expense to the Contractor. A minimum of 72 hours' notice is required for the scheduling of Railroad flag protection. Requests for EIC are to be made to Roadmaster Mark Renker at mrenker@masscoastal.com or (508) 989-6856

6.15 EMERGENCIES

- 6.15.1 In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Railroad, is obligated to act to prevent threatened damage, injury or loss.
- 6.15.2 The Contractor shall give the Railroad prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Documents is required because of the action taken in response to an emergency.

6.16 CONTINUING THE WORK

- 6.5.1 The Contractor shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the Railroad.
- 6.5.2 No Work shall be delayed or postponed pending resolution of any disputes, disagreements, or claims except as the Contractor and the Railroad may otherwise agree in writing.

6.17 CONSENT TO ASSIGNMENT

- 6.17.1 The Contractor shall obtain the prior written consent of the Railroad and the Owner to any proposed assignment of any interest in, or part of this Contract.
- 6.17.2 The consent to any assignment or transfer shall not operate to relieve the Contractor of any of his or its obligations under this Contract.
- 6.17.3 Nothing herein contained shall be construed to hinder, prevent, or affect an assignment of monies due, or to become due hereunder, made for the benefit of the Contractor's creditors pursuant to law.

6.18 CONTRACTOR'S RECORDS

- 6.18.1 Records of the Contractor and subcontractor(s) relating to personnel, payrolls, invoices of materials, and any and all other data relevant to the performance of the Contract, must be kept on a generally recognized accounting system.
- 6.18.2 Such records must be available during normal work hours to the Railroad and the Owner for purposes of investigation to ascertain compliance with provisions of the Contract Documents.
- 6.18.3 Payroll records must contain the name and address of each employee, his correct classification, social security number, rate of pay, daily and weekly number of hours of worked, deductions made, and actual wages paid and any other information required by the U.S. and/or State Department of Labor.
- 6.18.4 The Contractor and subcontractor(s) shall make employment records available for inspection by the Railroad, the Owner, and their respective representatives,

and will permit such representatives to interview employees during working hours on the Project.

6.18.5 Records of all communications between the Railroad and the Contractor and other parties, where such communications affected performance of this Contract, must be kept by the Contractor and maintained for a period of three years from Final Completion.

6.18.6 The Railroad, the Owner, or their respective assigned representatives may perform an audit of these records during normal work hours after written notice to the Contractor.

7. ARTICLE 7 – LAWS AND REGULATIONS:

7.1 LAWS TO BE OBSERVED

7.1.1 The Contractor shall keep fully informed of all federal and Commonwealth of Massachusetts regulatory requirements and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or which in any way affect the conduct of the Work.

7.1.2 The Contractor shall at all times observe and comply with all such regulatory requirements, orders and decrees; and shall defend and indemnify the Railroad and its representatives against claim or liability arising from or based on the violation of any such regulatory requirement, order, or decree whether by the Contractor, subcontractor(s), or any employee of either.

7.1.3 Except where otherwise expressly required by applicable regulatory requirements, the Railroad shall not be responsible for monitoring Contractor's compliance with any regulatory requirements.

7.2 SANITARY PROVISIONS

7.2.1 The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees and Railroad representatives in strict accordance with the requirements of the State and local Boards of Health, OSHA or of other bodies or tribunals having jurisdiction.

7.3 WAGES AND HOURS OF LABOR

7.3.1 The Contractor shall maintain certified payrolls bearing an original signature for the Railroad on a weekly basis and shall retain copies of the payrolls for a minimum of three (3) years.

7.3.2 The certification shall affirm that the payrolls are current and complete, that the wage rates contained therein are not less than any applicable rates referenced in the Contract Documents, and that the classification set forth for each laborer or mechanic conforms with the work he performed.

7.3.3 The Contractor shall attend all hearings and conferences and produce such books, papers, and documents all as requested by the Railroad.

8. ARTICLE 8 – CHANGES:

8.1 OWNER'S RIGHT TO CHANGE

- 8.1.1 Without invalidating the Contract, the Railroad may, in accordance with the MassDOT authorization, direction and/or approval, order additions, deletions or revisions to the Work.

8.2 DIRECTIVE

- 8.2.1 The Railroad shall provide written clarification or interpretation of the Contract Documents pursuant to paragraph 3.7.
- 8.2.2 The Railroad may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Amount or the Contract Time and are consistent with the overall intent of the Contract Documents.
- 8.2.3 The Railroad may order the Contractor to correct defective work or methods which are not in conformance with the Contract Documents.

8.3 CHANGE ORDER

- 8.3.1 A change in Contract Time, Contract Amount, or responsibility may be made for changes within the scope of the Work only by Change Order which must be requested in advance of performing any Work by the Contractor.
- 8.3.2 Upon receipt of an executed Change Order indicating approval of the Work by the Railroad and the Owner, the Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents except as otherwise specifically provided.
- 8.3.3 Changes in Contract Amount and Contract Time shall be made in accordance with Articles 10 and 11. NO ADDITIONAL WORK SHALL BE UNDERTAKEN, NO ADDITIONAL COSTS OR EXTENSIONS OF TIME MAY BE CONSIDERED OR OCCUR WITHOUT MASSDOT'S EXPRESS WRITTEN AUTHORIZATION, IN ADVANCE.

8.4 UNAUTHORIZED WORK

- 8.4.1 The Contractor shall not be entitled to an increase in the Contract Amount or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in this Article 8, except in the case of an emergency as provided in paragraph 6.15.

8.5 DIFFERING SITE CONDITIONS

- 8.5.1 The Contractor shall promptly, and before such conditions are disturbed (except in an emergency as permitted by paragraph 6.15), notify the Railroad in writing of:
 - 8.5.1.1 Subsurface or latent physical conditions at the site differing materially from those indicated in the Contract, and which could not have been discovered by a careful examination of the site, or
 - 8.5.1.2 Unknown physical conditions at the site, or an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in this Contract.

- 8.5.2 The Railroad shall promptly investigate the conditions, and if the Railroad finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or time required for, performance of this Contract, an equitable adjustment shall be made and the Contract modified in writing accordingly.
- 8.5.3 Any claim for additional compensation by the Contractor under this clause shall be made in accordance with Article 14 and shall not be allowed unless the Contractor has first given the notice required by this Contract.
- 8.5.4 In the event that the Railroad and the Contractor are unable to reach an agreement concerning an alleged differing site condition, the Contractor will be required to keep an accurate and detailed record which will indicate the actual cost of the Work done under the alleged differing site condition.
- 8.5.5 Failure to keep such a record shall be a bar to any recovery by reason of such alleged differing site conditions. The Railroad shall be given the opportunity to supervise and check the keeping of such records.

9. ARTICLE 9 – CONTRACT AMOUNT – COMPUTATION AND CHANGE:

9.1 CONTRACT AMOUNT

- 9.1.1 The Contract Amount constitutes the total compensation (subject to authorized adjustments) payable to the Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the Contractor shall be at his expense without change in the Contract Amount. The Contract Amount may only be changed by a Change Order.

9.2 CLAIM FOR CHANGE IN CONTRACT AMOUNT

- 9.2.1 Any claim for an increase or decrease in the Contract Amount shall be submitted in accordance with the terms of this Article 9, and shall not be allowed unless the notice requirements of this Contract have been met.

9.3 CHANGE ORDER PRICE DETERMINATION

- 9.3.1 The value of any Work covered by a Change Order for an increase or decrease in the Contract Amount shall be determined in one of the following ways:
- 9.3.2 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of paragraph 9.9).
- 9.3.3 By mutual acceptance of a lump sum price which includes overhead and profit.
- 9.3.4 When 9.3.1 and 9.3.2 are inapplicable, on the basis of the Cost of the Work (determined as provided in paragraphs 9.4 and 9.5) plus a Contractor's fee for overhead and profit (determined as provided in paragraph 9.6).
- 9.3.5 MassDOT must approve any proposed changes to Time or Cost of Work by written Authorization before the Change Order is issued.

9.4 COST OF THE WORK

- 9.4.1 The term Cost of the Work means the sum of all costs necessarily incurred and paid by the Contractor in the proper performance of the Work.
- 9.4.2 Except as otherwise may be agreed to in writing by the Railroad, such costs shall be in amount no higher than those prevailing in the locality of the Project, shall

include only the following items and shall not include any of the costs itemized in paragraph 9.5:

- 9.4.2.1 Payroll costs for employees in the direct employ of the Contractor in the performance of the Work under schedules of job classifications agreed upon by the Railroad and the Contractor.
- 9.4.2.2 Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work.
- 9.4.2.3 Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include Social Security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto.
- 9.4.2.4 Such employees shall include superintendents and foremen at the site.
- 9.4.2.5 The expenses of performing Work after regular working hours, on Saturday, Sunday or Legal Holidays shall be included in the above to the extent authorized by the Railroad.
- 9.4.2.6 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and suppliers' field services required in connection therewith. All cash discounts shall accrue to the Contractor unless the Railroad deposits funds with the Contractor with which to make payments, in which case the cash discounts shall accrue to the Railroad. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the Railroad, and the Contractor shall make provisions so that they may be obtained.
- 9.4.2.7 Costs of special Consultants (including but not limited to engineers, architects, testing laboratories, and surveyors) employed for services necessary for the completion of the Work.
- 9.4.2.8 Supplemental costs including the following:
 - 9.4.2.8.1 The proportion of necessary transportation, travel and subsistence expenses of the Contractor's employees incurred in discharge of duties connected with the Work.
 - 9.4.2.8.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of the Contractor.
 - 9.4.2.8.3 Rentals of all construction equipment and machinery and the parts thereof whether rented from the Contractor or others in accordance with

- rental agreements approved by the Railroad and the costs of transportation, loading, unloading, installation, dismantling and removal thereof -all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.
- 9.4.2.8.4 Sales, consumer, use or similar taxes related to the Work, and for which the Contractor is liable.
- 9.4.2.8.5 Fees for permits and licenses.
- 9.4.2.8.6 Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by the Contractor in connection with the performance and furnishing of the Work provided they have resulted from causes other than the negligence of the Contractor, any Contractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of the Railroad. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining the Contractor's fee. If, however, any such loss or damage requires reconstruction and the Contractor is placed in charge thereof, the Contractor shall be paid for services a fee in accordance with paragraph 9.6.
- 9.4.2.8.7 The cost of utilities, fuel and sanitary facilities at the site.
- 9.4.2.8.8 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work
- 9.4.2.8.9 Cost of premiums for additional bonds and insurance required because of changes in the Work and premiums for property insurance coverage within the limits of the deductible amounts established by the Railroad in accordance with Article 5.

9.5 EXCLUDED COSTS

9.5.1 The term Cost of the Work shall not include any of the following:

- 9.5.1.1 Payroll costs and other compensation of Contractor's officers, executives, principles (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agency,

expeditors, timekeepers, clerks and other personnel employed by Contractor whether at the site or in Contractor's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 9.4.2.1 - all of which are to be considered administrative costs covered by the Contractor's Fee.

- 9.5.1.2 Expenses of Contractor's principal and branch offices.
- 9.5.1.3 Any part of Contractor's capital expenses including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 9.5.1.4 Cost of premiums for all insurance whether or not Contractor is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 9.4.2.8.9 above).
- 9.5.1.5 Costs due to the negligence of Contractor, any subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective work, disposal of materials or equipment wrongly supplied and making good any damage to property.
- 9.5.1.6 Costs for the use of small tools having a value of five hundred dollars (\$500) or less.
- 9.5.1.7 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 9.4.

9.6 CONTRACTOR'S FEE

- 9.6.1 The Contractor's fee allowed to Contractor for overhead and profit shall be a negotiated, mutually agreed upon fixed fee between the Contractor and the Railroad. The Contractor's fee shall be identified in the Contract between the Railroad and the Contractor and shall apply to both originally bid Work and any work Authorized by approved Change Order. If no fee can be agreed upon, a fee based on the following percentages of the various portions of the cost of the Work:
 - 9.6.1.1 For costs incurred under subparagraphs 9.4.2.1 through 9.4.2.6, the Contractor's Fee shall be 5%;
 - 9.6.1.2 For costs incurred under subparagraphs 9.4.2.7, and 9.4.2.8 the Contractor's Fee shall be 5%.
- 9.6.2 No fee shall be payable on the basis of costs itemized under paragraph 9.5;
- 9.6.3 The amount of credit to be allowed by the Contractor to the Railroad for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in Contractor's fee by a mutually agreed upon amount or if none can be agreed upon, then an amount equal to 5% of the net decrease; and
- 9.6.4 When both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with subparagraphs 9.6.1.1. and 9.6.1.2.

9.7 COST BREAKDOWN

- 9.7.1 Whenever the cost of any Work is to be determined pursuant to paragraphs 9.4 and 9.5, the Contractor will submit in a form acceptable to the Railroad an itemized cost breakdown together with supporting data.

9.8 UNIT PRICE WORK

- 9.8.1 Where the Contract Documents provide that all or part of the work is to be Unit Price Work, initially the Contract Amount will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract.
- 9.8.2 The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Amount.
- 9.8.3 Determinations of the actual quantities and classifications of Unit Price Work performed by the Contractor will be made by the Railroad in accordance with paragraph 9.9.
- 9.8.4 Each unit price will be deemed to include an amount considered by the Contractor to be adequate to cover the Contractor's overhead and profit for each separately identified item.
- 9.8.5 If the "Basis of Payment" clause in the Contract Documents relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain Work or material essential to the item, this same Work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Contract Documents.
- 9.8.6 Payment to the Contractor shall be made only for the actual quantities of Work performed and accepted or materials furnished, in conformance with the Contract Documents.
- 9.8.7 When the accepted quantities of Work or materials vary from the quantities stated in the bid schedule, or change documents, the Contractor shall accept as payment in full, payment at the stated unit prices for the accepted quantities of Work and materials furnished, completed and accepted.

9.9 DETERMINATIONS FOR UNIT PRICES

- 9.9.1 The Railroad will determine the actual quantities and classifications of Unit Price Work performed by the Contractor.
- 9.9.2 The Railroad will review with the Contractor preliminary determinations on such matters before certifying the prices on the bid schedule.
- 9.9.3 The Railroad's certification thereon will be final and binding on the Contractor, unless, within ten (10) days after the date of any such decision, the Contractor delivers to the Railroad written notice of intention to appeal from such a decision.

10. ARTICLE 10 – CONTRACT TIME – COMPUTATION & CHANGE:**10.1 COMMENCEMENT OF CONTRACT TIME – NOTICE TO PROCEED**

- 10.1.1 The Contract Time will commence to run on the day indicated in the Notice to Proceed.

10.2 STARTING THE WORK

- 10.2.1 No Work on Contract items shall be performed before the effective date of the Notice to Proceed. The Contractor shall notify the Railroad at least 24 hours in advance of the time actual construction operations will begin.

10.3 COMPUTATION OF CONTRACT TIME

- 10.3.1 When the Contract Time is specified on a calendar days basis, all Work under the Contract shall be completed within the number of calendar days specified.
- 10.3.2 The count of Contract Time begins on the day following receipt of the Notice to Proceed by the Contractor, if no starting day is stipulated therein.
- 10.3.3 Calendar days shall continue to be counted against Contract Time until and including the date of Final Completion of the Work.
- 10.3.4 When the Contract completion time is specified as a fixed calendar date, it shall be the date of Final Completion.

10.4 TIME CHANGE

- 10.4.1 The Contract Time may only be changed by a Change Order. Any extension for time needs to be approved by MassDOT in advance.

10.5 EXTENSION DUE TO DELAYS

- 10.5.1 The right of the Contractor to proceed shall not be terminated nor the Contractor charged with liquidated or actual damages because of any delays to the completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including, but not restricted to the following: acts of God or of the public enemy, acts of the Railroad in contractual capacity, acts of another Contractor in the performance of a contract with the Railroad, floods, fires, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather and delays of subcontractors or suppliers due to such causes.
- 10.5.2 Any delay in receipt of materials on the site, caused by other than one of the specifically mentioned occurrences above, does not of itself justify a time extension.
- 10.5.3 The Railroad shall ascertain the facts and the extent of the delay and extend the time for completing the Work when the findings of fact justify such an extension.

10.6 ESSENCE OF CONTRACT

- 10.6.1 All time limits stated in the Contract Documents are of the essence of the Contract.

ARTICLE 10 – Contract Time – Computation and Change (continued):

10.7 REASONABLE COMPLETION TIME

- 10.7.1 It is expressly understood and agreed by and between the Contractor and the Railroad that the date of beginning and the time for Final Completion of the Work described herein are reasonable times for the completion of the Work.

10.8 DELAY IN COMPLETION OF THE WORK; LIQUIDATED DAMAGES

- 10.8.1 In the event that the Contractor does not proceed with the Work within the time frame stipulated in the Contract Documents or otherwise fails to perform the other work specified in the Contract Documents in reasonable accordance with the Contract Schedule, so as to complete the Work on or before the time for Final Completion, the Railroad may terminate the Contract, and seek to complete the Work pursuant to the provisions of and with funding provided by the Contractor's Performance Bond.
- 10.8.2 Whether or not the Contractor's right to proceed with the Work is terminated, he shall be liable for damages resulting from Contractor's refusal or failure to complete the Work within the specified time. Liquidated damages for delay shall be paid by the Contractor to MassDOT in the amount of \$1,000 for each calendar day the completion of the Work or any part thereof is delayed beyond the Contract Time required by the Contract, or any extension thereof.
- 10.8.3 The Contractor acknowledges that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that the Railroad and the Owner will sustain by reason of delayed completion. These liquidated damages are intended as compensation for losses difficult to estimate.
- 10.8.4 These damages will continue to run both before and after termination in the event of default termination. These liquidated damages do not cover excess costs of completion, the Railroad's and/or MassDOT' costs, fees, and charges related to solicitation and selection of an alternative work force to complete the Work.

11. ARTICLE 11 – QUALITY ASSURANCE:

11.1 WARRANTY AND GUARANTY

- 11.1.1 The Contractor warrants and guarantees to the Railroad and the Owner that all Work will be in accordance with the Contract Documents and will not be defective.
- 11.1.2 Prompt notice of all defects shall be given to the Contractor. All defective work, whether or not in place, may be rejected, corrected or accepted as provided for in this Article.

11.2 ACCESS TO WORK

- 11.2.1 The Railroad, the Owner, their representatives, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. The Contractor shall provide proper and safe conditions for such access.

11.3 TESTS AND INSPECTIONS

11.3.1 The Contractor shall give the Railroad timely notice of readiness of the Work for all required inspections.

11.4 RAILROAD MAY STOP THE WORK

11.4.1 If the Work is defective, or the Contractor fails to supply suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the Railroad may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; provided, however, that the right of the Railroad to stop the Work shall not give rise to any duty on the part of the Railroad to exercise the right for the benefit of the Contractor or any other party, except that the Railroad shall have a duty to exercise the right for the benefit of the Owner.

11.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK

11.5.1 If required by the Railroad, the Contractor shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Railroad, remove it from the site and replace it with Work which conforms to the requirements of the Contract Documents. The Contractor shall bear all direct, indirect and consequential costs of such correction removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

11.6 ONE YEAR CORRECTION PERIOD

11.6.1 If within one (1) year after the date of Final Completion or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, the Contractor shall promptly, without cost to the Railroad and in accordance with the Railroad's written instructions, either correct such defective Work, or, if it has been rejected by the Railroad, remove it from the site and replace it with conforming Work.

11.6.2 If the Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the Railroad may have the defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by the Contractor.

11.7 ACCEPTANCE OF DEFECTIVE WORK

11.7.1 Instead of requiring correction or removal and replacement of defective Work, the Railroad may, with the Owner's prior written approval, accept defective Work. All decisions with respect to acceptance of defective Work are solely at the discretion of, and to be made by, MassDOT. In the event of MassDOT's decision to accept defective Work, the Contractor shall bear all direct, indirect and consequential costs attributable to the Railroad's and/or Owner's evaluation of and determination to accept such defective Work (costs to include but not be

limited to fees and charges of engineers, architects, attorneys and other professionals).

11.7.2 Any acceptance of defective Work, as described in Article 11.7.1, shall only be contemplated upon written notification and request by the Railroad supported by documentation to support the request.

11.7.3 If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Railroad shall be entitled to an appropriate decrease in the Contract Amount.

11.7.4 If the Railroad has already made final payment to the Contractor, an appropriate amount shall be paid by the Contractor to MassDOT.

12. ARTICLE 12 – PAYMENTS TO CONTRACTOR AND COMPLETION:

12.1 SCHEDULE OF VALUES

12.1.1 The schedule of values established as provided in paragraph 6.5 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the Railroad. Progress payments on account of Unit Price Work will be based on the number of units completed.

12.2 PRELIMINARY PAYMENTS

12.2.1 Upon approval of the Schedule of Values the Contractor may be paid for direct costs substantiated by paid invoices and other prerequisite documents required by the Contract Documents. Direct costs shall include the cost of bonds, insurance, approved materials stored on the site or at approved remote storage sites, deposits required by a supplier prior to fabricating materials, and other approved direct mobilization costs substantiated as indicated above. These payments shall be included as a part of the total Contract Amount as stated in the Contract.

12.3 APPLICATION FOR PROGRESS PAYMENT

12.3.1 The Contractor shall submit to the Railroad for review an Application for Payment filled out and signed by the Contractor covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as required by the Contract Documents.

12.3.2 Progress payments will be made as the Work progresses on a monthly basis or other schedule as may be agreed upon, in advance of the start of Work, by the Contractor and the Railroad.

12.4 REVIEW OF APPLICATION FOR PROGRESS PAYMENT

12.4.1 Railroad will, either indicate in writing a recommendation of payment, or return the Application for Payment to the Contractor indicating in writing the Railroad's reasons for refusing to recommend payment.

12.4.2 If the latter case, the Contractor may make the necessary corrections and resubmit the Application for Payment.

12.5 WITHHOLDING OF PAYMENTS

12.5.1 The Railroad may withhold or refuse payment for any of the reasons listed below provided it gives written notice of its intent to withhold and of the basis for withholding:

- 12.5.1.1 The Work is Defective, or completed Work has been damaged requiring correction or replacement, or has been installed without Approval of Shop Drawings, or by an unapproved Contractor.
- 12.5.1.2 The Contract Amount has been reduced by Change Order.
- 12.5.1.3 The Railroad has been required to correct Defective Work or complete Work in accordance with paragraph 12.9.
- 12.5.1.4 The Railroad's actual knowledge of the occurrence of any of the events enumerated in subparagraphs 13.2.1.1 through 13.2.1.11 inclusive.
- 12.5.1.5 Claims have been made against the Railroad or against the funds held by the Railroad on account of the Contractor's actions or inactions in performing this Contract, or there are other items entitling the Railroad to a set-off.
- 12.5.1.6 Subsequently discovered evidence or the results of subsequent inspections or tests, nullify any previous payments for reasons stated in subparagraphs 12.5.1 through 12.5.1.5.
- 12.5.1.7 The Contractor has failed to fulfill or is in violation of any of his obligations under any provision of this Contract.

12.6 RETAINAGE

A percentage of a Contractor's Application for Payment may be withheld if, within the Railroad's or Owner's judgment, a portion of the Work for which payment is requested has not been completed according to the Project Plans and Specifications. The percentage withheld will be commensurate with the proportion of the incomplete Work in relation to the total amount of the Application for Payment. Any amount withheld shall be promptly processed for payment upon satisfactory completion and acceptance of the Work.

12.7 SUBSTANTIAL COMPLETION

- 12.7.1 When the Contractor considers the Work ready for its intended use the Contractor shall notify the Railroad in writing that the Work of a designated portion thereof is substantially complete (except for items specifically listed by the Contractor as incomplete) and request that the Railroad issue a certificate of Substantial Completion. The Railroad shall in turn forward notification from the Contractor to MassDOT for its records.
- 12.7.2 Within a reasonable time thereafter, the Railroad, the Contractor and the Owner's representative shall make an inspection of the Work to determine the status of completion.
- 12.7.3 If the Railroad, in consultation with the Owner, does not consider the Work to be substantially complete, the Railroad will notify the Contractor in writing giving the reasons therefore. If the Railroad and the Owner consider the Work to be substantially complete, the Railroad will, within fourteen (14) days, execute and deliver to the Contractor a certificate of Substantial Completion with a tentative list of items to be completed or corrected. A copy of the certificate of Substantial

Completion with accompanying list of items to be completed or corrected shall be forwarded by the Railroad to MassDOT for its records.

- 12.7.4 At the time of delivery of the certificate of Substantial Completion the Railroad will deliver to the Contractor a written division of responsibilities pending Final Completion with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties which shall be consistent with the terms of the Contract Documents. A copy of the written division of responsibilities shall be forwarded by the Railroad to MassDOT for its records.
- 12.7.5 The Railroad and the Owner shall be responsible for all of their respective costs resulting from the initial inspection and the first re-inspection, and the Contractor shall pay all costs incurred by the Railroad and the Owner resulting from re-inspections, thereafter.

12.8 ACCESS FOLLOWING SUBSTANTIAL COMPLETION

- 12.8.1 The Railroad shall have the right to exclude the Contractor from the Work after the date of Substantial Completion, but the Railroad shall allow Contractor reasonable access to complete or correct items on the tentative list.

12.9 FINAL INSPECTION

- 12.9.1 Upon written notice from the Contractor that the entire Work or an agreed portion thereof is complete, the Railroad will make a final inspection with the Contractor and the Owner's representative(s), and will notify the Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective.
- 12.9.2 The Contractor shall immediately take such measures as are necessary to remedy such deficiencies.
- 12.9.3 The Contractor shall pay for all costs incurred by the Railroad and the Owner resulting from re-inspections.

12.10 FINAL APPLICATION FOR PAYMENT

- 12.10.1 After the Contractor has completed all such corrections to the satisfaction of the Railroad and the Owner, and has delivered all guarantees, bonds, certificates of payment to all laborers, subcontractors and suppliers, certificates of inspection, marked-up record documents and other documents, all as required by the Contract Documents, and after the Railroad has indicated that the Work is acceptable (subject to the provisions of paragraph 12.13), the Contractor may make application for final payment following the procedure for progress payments.
- 12.10.2 The application for final payment shall be accompanied by two (2) copies of all certificates, warranties, guaranties, releases, affidavits, and other documentation required by the Contract Documents. These two (2) copies shall be submitted by the Railroad to MassDOT and shall be a condition of Final Payment by MassDOT by the Railroad.
- 12.10.3 All requirements of Article 6.12.7 must be met prior to MassDOT approval of the Final Application for Payment.

12.11 FINAL PAYMENT AND FINAL COMPLETION

- 12.11.1 If, on the basis of the Railroad's observation of the Work during construction and final inspection, and the Railroad's review of the application for final payment and accompanying documentation all as required by the Contract Documents, the Railroad is satisfied that the Work has been completed and the Contractor's other obligations under the Contract Documents have been fulfilled, the Railroad will process application for final payment.
- 12.11.2 Otherwise, the Railroad will return the application for final payment to the Contractor, indicating in writing the reasons for refusing to process final payment, in which case the Contractor shall make the necessary corrections and resubmit the application for final payment.
- 12.11.3 If, through no fault of the Contractor, final completion of the Work is significantly delayed, the Railroad shall, upon receipt of the Contractor's application for final payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted.
- 12.11.4 Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

12.12 FINAL ACCEPTANCE

- 12.12.1 Following receipt of the Contractor's release with no exceptions, and certification that laborers, subcontractors and material men have been paid, certification of payment of payroll and revenue taxes, and final payment to the Contractor, the Railroad will issue a letter of Final Completion (with a copy to MassDOT), releasing the Contractor from further obligations under the Contract, except as provided in paragraph 12.13.

12.13 CONTRACTOR'S CONTINUING OBLIGATION

- 12.13.1 The Contractor's obligation to perform and complete the Work and pay all laborers, sub-contractors, and material in accordance with the Contract Documents shall be absolute.
- 12.13.2 Neither any progress or final payment by the Railroad, nor the issuance of a certificate of Substantial Completion, nor any use or occupancy of the Work or any part thereof by the Railroad, nor any act of acceptance by the Railroad nor any failure to do so, nor any correction of defective Work by the Railroad will constitute an acceptance of Work not in accordance with the Contract Documents or a release of the Contractor's obligation to perform the Work in accordance with the Contract Documents.

12.14 WAIVER OF CLAIMS BY CONTRACTOR

- 12.14.1 The making and acceptance of final payment will constitute a waiver of all claims by the Contractor against the Railroad other than those previously made in writing and that remain unsettled.

12.15 NO WAIVER OF LEGAL RIGHTS

- 12.15.1 The Railroad shall not be precluded or be stopped by any payment, measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefore, from showing the true amount and character of the Work performed and materials furnished by the Contractor, nor from

showing that any payment, measurement, estimate or certificate is untrue or is incorrectly made, or that the Work or materials are defective.

- 12.15.2 The Railroad shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the Contractor such damages as it may sustain by reason of Contractor's failure to comply with requirements of the Contract Documents.
- 12.15.3 Neither the acceptance by the Railroad, or any representative of the Railroad, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of the Contract Time, nor any possession taken by the Railroad, shall operate as a waiver of any portion of the Contract or of the power herein reserved, or of any right to damages.
- 12.15.4 A waiver by the Railroad of any breach of the Contract shall not be held to be a waiver of any other subsequent breach.

13.1 RAILROAD MAY SUSPEND WORK

- 13.1.1 The Railroad may, at any time suspend the Work (after notice to and receipt of approval by MassDOT) or any portion thereof by notice in writing to the Contractor. If the Work is suspended without cause the Contractor shall be allowed an increase in the Contract Amount or an extension of the Contract Time, or both, directly attributable to any suspension if the Contractor makes an approved claim therefore as provided in Article 14. Any action by the Railroad to allow an increase in the Contract Amount or to allow an extension of the Contract Time may only be done with the prior written authorization of MassDOT. MassDOT shall not be liable for any additions to the Contract Amount or extensions in the Contract Time that it has not approved in writing in advance.
- 13.1.2 However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that suspension is due to the fault or negligence of the Contractor, or that suspension is necessary for Contract compliance, or that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or Acts of God (which shall be deemed to include severe weather conditions precluding prosecution of the Work).
- 13.1.3 In case of suspension of Work, the Contractor shall be responsible for preventing damage to or loss of any of the Work already performed and of all materials whether stored on or off the site or approved remote storage sites.

13.2 DEFAULT OF CONTRACTOR

- 13.2.1 If the Contractor:
 - 13.2.1.1 Fails to begin the Work under the Contract within the time specified in the Contract Documents, or
 - 13.2.1.2 Fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workmen or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 6.6 as revised from time to time), or
 - 13.2.1.3 Performs the Work unsuitably or neglects or refuses to remove materials or to correct defective Work.

- 13.2.1.4 Discontinues the prosecution of the Work, or
- 13.2.1.5 Fails to resume Work which has been discontinued within a reasonable time after notice to do so, or
- 13.2.1.6 Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency except as prohibited by 11 U.S.C. 363, or
- 13.2.1.7 Allows any final judgment to stand against him unsatisfied for period of 60 days, or
- 13.2.1.8 Makes an assignment for the benefit of creditor without the consent of the Railroad, or
- 13.2.1.9 Disregards requirements or orders of any public body having jurisdiction, or
- 13.2.1.10 Otherwise violates in any substantial way any provisions of the Contract Documents, or
- 13.2.1.11 For any cause whatsoever, fails to carry on the Work in an acceptable manner, the Railroad may give Notice in writing to the Contractor of such delay, neglect, or default.
- 13.2.2 If the Contractor, within the time specified in the above Notice of Default, shall not proceed in accordance therewith, then the Railroad may, upon written notification to the Contractor and Contractor's Surety of the fact of such delay, neglect or default and the Contractor's failure to comply with such notice, have full power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the Contractor.
- 13.2.3 The Railroad may terminate the services of the Contractor, exclude the Contractor from the site and take possession of the Work, and obtain and expend funds from the Performance Bond and the Payment Bond (as applicable) to complete the Work as required by the Contract Documents.
- 13.2.4 The Railroad may enter into an agreement for the completion of said Contract Work according to the terms and provisions of the Contract, or use such other methods that in the opinion of the Railroad (as approved by the Owner) are required for the completion of said Contract in an acceptable manner.
- 13.2.5 The Railroad may, by written notice to the Contractor, transfer the completion of the Work from the Contractor to another organization, or, if the Contractor abandons the Work undertaken under the Contract, the Railroad may, at its option and without any written notice to the Contractor, transfer the completion of the Work to another organization.

13.3 RIGHTS OR REMEDIES

- 13.3.1 Where the Contractor's services have been so terminated by the Railroad, the termination will not affect any rights or remedies of the Railroad against the Contractor then existing or which may thereafter accrue.
- 13.3.2 Any retention or payment of moneys due the Contractor by the Railroad will not release the Contractor from liability.

14. ARTICLE 14 – CLAIMS AND DISPUTES:

14.1 RAILROAD'S DECISION

- 14.1.1 With regard to any claim or dispute raised by the Contractor, the Railroad will make a determination of the validity and disposition of the claim or dispute and the Contractor will be furnished with the Railroad's decision within ninety (90) days of the receipt of the claim or dispute unless additional information is requested by the Railroad. Prior to any notification of the Contractor by the Railroad, MassDOT shall review the circumstances of the claim or dispute and the Railroad's decision on the validity of the claim or dispute.
- 14.1.2 The Railroad's decision (following review by MassDOT) is final and conclusive unless fraudulent as to the claim.

14.2 NOTICE OF APPEAL

- 14.2.1 Within fourteen (14) days of receipt of the Railroad's decision, the Contractor may deliver a Notice of Appeal to the Railroad (with a copy to Owner) and request a hearing.
- 14.2.2 The Notice of Appeal shall include specific exceptions to the Railroad's decision, including specific provisions of the Contract, which the Contractor intends to rely upon in the appeal.
- 14.2.3 General assertions that the Railroad's decision is contrary to law or to fact shall not be deemed sufficient.

14.3 RAILROAD'S DECISION ON APPEAL

- 14.3.1 The decision of the Railroad on appeal will be rendered within ninety (90) days after the receipt of the Notice of Appeal.
- 14.3.2 The time limits given above may be extended by mutual consent.
- 14.3.3 The decision of the Railroad on appeal shall be final and conclusive unless the Contractor requests the appeal be submitted to arbitration under the laws of the Commonwealth of Massachusetts.

15. ARTICLE 15 – MISCELLANEOUS:

15.1 GOVERNING LAW

- 15.1.1 This Contract shall be governed by the laws of the Commonwealth of Massachusetts.

15.2 CONTRACT CLAUSES / SEVERABILITY

- 15.2.1 If any contract clause is declared null and void, then all other clauses shall remain in force.

AGREEMENT FOR PROVISION OF FLAGGING SERVICES

This Agreement for Flagging Services (the "Agreement"), dated _____ (the "Effective Date"), is made by and between Massachusetts Coastal Railroad, LLC, a limited liability company organized under the laws of the Commonwealth of Massachusetts having an address at 12 Harding Street, Lakeville, Massachusetts ("MCRR"), and _____ ("Contractor").

RECITALS

WHEREAS, MCRR is party to a certain License and Operating Agreement (the "Operating Agreement") by and between MCRR and the Massachusetts Department of Transportation ("MassDOT") a body politic and corporate and a political subdivision of the Commonwealth of Massachusetts having a principal place of business at 10 Park Plaza, Boston, Massachusetts, pursuant to which MCRR controls operations on the rail lines between Middleboro (Bay) to Hyannis, South Yarmouth and North Falmouth, Massachusetts (the "Cape Lines"), which lines are owned and administered by MassDOT through the Operating Agreement and dispatched, operated and maintained by MCRR in accordance with the Operating Agreement;

WHEREAS, the Contractor is conducting and planning to conduct various projects and work efforts to _____ and such other additional work on or about the Cape Lines as may be necessary or desirable in the future (collectively, "the Work");

WHEREAS, Roadway Worker Protection rules and regulations promulgated by the Federal railroad Administration ("FRA") require that a flagman be present during work that is performed on or near any active railroad right of way and that all personnel on any such right of way have received the necessary Roadway Worker Protection training and be properly equipped with safety equipment and apparel;

WHEREAS, pursuant to Sections 4.2 and 4.3 of the Operating Agreement, MCRR is required to maintain and operate the Cape Lines in accordance with all applicable rules and regulations of the FRA and other organizations having jurisdiction over any aspect of MCRR operations;

WHEREAS, upon the terms and subject to the conditions of this Agreement and the Operating Agreement, MCRR is willing to provide Flagging Personnel and Flagging Management to Contractor in connection with the Work;

WHEREAS, upon the terms and subject to the conditions of this Agreement, the Contractor is willing to accept the provision of the Flagging Personnel and Flagging Management in connection with the Work in exchange for the consideration described herein; and

WHEREAS, the Contractor is aware of the obligations of MCRR under the Operating

Agreement, and except as expressly stated otherwise herein, the Contractor agrees to assume to MCRR all the obligations and responsibilities that MCRR by the Operating Agreement assumes to the MASSDOT with respect to the subject matter hereof.

NOW, THEREFORE, in consideration of the premises, the mutual covenants and agreements hereinafter set forth and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereto, intending to be bound legally, hereby agree as follows:

1. Provision of Flagging Personnel and Flagging Management. MCRR agrees to provide the Flagging Personnel and to charge a fee for the Flagging Management to the Contractor to allow the Work to be performed on the Cape Lines right of way. The Contractor shall have the sole authority and responsibility to direct the Flagging Personnel in the conduct of the Work.

2. Term of Service. Beginning on the effective date, Flagging Personnel will be made available to Contractor by the designated Flagging Management representative of MCRR for such period(s) of time as the Contractor may request for the conduct of any component part of the Work. The periods of time during which Flagging Personnel shall be made available by the Flagging Management shall consist of (a) weekdays (Monday through Friday, excluding holidays recognized by MCRR) (the "Weekday Service") and (b) weekend days (Saturday, Sunday and paid MCRR holidays) (the "Weekend Service"). The hours worked by Flagging Personnel shall be invoiced on an hourly basis per Schedule 1 attached to this Agreement. Schedule 1 may be amended from time to time by the sole authority of MCRR to reflect any changes to the then current applicable hourly wage rates for the performance of Flagging services.

3. Cost of Services.

(a) In compensation for the Flagging Personnel and Flagging Management, Contractor shall pay, for Flagging Personnel, the labor rate(s) multiplied by the hours worked (the "Compensation") as set forth on Schedule I hereto, which Compensation shall include all benefits owing to such Flagging Personnel as set forth herein. Flagging Personnel are not employees of Contractor. In addition, Contractor shall pay \$1,500 deposit fee as compensation for the administration of Flagging Management services by MCRR:

- (i) Contractor shall pay MCRR, per Schedule 1, a labor rate per hour for each Flagging Personnel for the first eight hours of work per day of Weekday Service and shall pay overtime rates for all succeeding hours per day of such Weekday Service;
- (ii) Contractor shall pay MCRR, per Schedule 1, premium labor rate(s) per hour for each Flagging Personnel for all hours of work per day of Weekend Service.

(b) Contractor shall pay MCRR for the use of the miscellaneous support items (the "Support Items") set forth on Schedule 2 hereto, in accordance with the charges set forth opposite each Support Item on Schedule 2 (collectively, the "Support Item Charges").

(c) Contractor acknowledges that Contractor shall be obligated to pay (i) the applicable Schedule 1 labor rate per hour for all hours that the Flagging Personnel may work in performing the Work and the applicable dollar amount equal to 16% times the total charges for Flagging Personnel for the provision of Flagging Management services, and (ii) the hourly rate set forth on Schedule 2 for the use of any Support Item beyond the number of hours set forth opposite each Support Item on Schedule 2, provided that MCRR shall, in its sole discretion, determine whether all or any of the Flagging Personnel or Support Items are available beyond the days and/or hours provided herein.

4. Payment. Contractor shall pay the Compensation and Support Item Charges to MCRR as follows: on the Effective Date, Contractor shall pay by check \$1,500 administration fee. Contractor shall pay any additional costs or expenses incurred by MCRR or the Flagging Personnel or Flagging Management in connection with the performance of this Agreement, including but not limited to travel, meals and lodging, by check within fifteen (15) days after receipt of an invoice therefor from MCRR. The failure of the Contractor to pay the Compensation or Support Item Charges and reimburse any other expenses of MCRR in accordance with the terms hereof shall constitute a material default of this Agreement.

5. Term. This Agreement shall be in effect for a term of one year from the Effective Date (the "Term"), unless sooner terminated pursuant to Section 14 hereof. Any extension of the Term shall be effective only if the parties mutually agree in writing to such extension.

6. Authority for the Work. The Work shall be conducted under the exclusive direction and control of the Contractor, who is solely responsible for determining the scope and manner of the Work. Any knowledge that MCRR acquires regarding the Work shall not make MCRR responsible or liable for errors, acts or omissions in the Work. MCRR shall not have control or charge of means, methods, techniques, sequences, procedures, safety precautions or programs implemented in connection with the Work, and MCRR shall not be responsible for the acts or omissions of Contractor, subcontractors of Contractor, or any other person performing any of the Work and for which Contractor is legally liable. Contractor's scope direction to Flagging Personnel and Flagging Management shall be limited to identifying the location(s) where the Contractor is performing the Work.

7. Responsibilities of Contractor.

(a) Contractor is solely liable for, and shall promptly pay, all taxes, licenses, costs, expenses and fees of every nature incurred by or imposed on Contractor in the course of the Work, including but not limited to the Compensation and Support Item Charges, and the cost of any other labor, materials or other elements used in the Work.

(b) Contractor shall exercise all due diligence and care with regard to the Work. Contractor shall perform the Work and direct the Flagging Personnel and Flagging Management in strict compliance with all applicable federal, state and local statutes, ordinances, codes, rules and regulations. Under no circumstances shall MCRR be responsible or liable for errors, acts or omissions regarding the Work.

8 Representations or Warranties. MCRR represents and warrants that the Flagging Personnel and Flagging Management shall be properly skilled and trained for the purpose for which they are being provided. Contractor understands that a flagman must be present during work that is performed on or near active railroad right of way pursuant to the Roadway Worker Protection rules. Contractor agrees to require its personnel to follow all directions and instructions of any Flagging Personnel employed by MCRR to enforce these rules. MCRR shall be responsible for the acts, errors or omissions of the Flagging Personnel and Flagging Management in the enforcement of Roadway Worker Protection rules. MCRR makes no other representations, and expressly any and all other warranties, with respect to the Flagging Personnel and Flagging Management or the quality or workmanship of any services which the Flagging Personnel perform for the Contractor under this Agreement. The provisions of this Section 8 expressly survive the termination of this Agreement.

9. Safety. The Contractor shall be fully responsible for and implement all health and safety precautions required for the Work. Without limiting the generality of the foregoing, the Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders issued by a public authority, whether federal, state, local or otherwise, including but not limited to, the Federal Railroad Administration, the Federal Transit Administration and the Occupational Safety and Health Act and those required in the conduct of operations or adjacent to railroad rights of way and, in addition to the foregoing, all safety measures identified by Contractor, including but not limited to the Owner's Right of Way Safety Certification Program and the Contractor Safety Awareness Certification Program.

10. Insurance.

(a) During the term of this Agreement, the Contractor shall maintain at a minimum:

(i) Commercial general liability (CGL) insurance protecting against all claims which might arise from or out of the Work, including but not limited to the involvement of the Flagging Personnel and Flagging Management in the Work, including premises operations, independent contractors, products-completed operations, personal injury, bodily injury, death or property damage (including loss of use thereof), blanket contractual liability and subject to limits of not less than two million dollars (\$2,000,000) inclusive per occurrence;

(ii) railroad protective liability insurance, subject to limits of not less than six million dollars (\$6,000,000) inclusive per occurrence;

(iii) motor vehicle insurance subject to limits of not less than two million

dollars (\$2,000,000) inclusive per occurrence;

- (iv) Workers' compensation or FELA insurance, premises operations, independent contractors, products-completed operations, personal injury,;
- (v) Commercial umbrella, subject to limits of not less than five million dollars (\$5,000,000);
- (v) Such other insurance as MCRR may reasonably request.

(b) The Contractor shall furnish MCRR with certificates of insurance evidencing such coverage and naming MCRR and MASSDOT each as an additional insured (except for workers compensation policy). Each insurance policy shall include the provision that such insurance shall not be canceled or materially changed without at least thirty (30) days written notice to MCRR. All of the Contractor's insurance shall be primary and non-contributing for any claims arising out of Contractor's services. The Contractor shall provide MCRR with a vicarious liability endorsement for the Contractor's Workers' Compensation or FELA policies, as applicable. The Contractor waives all rights of subrogation for recovery of damages to the extent those damages are covered by commercial general liability, business, auto liability or workers' compensation, FELA or employers liability insurance maintained pursuant to these requirements.

(c) Nothing contained in this Agreement shall in any way act as a limitation of the Contractor's liability for damage or injury, including death, which arises out of or is the result of the Contractor's acts or omissions under this Agreement.

11. Indemnification., Hold Harmless.

(a) The Contractor, for itself and on behalf of its agents, employees, subcontractors and subconsultants, shall indemnify, defend and hold MCRR and the MASSDOT, and each of their agents, consultants, officers, directors, representatives, employees, assigns and successors-in-interest, harmless to the fullest extent provided by law from and against any and all losses, expenses, costs, damages, claims, demands, fines, penalties, liens or any and causes of action, including but not limited to attorneys' fees and costs of collection, pertaining to or in any way arising out of this Agreement and asserted against MCRR or the MASSDOT by any person (including without limitation, any claims by MCRR's own employees) for injury to persons (including but not limited to the Flagging Personnel and Flagging Management), including death, or for loss of or damage to property or the loss of use thereof, to the extent caused by the acts or omissions of the Contractor, or any of the Contractor's subcontractors, employees, agents or other persons or entities for whose acts the Contractor may be liable. The indemnification required by this Section 11 shall not be limited in any way by the limits, terms or conditions of any insurance policy. Contractor will defend all such claims at its own cost and expense and reimburse MCRR for any attorneys' fees incurred by MCRR with respect to any such claim.

The parties specifically agree that this indemnification also includes indemnification against and from any and all claims and suits, and any and all liability for loss or expense arising from or

incidental to or in connection with any environmental damage. Notwithstanding the foregoing, the Contractor shall not be required to indemnify or defend the MCRR or MASSDOT against claims resulting from the sole negligence of their agents, consultants, officers, directors, representatives, employees.

(b) The Contractor shall pay for all costs associated with the Work, including but not limited to costs for labor, materials and equipment, and Contractor shall defend and indemnify MCRR and the MASSDOT against and save them harmless from and against any and all claims, suits or liens therefore brought by the Contractor's subcontractors, consultants, agents or employees, or any other person or entity.

(c) The provisions of this Section 11 shall survive the termination of this Agreement.

12 Damages. The Contractor expressly agrees to reimburse MCRR for any liquidated, consequential or other damages that the MASSDOT, the Federal Railroad Administration or other third parties may assess against MCRR or which are incurred by MCRR and which are attributable to or caused by the Contractor's acts or omissions. In no event shall MCRR be liable for any liquidated, consequential or other damages that the Contractor may incur in connection to the Agreement or the subject matter hereof.

13 Venue. Any action, suit or other legal proceeding with respect to this Agreement shall solely be brought in the Superior Courts for the Commonwealth of Massachusetts. The parties consent to and accept the jurisdiction of each of such courts and waive any objection (including any objection to venue or any objection based upon the grounds of forum non conveniens) which might be asserted against the bringing of any such action, suit or other legal proceeding in such courts. Service of process in any such action, suit or other legal proceeding may be made by mailing copies thereof by registered or certified mail to the address provided for the giving of notices hereunder or in any manner permitted by law.

14 Termination. Either party may terminate this agreement upon ten (30) days' written notice to the other party hereto. Notwithstanding any other provision of this Agreement, MCRR may terminate this Agreement immediately if (a) Contractor fails to make payment in accordance with this agreement, (b) MCRR believes that the Flagging Personnel and Flagging Management are not being used by the Contractor in accordance with the terms hereof, or (c) MCRR determines, in its sole discretion, that the operation of the Cape Lines requires the return of the Flagging Personnel and Flagging Management. In the event of the return of such personnel to MCRR operation of the Cape Lines, MCRR may elect to terminate the Work until further notice as an alternative to terminating this Agreement. In no event shall MCRR be liable to the Contractor for any damages, whether special, consequential, or otherwise, that Contractor may incur as a result of MCRR's termination of this Agreement in accordance with the terms hereof.

15 Representations and Warranties of the Contractor. The Contractor hereby represents and warrants to MCRR:

(a) The Contractor is a corporation duly organized and existing under the laws

of the state of Massachusetts.

(b) The Contractor has full power and authority to enter into and perform this Agreement.

(c) The execution and performance of this Agreement will not violate or result in a default, either immediately or with the giving of notice or the passage of time, under any other material agreement by which the Contractor is bound.

(d) The person executing this Agreement on behalf of the Contractor is duly authorized to do so under the laws, articles of incorporation, bylaws or other governing instrument applicable to the Contractor.

(e) Neither this Agreement nor any other document delivered by the Contractor contains an untrue statement of material fact or omits to state a material fact required to be stated herein or therein or necessary to make the statements herein or therein, in light of the circumstances under which they were made, not misleading.

16. Status. The Contractor specifically agrees that it is not an agent, employee or a joint venture partner of MCRR.

17. Severability. In the event that any part, term or provision of this Agreement not essential to its overall purpose is determined by a court of competent jurisdiction to be unlawful or unenforceable, the validity and enforceability of the remaining portions or provisions shall not be affected thereby.

18. Entire Agreement. This Agreement constitutes the entire agreement between the parties and shall supersede all previous agreements or understandings with respect to the subject matter hereof. No oral statement or prior written matter will have any force or effect. The parties hereby acknowledge that they are not relying on any representations or agreements other than those contained in this Agreement. This Agreement shall not be modified except in writing signed by both parties.

19. Headings. The headings used in this Agreement are included solely for convenience and shall not be used in connection with the interpretation hereof,

20. Assignment. The Contractor may not assign, transfer or delegate its rights, obligations or duties under this Agreement without the express written consent of MCRR.

21. Successors and Assigns. This Agreement shall be binding upon the heirs, court-appointed representatives, assigns and successors of the parties hereto.

22. Notice. Notice shall be deemed to have been duly served if delivered in person to the individual or individuals identified below, or if delivered to the individuals identified below by recognized national overnight courier service.

23.

If to MCRR:

Massachusetts Coastal Railroad
12 Harding Street
Lakeville, MA 02347
Attention: Andrew J. Reardon

If to Contractor:

24. Governing Law. This Agreement shall be construed in accordance with the laws of the Commonwealth of Massachusetts, without regard to its conflicts of law principles.

[SIGNATURES APPEAR ON THE FOLLOWING PAGE]

IN WITNESS WHEREOF, the parties hereto have executed this Agreement by their proper officers or duly authorized agents as of the day and year first above written.

MCRR:

MASSACHUSETTS COASTAL RAILROAD

By: _____
Name:

CONTRACTOR:

By: _____
Name:
Title:

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Massachusetts Coastal Railroad LLC**Contractor:**

NOTE: THESE RATES ARE SUBJECT TO CHANGE IN FUTURE UPON APPROVAL FROM MA DOT

Schedules 1 and 2**Effective June 1, 2021**

Hourly rates/daily rates effective for an 8 hour week day; overtime rates are 1.5 times hourly rate for work beyond an 8 hour week day and any weekend day or holiday

Description of Service	Hourly Rate	OT/Weekend
<i>Attachment 1 – Flagging Services</i>		
<i>By job type:</i>		
Flagger	\$108.21	\$159.86
<i>Attachment 2 – Support Services</i>		
<i>By job type:</i>		
Employee in charge (EIC)	\$108.21	\$159.86
<i>Other items:</i>		
Road Worker Protection (RWP) Training – minimum fee to be PREPAID, for employees	\$500.00	
Road Worker Protection (RWP) Training per employee (over 4 employees)	\$125.00	
Mileage rate (from Onset to worksite)	\$.58 per mile	

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DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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Project Utilities Coordination (PUC) Form
CONTACTS AND GENERAL UTILITY INFORMATION

5/28/2021
Revision
Date:

City/Town: Barnstable	Project File #: 606272	PUC Completed by: cjl	Utility Pole Set: Verizon
Route/Street: Iyannough Road (Route 28) & Yarmouth Road	Resident Engineer:	Mass DOT PM: Thomas H. Currier	Scheduled Ad Date: 5/29/2021
			Total Poles Relocated: 25

5/28/2021
PRINTED

Consultant:		Contact:		Office #		Cell #		Email					
TanSystems Corp.		Lenny Velichansky		(857) 453-5456				lavelichansky@transystems.com					
Utility Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement		Potential for District Initiated Early Relocation *		Utilities On Bridge/Structure		Utilities Underground (UG) /Aerial (OH)
					Yes	No	Agreement	Non-Reimb'te	Notes	YES	NO	YES	
Eversource Electric	Brian Mello	(508)-441-5881		brian.mello@eversource.com	X					X		X	X
Eversource Fiber	Brian Mello	(508)-441-5881		brian.mello@eversource.com	X					X		X	X
Verizon	Karen Mealey	(774) 409-3160		karen.m.mealey@verizon.com	X					X		X	X
Comcast	Wendy Brown	(978) 848-5183		Wendy_Brown@cable.comcast.com	X					X		X	X
Ngrid Gas	Melissa Owens	(781)-907-2845		Melissa.Owens@nationalgrid.com	X					X		X	
Barnstable IT	Dan Wood	(508) 862-4624		daniel.wood@town.barnstable.ma.us	X					X		X	X
Hyannis Fire District	John Cosmo	(508) 775-1300				X			Town owned street lights.	X		X	X
MassCoastal RR	Chris Podgurski	(508) 291-2116		cpodgurski@capetrain.com	X					X		X	
Verizon Wireless	Sean Conway	(508)-320-2017		Sean.Conway@VerizonWireless.com		X			Not seeking reimbursement per phone conversation on 11/27/19.	X		X	X

Utility Relocation Notes for MassDOT Contractor

Unless otherwise noted by Contract, the MassDOT Contractor is to provide the District Construction Office with 7 Calendar Days advance notification in order to validate the current progress and provide the required 30 Days advance notice-to-proceed for the first Utility - and each subsequent Utility. These advance notifications are to be identified in the Contractor's Schedules (Pre-Con preparation, Baseline, Subnets, and Updated/Monthly Schedules) as specified in Subsection 8.02 (for DBB Contracts) and/or Section 9 (of DBB Contracts). Note: The durations included below do not include these lead-times. See Additional 'Important Basis notes for Contractor' - on last PUC Form page.

Additional notes:

Suggested Sequence of Relocation / Based on Consultant proposed construction staging)

The sequence as detailed on the following pages is based on the consultants proposed staging plan. This information was compiled through meetings that included all of the utilities listed below along with the designer and the Town of Barnstable. The information provided is the best available information prior to project advertisement.

PUC FORM - CONTINUED

Is 'enabling' (prep) work, by the Contractor, necessary prior to the start of the first series of utility relocations:	Yes	No
	X	
Has any of the Utility work been identified to work concurrently	Yes	No
		X

5/28/2021
PRINTED



RESPONSIBLE PARTY	C = Contractor U = Utility Co.	DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes	
				Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	Potential Access Restraint	Should an AR be considered for the Contractor ?
				Utility working with no other Utilities in vicinity	Utility working with other Utilities on site	No Contractor physical construction on-site	Utility are working on-site but NOT in the same vicinity	(Yes/No)	
Phase : 1	C	>Contractor to notify utilities 30 days prior to the start of work. >Contractor to demolish KAM Appliance building prior to gas main installation. (Stage 1A Contract TTCP)							
UTILITY OPERATIONS - Underground (Permanent)									
Task : 1		Ngrid Gas							
	u	Relocate approx. 2210 FT of 6"/4" steel/plastic (60 psig) gas main with 8" plastic to avoid conflicts with drainage structures, drainage pipe & street box cuts.	50	x			x		
	u	Ivannough Rd (#251 Ivannough Rd to RR, RR to #151 Ivannough Rd)		x			x		
	u	Yarmouth Rd (#145 Yarmouth Rd to Old Yarmouth Rd)		x			x		
	u	Trenching & Pipe installation		x			x		
	u	Main connections and purging		x			x		
	u	Backfill and restoration		x			x		
		Sub-Total	50						
Phase : 2	C	>Contractor to notify utilities 30 days prior to the start of work. >Contractor to install utility manholes, hand holes, pads, enclosures, conduits and grounding for (primary and secondary electrical systems plus communication systems). (Stage 1A & 3A Contract TTCP)							
UTILITY OPERATIONS - Aerial & Underground (Permanent)									
Task : 1		Verizon							
	u	Verizon Line place 28 new poles	46	x			x		
		Sub-Total	46						
Task : 2		Eversource Electric							
	u	Relocation & install 29 poles by Verizon	17	x			x		
	u	Install overhead wire, transformers, cutouts	30	x			x		
	u	Transfer Wire	10	x			x		
	u	Install 4 Electronic switches	6	x			x		
	u	Removal of overhead wire	15	x			x		
	u	Install Underground Primary Cable	20	x			x		
	u	Primary Cable Splicing	35	x			x		
	u	Install Underground Secondary Cable	20	x			x		
	u	Install Risers & Riser Equipment	25	x			x		
		Sub-Total	178						
Task : 3		Eversource Energy - Fiber							
	u	Install 1600' of Fiber	10	x			x		
		Sub-Total	10						
Task : 4		Hyannis Fire District							
	u	**Remove utility pole mounted street lighting on poles being eliminated and R&R on poles being relocated.	14	x			x		
		Sub-Total	14						
Task : 5		Barnstable IT							
	u	Remove aerial temporary cable from temp poles and place in new underground. Splice and test new cable into network.	1	x			x		
		Sub-Total	1						

RESPONSIBLE PARTY	C = Contractor U = Utility Co.	DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes	
				Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	Potential Access Restraint (Yes/No)	Reason/Note (optional)
				Utility working with no other utilities in vicinity	Utility working with other utilities on site	No Contractor physical construction operations on-site	Utility are working on-site - but NOT in the same vicinity		
Task: 6		Comcast							
	u	Run new strand onto new poles.	4	x			x		
	u	Pull in new U/G cable into existing conduits.	5	x			x		
	u	Pull in new aerial cable / lash.	5	x			x		
	u	Pull in / Trench New Drops.	5	x			x		
	u	Cold Splice All New Cables.	4	x			x		
	u	Activate all new coax - Cable.	2	x			x		
	u	Wreck out old aerial cable.	5	x			x		
		Sub-Total	30						
Task: 7		Verizon							Proposal No. 606272 - 114724
	u	VZ contractor dig splice pits & place conduit from MHs/Peds to splice pits & riser poles	14	x			x		
	u	Verizon Line place all aerial strand & guying	6	x			x		
	u	Verizon Line place all aerial copper cable	6	x			x		
	u	Verizon Line place all riser copper cables	6	x			x		
	u	Verizon Line place all underground copper cables	16	x			x		
	u	Verizon Line place buried cables in conduit & assoc, pedestals	5	x			x		
	u	Verizon Line place Pad Mounted SAI	1	x			x		
	u	Verizon Line place inner duct for fiber cables	1	x			x		
	u	Verizon Line place all underground fiber cables	1	x			x		
	u	Verizon Line place aerial fiber cable	3	x			x		
	u	Verizon Splice all aerial fiber cables	7	x			x		
	u	Verizon Splice all underground fiber cables	2	x			x		
	u	Verizon Splice all aerial copper cables	23	x			x		
	u	Verizon Splice all side leads	11	x			x		
	u	Verizon Splice all underground copper cables	21	x			x		
	u	Verizon Splice X-Wire SAI 24/8S @ Sea St	41	x			x		
	u	Verizon Splice all terminals and recon/replace drops	21	x			x		
	u	Verizon Splice cut off all aerial copper cables & assoc. equipment to be removed	16	x			x		
	u	Verizon Splice cut off all underground copper cables to be removed	5	x			x		
	u	Verizon Line Transfer copper cables to new Ups	1	x			x		
	u	Verizon Line remove all aerial cables & associated plant	12	x			x		
	u	Verizon Line remove underground fiber cables	2	x			x		
	u	Verizon Line remove all underground copper cables	12	x			x		
	u	Verizon Line remove all utility poles & anchors	46	x			x		
		Sub-Total	279						
Task: 8		Verizon Wireless							
	u	** Transfer small cell site located on Temporary UP#36/15A to a pole outside FAA airspace restriction.	5	x			x		
		Sub-Total	5						
Phase : 3	C	>Contractor to notify utilities 30 days prior to the start of work. >Contractor to install proposed Traffic Signal equipment. (Stage 4 Contract TTCP). >Contractor to construct proposed sidewalks, shared use path and raised median islands. (Stage 4 Contract TTCP).							
Task: 1		UTILITY OPERATIONS - Rail Road crossing (Saratoga RR)							
		MassCoastal RR							
	u	Installation of new traffic controller – interface new connecting cable, and test with MassDOT traffic control personnel.	7	x			x		
	u	Adjust warning time to account for pedestrian walk cycle per Transystems calculations.	7	x			x		
	u	Installation of 2 signals in the median with gates and test.	7	x			x		
	u	Installation of gates on all remaining signals. (gates are in storage and will have to be shipped when we schedule the work).					x		
		Sub-Total	21						

C = Contractor

RESPONSIBLE PARTY

U = Utility Co.

DESCRIPTION - Utility Relocation Phases, Tasks and Activities				Estimated Duration (Work Days) by Utilities (Lead time not included)		Concurrent / Exclusive Utility Work Contractor note: In planning and executing the work, the Access Restraints listed in the Special Provisions, takes precedence over the checklist in these 4 columns.			Access Restraint & Limitations of Operations Notes	
					Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	Potential Access Restraint (Yes/No)	Reason/Note (optional)
					Utility working with no other utilities in vicinity	Utility working with other utilities on site	No Contractor physical construction operations on-site	Contractor and Utility are working on-site but NOT in the same vicinity		Should an AR be considered for the Contractor ?

IMPORTANT BASIS NOTES - FOR CONTRACTOR

- Unless otherwise specified in the MassDOT Construction Contract, or unless specifically noted within this PUC Form, these durations (herein) are based upon the Contractor providing *unimpeded access* to the Utility company to perform Utility relocations (see Note 5 - Access).
- "Concurrent Utilities" operations noted herein, are to signify those Utility Company operations that can be worked concurrently (e.g. Utility A and Utility B work on-site together) - MassDOT and the Contractor are to prepare NTPs to Utilities accordingly.
- "Potential Access Restraints" noted within this PUC Form are for planning purposes. See MassDOT Contract for Contractual Access Restraints (refer to Subsections 8.02, 8.03, and/or 8.06 for Design Bid Build Contracts and Volume II Section 9 for Design Build Contracts).
- Utility non-work periods - For planning purposes, the durations above contain some non work days (contingency) for New England conditions (precipitation, high temperatures, low temperatures, snow, ice), Gas line work however, typically has a seasonal restriction and can NOT be installed from 15-November to 15-March. Municipally Owned Electric and Gas Utilities are also restricted from proceeding from 15-November to 15-March. The Contractor shall (and the CTD plan) reflect this calendar restriction within the schedule (unless otherwise note).
- Access - Unless otherwise noted in the Contract, and in addition to the 'enabling' notes above, the Contractor must provide safe and unimpeded access (for trucks, lifts, cranes, etc.) to the Utilities, to allow for the proposed relocation(s) - including but not limited to snow removal, clearing and grubbing, guard rail removal, barrier removal, tree removal, and grading.
- For all MassDOT construction contracts issued after January 2014, the new Utility Coordination/documentation specification is required. This is Section 8.14 in Design-Bid-Build Contracts (see Design-Build index reference for applicable section #).
- Prior to starting any and all enabling work for Utilities, the Contractor is to plan in advance with submittals and approved durations.
- * Potential District Initiated Early Utility Relocation - if noted herein, the District reserves the right to initiate early utility relocation in advance of the Contract NTP. In submitting a bid price and in the development/basis of the Baseline Schedule, the Contractor shall not plan the Work with the potential benefit of any form of 'early utility relocation.' As a requirement of the Baseline submission, unless otherwise noted in this Specification, the earliest that the first Utility company is to receive the 30 days advance notification to mobilize to the site, will be 7 calendar days after the pre-construction meeting and never sooner than 7 days after the Contract NTP.
- ** Assumed durations not supplied by utility.



WORK ZONE SAFETY

Temporary Traffic Control

*Typical Details and
Massachusetts Guidelines
for MassDOT, Municipalities,
Utilities, and Contractors*

SHEET INDEX (1 OF 3)**GENERAL****PAGE**

NOTES AND GUIDELINES.....	1-9
FIG. 1: TYPICAL TRAFFIC CONTROL DEVICES.....	10
FIG. 2: PAVEMENT EDGE DROP-OFF GUIDANCE.....	11
FIG. 3: TYPICAL DEVICE SPACING; (AT 30 MPH).....	12-13
FLAGGING GUIDANCE.....	14-15
FIG. 4-5: TYPICAL PEDESTRIAN DEVICES.....	16-17

STATIONARY OPERATIONS

FIG. 6: TWO LANE UNDIVIDED ROADWAY; HALF OF ROADWAY CLOSED; WORK NEAR CURVE.....	18-19
FIG. 7: TWO LANE UNDIVIDED ROADWAY; HALF OF ROADWAY CLOSED.....	20-21
FIG. 8: TWO LANE UNDIVIDED ROADWAY; SHOULDER CLOSED.....	22-23
FIG. 9: TWO LANE UNDIVIDED ROADWAY WITH TRAVERSABLE SHOULDER; HALF OF ROADWAY CLOSED; MAINTAIN TWO-WAY TRAFFIC.....	24-25
FIG. 10: FOUR LANE UNDIVIDED ROADWAY; RIGHT LANE CLOSED.....	26-27
FIG. 11: FOUR LANE UNDIVIDED ROADWAY; LEFT LANE CLOSED.....	28-29
FIG. 12: FOUR LANE UNDIVIDED ROADWAY; HALF OF ROADWAY CLOSED.....	30-31
FIG. 13: MULTILANE DIVIDED ROADWAY; RIGHT LANE CLOSED.....	32-33
FIG. 14: MULTILANE DIVIDED ROADWAY; LEFT LANE CLOSED.....	34-35
FIG. 15: MULTILANE DIVIDED ROADWAY; CENTER LANE OR RIGHT/CENTER LANES CLOSED.....	36-37
FIG. 16: MULTILANE DIVIDED ROADWAY; CENTER LANE OR LEFT/CENTER LANES CLOSED.....	38-39

SHEET INDEX (2 OF 3)

<u>STATIONARY OPERATIONS (CONT.)</u>	<u>PAGE</u>
FIG. 17: MULTILANE DIVIDED ROADWAY; RIGHT SIDE OF OFF RAMP CLOSED.....	40-41
FIG. 18: MULTILANE DIVIDED ROADWAY; LEFT SIDE OF OFF RAMP CLOSED.....	42-43
FIG. 19: MULTILANE DIVIDED ROADWAY; ROADWORK BEYOND ON RAMP.....	44-45
FIG. 20: MULTILANE DIVIDED ROADWAY; ROADWORK BEYOND OFF RAMP.....	46-47
FIG. 21: MULTILANE DIVIDED ROADWAY; TYPICAL RAMP CLOSURE.....	48-49
FIG. 22: MULTILANE DIVIDED ROADWAY; TYPICAL CLOVERLEAF RAMP CLOSURE.....	50-51
FIG. 23: MULTILANE DIVIDED ROADWAY; TYPICAL RAMP CLOSURE; ADVANCE SIGNING.....	52-53
FIG. 24: FOR MULTILANE DIVIDED ROADWAY; PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS.....	54-55
<u>MOBILE OPERATIONS</u>	
NOTES FOR MOBILE OPERATIONS.....	56
FIG. 25: ANY ROADWAY; BEYOND RIGHT SHOULDER.....	57
FIG. 26: ANY ROADWAY; SHOULDER.....	58
FIG. 27: DIVIDED ROADWAY; MEDIAN WORK.....	59
FIG. 28: UNDIVIDED TWO LANE ROADWAY; HALF OF ROADWAY CLOSED.....	60
FIG. 29: MULTILANE DIVIDED ROADWAY; LEFT LANE.....	61
FIG. 30: MULTILANE DIVIDED ROADWAY; RIGHT LANE.....	62
FIG. 31: MULTILANE DIVIDED ROADWAY; CENTER LANE.....	63
FIG. 32: POST-STORM CLEANUP OPERATION.....	64

SHEET INDEX (3 OF 3)**EMERGENCY RESPONSE****PAGE**

NOTES FOR TRAFFIC EMERGENCY/INCIDENT OPERATIONS... 65

FIG. 33: ANY ROADWAY; SHOULDER ENCROACHMENT..... 66

FIG. 34: TWO LANE ROADWAY; NO SHOULDER; TRAVEL
LANE ENCROACHMENT.....67FIG. 35: TWO LANE ROADWAY; TRAVERSABLE SHOULDER;
SINGLE LANE ENCROACHMENT..... 68FIG. 36: TWO LANE ROADWAY; TRAVERSABLE SHOULDER;
CENTER OF ROADWAY..... 69

FIG. 37: MULTILANE DIVIDED ROADWAY; RIGHT LANE..... 70

FIG. 38: MULTILANE DIVIDED ROADWAY; LEFT LANE.....71

FIG. 39: MULTILANE UNDIVIDED ROADWAY; LEFT LANE..... 72

FIG. 40: MULTILANE DIVIDED ROADWAY; MIDDLE LANE;
APPROACH FROM LEFT.....73FIG. 41: MULTILANE DIVIDED ROADWAY; MIDDLE LANE;
APPROACH FROM RIGHT.....74**TRAFFIC SIGNAL REPAIR WORK AT INTERSECTION**FIG. 42: MULTILANE UNDIVIDED ROADWAY; LEFTMOST OR
LEFT TURN LANE.....75FIG. 43: TWO LANE UNDIVIDED ROADWAY; ONE LEG OF
INTERSECTION..... 76FIG. 44: MULTILANE UNDIVIDED ROADWAY; CENTER OF
INTERSECTION..... 77**PEDESTRIAN DETAILS**

FIG. 45: PEDESTRIAN BYPASS.....78

FIG. 46: TEMPORARY SIDEWALK CLOSURE..... 79

BIKE LANE DETAILS

FIG. 47: BIKE LANE CLOSURE.....80-81

INTRODUCTION

This guide has been prepared to assist in the planning and installing of temporary traffic controls in maintenance, utility, or short-term construction work areas (work lasting 10 hours or less). This guide serves to assist with the many decisions that must be made for each work site. Special planning for traffic control is necessary on a case by case basis because conditions can vary widely among work locations. **Since this guide cannot cover every situation, representative illustrations covering typical short-term construction, maintenance, and utility operations are presented.**

All typical traffic control device setups illustrated should be considered as guides. The traffic control devices that are shown, the arrangement or position of the devices, and the distances prescribed in the tables are based on the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) and the Massachusetts Amendments to the MUTCD (MA Amendments), but these illustrations only present minimum standards. The provision of safe work zones for all roadway users and roadway workers affected by these activities is paramount. Traffic controls may be expanded or improved upon whenever deemed necessary. Traffic movement through the work site all traffic control devices shall be periodically observed and inspected at all locations.

If necessary, Part 6 of the MUTCD and the MA Amendments, Chapter 17 (Work Zone Management) of MassDOT's Project Development & Design Guide, and the "Traffic Engineering and Safety Section" of the MassDOT web site: (<https://www.massdot.state.ma.us/highway/Departments/TrafficandSafetyEngineering.aspx>), as well as MassDOT District offices can provide additional guidance, information, and suggestions for work zone setups.

RESPONSIBILITIES FOR TRAFFIC CONTROL

Short-term construction, maintenance, and utility work on or near the roadway creates a potentially hazardous situation, typically requiring the use of temporary traffic controls. These controls are important to protect both work crews and the road users. It is the responsibility of each maintenance foreman to establish and maintain safe and effective controls.

Usually the supervisor, working with the crew, plans the traffic control procedures for proposed work sites. The foreman is responsible for re-requesting, storing, and maintaining all traffic control devices necessary for their crews.

The foreman is responsible for placing the devices according to these guidelines. They must inspect each installation and observe traffic flow through the area. The foreman is generally authorized to make adjustments to the original installations that, in their judgment, are necessary to improve the control of traffic and establish greater safety.

All necessary traffic control devices must be installed before work begins and properly maintained during the work period. They must also be removed as soon as they are no longer relevant to the roadway conditions.

PAGE 2

In situations such as night time road or lane closures, detours, or other unusual conditions on state highways, the District Traffic Maintenance Engineer (DTME) should be advised. If the DTME is absent, the section foreman shall follow the instructions of the District Maintenance Engineer.

TRAFFIC CONTROL DEVICES

Traffic control devices regulate the movement of road users, warn of unexpected or unusual roadway conditions, and inform them how to maneuver safely through or around the work area. All signs, channelizing devices, barricades, and other miscellaneous traffic control devices should work together to guide traffic safely and efficiently. Common temporary traffic control devices are outlined and described below.

Signs

Temporary traffic control zone (TTCZ) signs are the primary means of providing information and directions to roadway users. All signs must be retroreflective per MassDOT's latest standard.

Warning signs call attention to unexpected conditions and to situations that might not be readily apparent to road users on or adjacent to a roadway. Warning signs alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations. Nearly all warning signs for construction and work areas have black legends and borders on a fluorescent orange background.

Regulatory signs shall be used to inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements. Regulatory signs typically have black legends and borders on a white background.

Channelizing Devices

When used properly, traffic cones, reflectorized plastic drums, and barricades guide traffic through the work area along an appropriate travel path. It takes roadway users a certain distance along the roadway to safely move away from the upcoming active work site. These transition distances are based on the following taper length (L) formulas:

$L = WS^2/60$ for speeds of 40 mph or less; or

$L = WS$ for speeds of 45 mph or more; where

- L = minimum length of taper in feet,
- S = posted speed limit or typical travel speed in miles per hour prior to the work, and
- W = width of lane closure in feet.

The spacing of channelizing devices (in feet) is approximately equal to the existing speed of traffic (in mph).

Warning Lights

Rotating beacons and other flashing lights mounted on work vehicles, signs, or channelizing devices help alert roadway users to the work area. They may also be used to warn roadway users of hazards within the work area. The first 10 drums in any taper shall be equipped with sequential flashing lights.

Arrow Boards

Arrow boards are a special type of sign that are highly visible work zone warning devices. They are particularly effective on highways, where both speed and volume are high. Arrow boards in the non-directional, CAUTION, mode (four corner flashing) may be used to indicate that a shoulder is closed. Arrow boards in the arrow mode shall only be used when a travel lane is dropped on a multi-lane road and one lane of traffic must merge with another. All arrow boards should be located at the beginning of each lane or shoulder closure taper without extending outside of it. Arrow boards shall flash at a rate of 25 to 40 flashes per minute. Arrow boards shall not be used to indicate a lane shift.

BASIC REQUIREMENTS

In every work situation, the temporary traffic control setup must: Give roadway users sufficient advance warning of the work area; advise roadway users of the proper actions to take and travel paths to follow; and provide protection to roadway users, workers, and the work area. These three general requirements can be met as outlined below.

Provide Advance Warning

Warning devices along the approaches to a work area alert roadway Users to changes to road and operating conditions. Roadway users are usually alerted to these dangers via a sign or series of signs installed in the same order as the roadway user generally would expect to see them on long-term construction projects.

The initial project limit sign is usually a general warning such as "ROAD WORK 1500 FT". Other operational warning signs then provide the roadway user with more specific information about the situation. A minimum of three advance warning signs (the initial project limit sign and two operational warning signs) is recommended when work is located on the traveled way. Warning lights and flags can be used to attract attention to the signs. A highly visible work area helps reinforce the advance warnings.

Advise and Direct Travelers

Operational warning signs provide information to the road-way user such as the type of work being performed, special conditions to watch for, or actions to take. These include signs such as, SHOULDER WORK, RIGHT LANE CLOSED, DETOUR 500 FT, ROAD CLOSED to THRU TRAFFIC, POLICE OFFICER AHEAD, etc. All of these signs must be located far enough in advance of the work area that the roadway user has sufficient time to react to them appropriately. For projects in Urban Areas, see detail: Typical Device Spacing for minimum sign spacing.

Protect Travelers, Workers, and the Work Area

The primary protection of any work area is its own visibility. Traffic cones, reflectorized plastic drums, portable breakaway barricades, etc. are used to make the work area visible and separate workers from traffic.

PAGE 4

Other devices, such as flashing lights, flags, delineators, temporary lighting, and portable changeable message signs (PCMS) can be used to provide additional emphasis and visibility.

Workers must protect themselves by being alert to their work situation, wearing safety vests and hard hats, and by facing traffic whenever possible.

Work vehicles can also add protection when they are equipped with truck mounted attenuators, rotating beacons, flashing lights, flashing arrow boards, etc. and are parked between workers and oncoming traffic. However, workers should not position themselves between two closely parked vehicles. No private personal vehicles are allowed within the work site.

PLANNING GUIDELINES

Decisions regarding selection of work area traffic control devices require a knowledge and understanding of the specifics of each work zone. As there may be vast differences between situations, three main variables need to be considered prior to determining the need for, or the selection of, traffic control devices: 1) location of work, 2) type of roadway, and 3) speed of traffic.

Compiling information about these variables will help with planning a safe work area control. Each of these variables is explained below.

Location of Work

The choice of traffic controls needed for a short-term construction, maintenance, or utility operation depends upon the work zone's location. As a general rule, the closer the active work site is to the roadway, the more control devices are needed. Work can take place:

- Away from the shoulder or edge of pavement. No special devices are needed if work is confined to an area 15 or more feet from the edge of the shoulder. A general warning sign, such as ROAD WORK AHEAD, should be used if workers and equipment must occasionally move closer to the roadway.
- On or near the shoulder/ edge of pavement. This area should be signed as if work were on the road itself, since it is part of the roadway users' recovery area. Advance warning and operational signs are needed, as well as channelization devices to direct traffic and keep the work area visible to roadway users.
- On the median of a divided highway. Work in this location may require traffic control in both directions of traffic. Advance warning and channelization devices should be used if the median is narrow.
- On the roadway. This condition requires detailed protection for workers and sufficient warning to roadway users. Advance warning must provide a general message that work is taking place as well as information about specific hazards and specific actions the roadway user must take.

TYPE OF ROADWAY

The characteristics of the roadway also have an important influence on the selection of work area traffic control. The roadway, itself, may present special hazards. You should plan for maximum protection, using the worst hazard present as your guide to signing the work area. Some general considerations are described below for road conditions.

One-way roads: A one-way road requires signage on both sides of the road if it carries two or more lanes in one direction, ensuring roadway users in all lanes are alerted and informed.

Two-way roads:

- **Undivided:** Two-way, undivided roads will usually require controls for both directions of traffic. When the active work site is well off the roadway, controls for the opposite lane may be eliminated.
- **Divided:** Work on divided multi-lane roadways can often be handled as work along a one-way road (i.e. signs are provided along both sides of the roadway along the direction affected). If the work is in the median, both directions of traffic must be controlled, and both approaches should be double signed (i.e. have all 3 advance warning signs on both sides of each direction).

EFFECTS OF SPEED ON WORK ZONES

Speed is an important consideration in the use of work area traffic control devices. As a general rule, the greater the speed of traffic approaching a work area, the greater the size, number, and spacing of control devices.

Size. The standard size for most warning signs is 36 x 36 inches on conventional roadways and 48 x 48 inches on freeways and expressways. Signs larger than the standard 36 x 36 inches may be desirable on high-speed conventional roads.

Position. Install signs far enough in advance of the work area so the roadway users have time to react to them (see charts associated with diagrams for spacing).

OTHER FACTORS

Sight Obstructions. To ensure safety, work areas must be visible. Assess the placement of the temporary traffic control devices by driving through the area, and determine if the devices can be easily seen and provide sufficient time for roadway users to react in a safe manner. Extra precaution should be enacted in areas where horizontal or vertical curves may obstruct a roadway user's clear view of road activities ahead.

Police/Flaggers. It should be noted that the MUTCD does not require police/flaggers for stationary setups. If police/flaggers are used, a police/flagger ahead sign should be used in advance of any point where the police/flagger is stationed to control road users.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL

1. PLAN YOUR WORK

Inspect location of work area and its surroundings.

Analyze:

- Location of work in relation to the traveled way, intersecting road-ways, driveways, and sight distances;
- Type of roadway and traffic involved; and
- Volume and speed of traffic.

Meet and discuss the work and necessary traffic control with the crew.

Study representative illustrations in this guide to develop a temporary traffic control plan (TTCP).

Other Considerations:

- Base your traffic control plan on the premise that all roadway users are unfamiliar with the area.
- The closer the work area location is to traffic, the more controls are needed.
- Plan for maximum protection.
- Select and inspect the temporary control devices needed (including all warning signs), if they are not in good condition, REPLACE THEM!
- Then collect and transport them to the work site.
- Determine their proper placement.
- Install signs and other traffic control devices prior to allowing personnel or equipment onto the roadway.
- Make sure signs are reflective, accurate, clean, and meet specifications. Completely cover any existing permanent signs that will conflict with the messages of the new work area control signs.

2. INSTALLING/REMOVING TEMP. TRAFFIC CONTROL DEVICES

Care must be exercised when installing and removing temporary traffic control (TTC) devices. The traffic control needed to perform the operation safely is dictated by the location on the roadway the operation will occur: in a shoulder or a lane, in the left lane or right, etc. In all cases, installing TTC begins and ends as a mobile operation.

A shadow vehicle with a truck mounted attenuator (TMA) shall be used to protect workers installing and removing TTC devices on all roadways with a posted speed limit of 45 MPH or greater as directed by the engineer. TTC devices shall not be installed or removed from a shadow vehicle with a TMA. TTC devices shall be installed or removed from a work operation vehicle only and a shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

3. INSTALL TRAFFIC CONTROL DEVICES AT WORK SITE FOR LOWER SPEED (≤ 40 MPH) ROADWAYS:

- 1) All devices shall be installed in order with the flow of traffic.
- 2) Where one direction of traffic is being affected, the first sign installed should be the sign farthest from the work site, and on the same side as the work.
- 3) Where two directions of traffic are affected, install signs for opposing traffic first, starting with the sign farthest from the work area. When signs for opposing traffic have been installed, install signs on the same side as the work area, again beginning with the sign farthest from the active work site.
- 4) Once signs are in place, other traffic control devices shall be installed in the same manner as the signs.

FOR HIGHER SPEED (≥ 45 MPH) ROADWAYS:

- 1) All devices shall be installed in order with the flow of traffic.
- 2) Install all advance warning signs, beginning with the ROAD WORK XXX (W20-1) sign and ending with the END ROAD WORK/DOUBLE FINES END (MA-R2-10E) sign.
- 3) Install all signs beginning with the opposite side which will be closed (for a right lane closure; first, install all signs on the left side (shoulder) and then install all signs on the right side (shoulder). No signs shall be erected on the roadway unless delineated by traffic control devices.
- 4) If required, install shoulder taper as the mobile operation advances.
- 5) Install arrow board on the shoulder prior to the merging taper or as close to the beginning of the merging taper as possible.
- 6) Install channelizing devices to form a merging taper. Use of a shadow vehicle with a TMA during installation is required on roads with speed limits of 45 MPH or greater or as directed by the Engineer.
- 7) Install traffic control devices along the buffer space at the appropriate spacing.
- 8) Continue placing devices along the work space at the appropriate spacing.
- 9) Install devices for the termination area as necessary.
- 10) Place the shadow vehicle with a TMA in advance of the first work crew or hazard approached by motorists. Multiple shadow vehicles may be required based on the number of lane and shoulder closures implemented.

4. INSPECT WORK AREA SIGNING AND CONTROL DEVICES

- 1) Assess the placement of the temporary traffic control devices by driving through the work area. All approaches to the work zone should be checked.
- 2) Ensure roadway users will have sufficient time to read signs and react in a safe manner.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

- 3) Check visibility of entire work area. If approaching roadway users can't see the work area well, or if they can't see ahead to traffic that may already be queued on the approach because of the work, additional traffic control devices should be deployed.
- 4) Check to ensure the proper temporary traffic control devices are positioned to protect workers from traffic (where possible).
- 5) Ensure all workers wear safety vests, hard hats, and all other necessary safety equipment. All worker safety gear should be in good condition. All reflective gear should be clean and highly visible in the dark.
- 6) Record in the log book the number and location of all signs and devices.

Considerations:

- Work area signs should never be blocked from view or obscured by vegetation, existing signs, or other obstructions.
- Flags, flashing lights, and edge line traffic cones can be used to improve visibility.

5. REMOVE TRAFFIC CONTROL DEVICES AT WORK SITE

All workers and equipment should be clear from work site BEFORE removing signs and other devices.

FOR LOWER SPEED (≤ 40 MPH) ROADWAYS:

- 1) Remove signs and other devices within the delineated area when work is complete.
- 2) Remove other traffic control devices in the reverse order in which they were installed
- 3) Remove signs in the reverse order in which they were installed (i.e. sign closest to the work area to be removed first).
- 4) When the operation is complete, uncover any existing permanent signs covered in Step 2.
- 5) Record in the log book the time at which the signs were removed.

FOR HIGHER SPEED (≥ 45 MPH) ROADWAYS:

All TTC devices for a stationary lane closure on a multi-lane roadway, except advance warning signs, should be removed against the flow of traffic in the following sequence:

- 1) Remove the channelizing devices starting from the end of the activity area working back to the widest part of the merging taper.
- 2) A shadow vehicle with TMA shall be positioned to protect workers removing devices and work backwards as the setup is removed from the roadway.

PROCEDURES FOR WORK AREA TRAFFIC CONTROL (CONT.)

- 3) Place the removal vehicle on the shoulder, and remove the channelizing devices from the merging taper by hand onto the work vehicle.
- 4) Remove the arrow board once traffic is clear and it is safe to do so.
- 5) Circle back and moving with the flow of traffic, remove the advance warning signs starting with the opposite side from previous lane closure first.
- 6) At no time shall workers run across the multilane roadway to remove signs on both sides of the road simultaneously.
- 7) Record in the log book the time at which the signs were removed

RAMP FACILITIES

At all times it is necessary to control the on and off-ramp traffic during the installation and breakdown of traffic control devices. Use of temporary traffic slow-downs or rolling roadblocks is recommended to allow for the safety of workers handing temporary traffic control devices on ramp facilities. A shadow vehicle with a TMA shall be used to protect the workers installing or removing the devices. At no time shall the work operation vehicle be used as the shadow vehicle with the TMA.

USE OF THIS GUIDE

Illustrations showing minimum standards for short-term construction, maintenance, and utility operations are arranged in this guide by type of operation. The users of this guide should compare all illustrated examples and examine their differences. After gathering information about the work zones using the general guidelines as outlined, proceed as follows:

- 1) Turn to the Index. Consider the type of operations and the type of roadway upon which work will occur.
- 2) Select the figure that most closely matches the conditions where you plan to work. Remember that all diagrams represent minimum standards.
- 3) Read the title of the illustration to ensure that it is appropriate to your location. Study the layout of traffic control devices and read all notes.
- 4) Consult the appropriate tables, as directed on each illustration to determine taper length and proper spacing of signs. Notice that distances change when speeds change. Also note that these are guidelines, only, and they must be adapted to your specific work area.
- 5) Use the **“PROCEDURES FOR WORK AREA TRAFFIC CONTROL”** for assistance in completing all necessary steps to provide effective and safe work area traffic control.



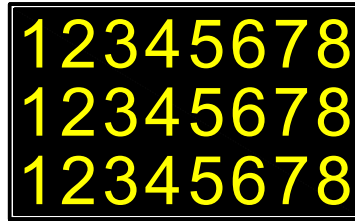
PAGE 10

Work Zone Safety
Standard Details
and Drawings

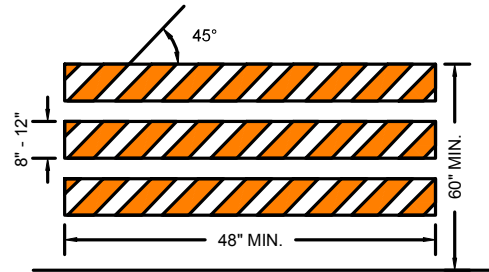
FIGURE 1
TYPICAL TRAFFIC CONTROL DEVICES
NOT TO SCALE



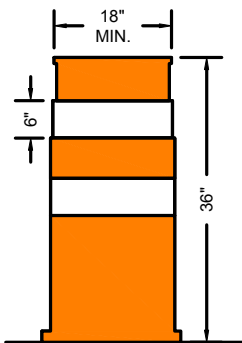
SIGN



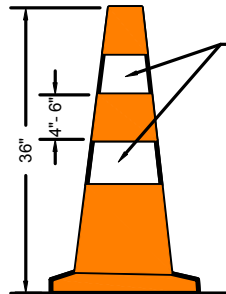
**PORTABLE CHANGEABLE
MESSAGE SIGN (PCMS)**



TYPE III BARRICADE

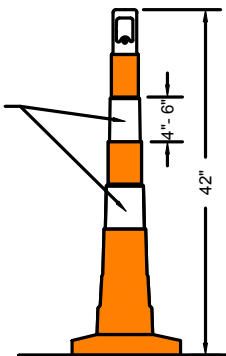


DRUM

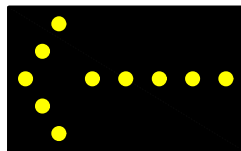


RETROFLECTIVE
BANDS

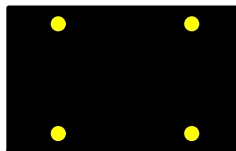
CONES



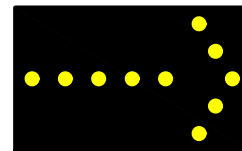
Cones may be used for all daytime operations. For night work, drums should be used to form the taper(s) and cones can be used along the tangent section of the work setup.



LEFT

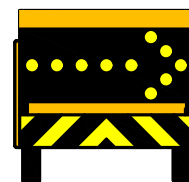


CAUTION



RIGHT

ARROW BOARD (WITH MODE)



TRUCK MOUNTED ATTENUATORS

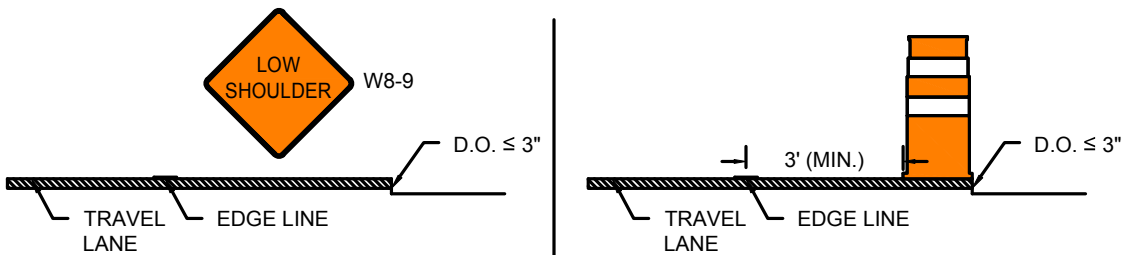
Truck Mounted Attenuators (TMA) shall be positioned between the start of the work area and the end of the designated buffer zone. The TMAs are to be positioned in each temporarily closed lane. This includes shoulders (≥ 8 feet) whether combined with a travel lane closure or being closed alone. These TMA conditions are required on roadways with speeds of 45 MPH or greater. TMAs can be used on other roadways at the discretion of the engineer. TMAs shall be used for the deployment and removal of all traffic control devices, including all advance warning signs.

SHORT-TERM PAVEMENT EDGE DROP-OFFS

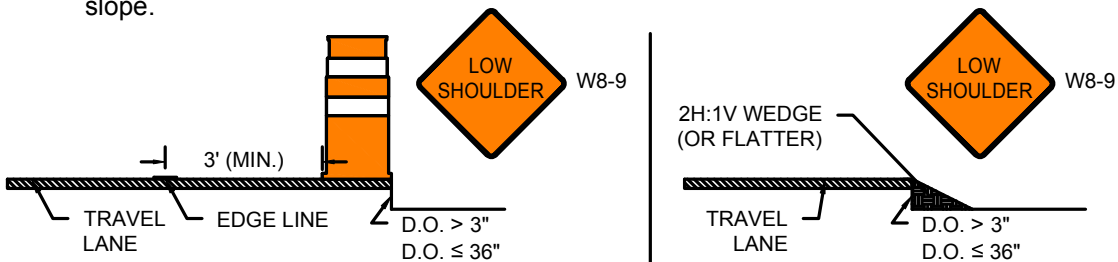
Note that this guidance is adopted from the Roadside Design Guide, 4th Edition.

Pavement drop-offs may occur during paving, excavation, and other construction activities. Drop-offs create hazards for vehicles if not properly mitigated. The following applies for all roads with speed limits greater than 30 mph; for roads with speed limits of 30 mph or less, treatments for pavement edge drop-offs are at the discretion of the Engineer. Drop-offs between adjacent, open travel lanes should not exceed 2", and any drop-off in excess of 3" should not be left unattended without one of these mitigation measures applied.

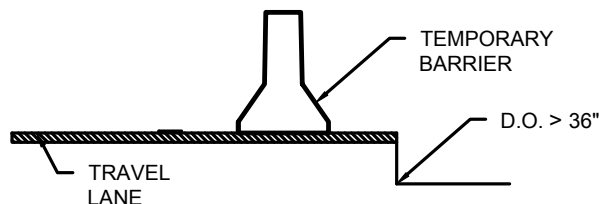
- Shoulder drop-offs 3" or less adjacent to a shoulder or active travel lane should be mitigated by:
 - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment; or
 - ✓ The placement of drums on the traffic side of the drop-off.



- Shoulder drop-offs greater than 3" but less than or equal to 36" should be mitigated by:
 - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of drums on the traffic side off the drop-off, offset at least 3' from the travel lane; or
 - ✓ A W8-9 (LOW SHOULDER) sign in advance of and at regular intervals throughout the treatment and the placement of a temporary wedge of material along the face of the drop-off. The wedge should consist of stable material placed on a 2H:1V or flatter slope.



- Shoulder drop-offs greater than 36" must be protected by temporary barrier.





PAGE 12

Work Zone Safety
Standard Details
and Drawings

TYPICAL DEVICE SPACING

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	55
45-55	500 / 1000 / 1000	660	495	40	40
60-65	1000 / 1600 / 2600	780	645	40	50

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

MINIMUM SPACING OF ADVANCE WARNING SIGNS FOR URBAN ROADWAYS	
ROAD TYPE	DISTANCE BETWEEN SIGNS
URBAN (LOW SPEED)	100 FT
URBAN (HIGH SPEED)	350 FT

NOTES

1. 40 FT = 10 FT PAVEMENT MARKING + 30 FT SKIP

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

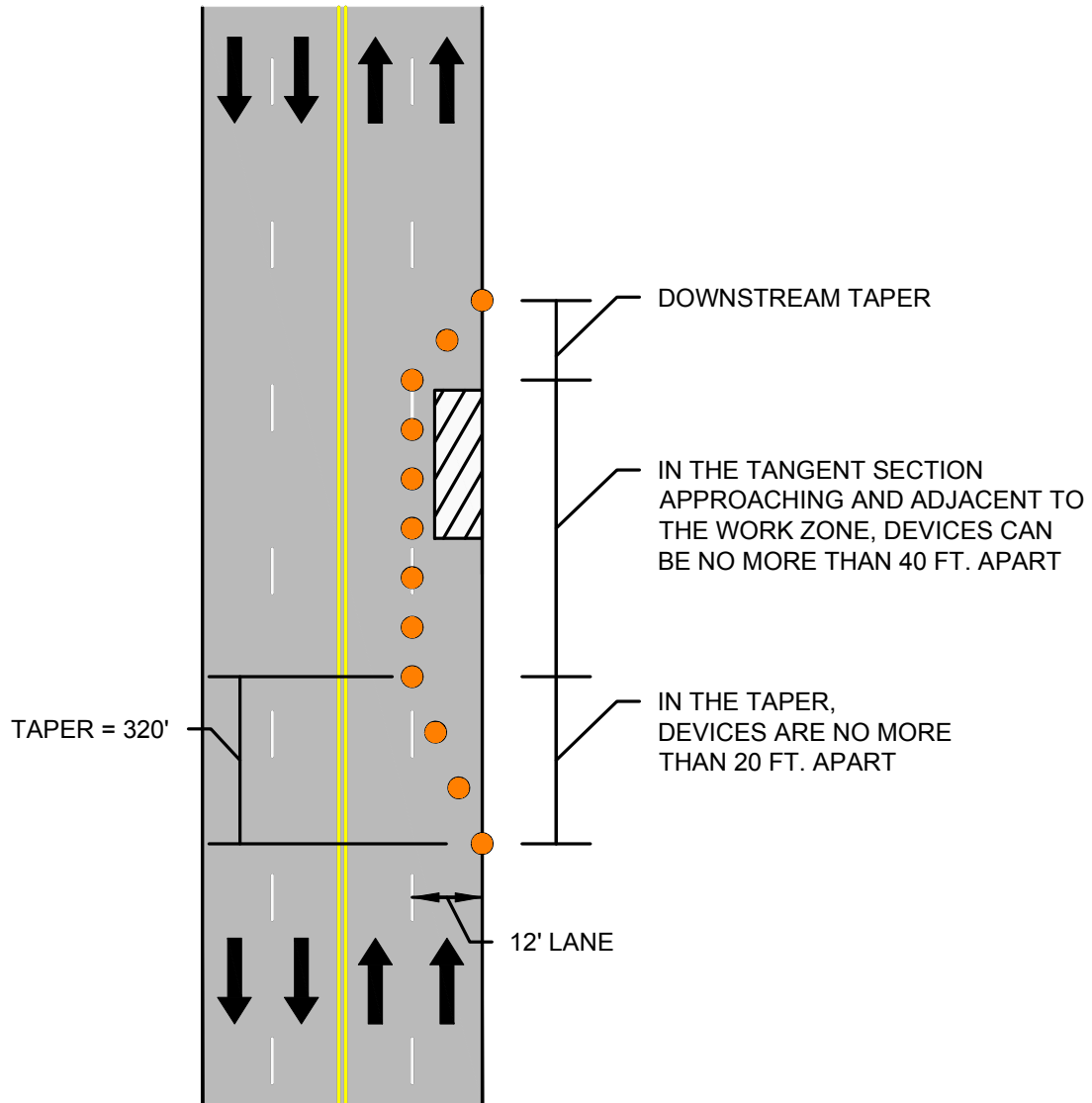


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 14

Work Zone Safety
Standard Details
and Drawings

FLAGGING GUIDANCE

Guidance for Flagging Operations

NOTE:

A flagger shall always be aware of their surroundings and have a good escape route. A flagger shall never be positioned directly beside or against construction equipment. When a flagger is required to direct traffic in an area where the escape route is partially blocked by a traversable obstruction such as a guardrail, the flagger shall be physically capable of traversing that obstruction. Prior to commencing a project, the supervisor in charge shall review the project, including guardrail areas, for safe flagging stations. The supervisor in charge shall clearly communicate with the flagger(s), indicating any locations where they cannot safely perform their duties.

Each flagger shall be equipped with the following high visibility clothing, signaling, and safety devices:

- 1) A white protective hard hat with a minimum level of reflectivity per the requirements of ANSI, Type I, Class E&G;
- 2) A clean, unfaded, untorn lime/yellow reflective safety vest and pants meeting the requirements of ANSI 107 Class 3 with the words "Traffic Control" on the front and rear panels in minimum two (2) inch (50 millimeter) high letters;
- 3) A 24 inch "STOP/SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a weighted, reflectorized red flag, flagger station advance warning signage, and two-way radios capable of providing clear communication within the work zone between flaggers, the Contractor, and the Engineer. The traffic paddle shall be mounted on a pole of sufficient length to be seven feet above the ground as measured from the bottom of the paddle;
- 4) A working flashlight with a minimum of 15,000 candlepower and a six inch red attachable wand, a whistle with a working lanyard, and a First Aid kit that complies with the requirements of ANSI Z308.1; and
- 5) An industrial/safety type portable air horn that complies with the requirements of the U.S. Coast Guard.

A "STOP/SLOW" paddle should be the primary hand-signaling device. It shall have an octagonal shape on a rigid handle. Flag use should be limited to emergency situations.

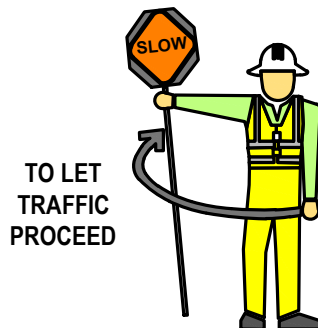


Properly Trained Flaggers

- Give clear messages to drivers.
- Allow distance for drivers to react.
- Coordinate with other flaggers.
- Use standard signaling methods.

Properly Equipped Flaggers

- Use approved stop/slow paddles.
- Use approved safety apparel.
- Use retroreflective equipment.
- Use hand held radios, as needed.
- All flaggers shall wear safety apparel that meets ANSI Class 3 requirements. The combination of vest and pants is required.



Proper Flagging Stations

- Good approach sight distance.
- Highly visible to traffic.
- Stand alone away from other machinery and people.
- Stand on right edge of pavement or shoulder- proceed to centerline only when first vehicle has come to stop.
- Have a good escape route.



Proper Advance Warning Signs

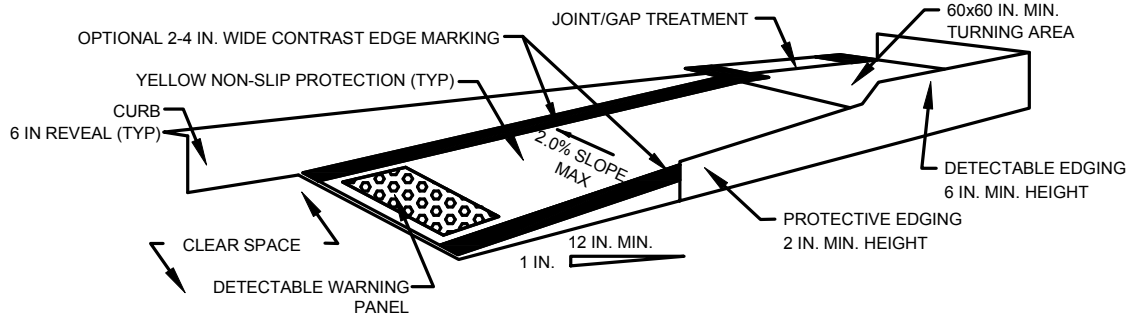
- Always use warning signs.
- Allow for reaction distance from signs.
- Remove signs if no longer necessary or not flagging.
- Use free hand in up-and-down motion to help slow traffic.



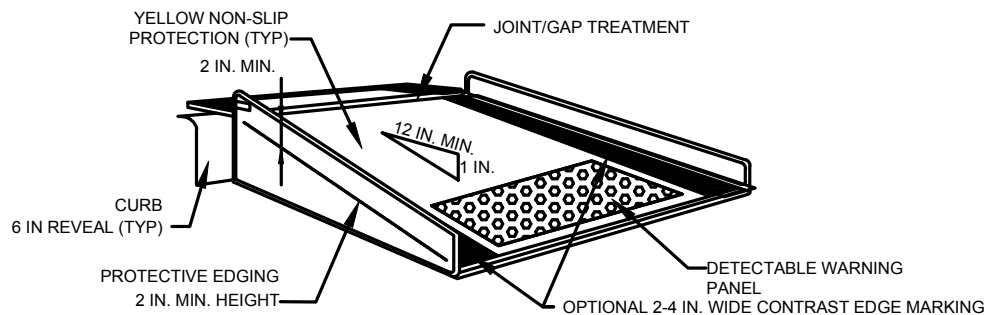
PAGE 16

Work Zone Safety Standard Details and Drawings

FIGURE 4
TYPICAL PEDESTRIAN DEVICES
(1 OF 2)
NOT TO SCALE



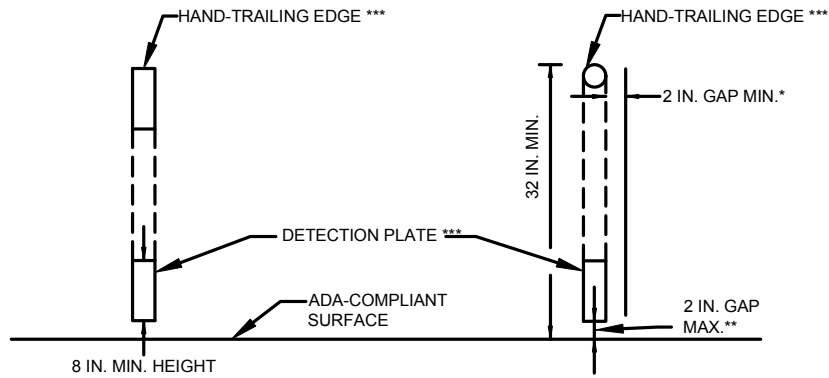
TEMPORARY CURB RAMP-PARALLEL TO CURB



TEMPORARY CURB RAMP-PERPENDICULAR TO CURB

NOTES:

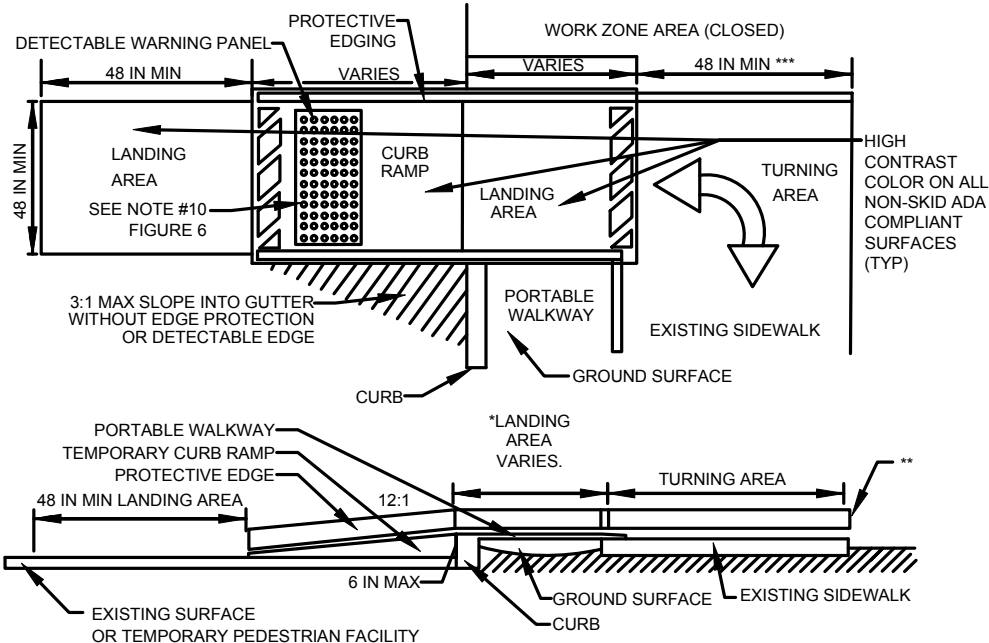
1. CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE, AND NON-SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOPE STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
3. PROTECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. THE CURB RAMP WALKWAY AND LANDING AREA SURFACE SHALL BE OF A SOLID CONTINUOUS CONTRASTING COLOR ABUTTING UP TO THE EXISTING SIDEWALK.
5. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
6. CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
7. WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
8. LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
9. CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.
10. IF A TEMPORARY PEDESTRIAN RAMP LEADS TO A CROSSWALK, THEN A DETECTABLE WARNING PAD MUST BE ADHERED TO THE BASE OF THE RAMP. IF IT LEADS TO A PROTECTED PEDESTRIAN BYPASS THAT DOES NOT CONFLICT WITH VEHICULAR TRAFFIC, THEN A PAD SHALL NOT BE INSTALLED ON THE RAMP.



CROSS SECTION VIEW

PEDESTRIAN CHANNELIZING DEVICE

- * THERE SHALL BE A 2 INCH GAP BETWEEN THE HAND-TRAILING EDGE AND ITS SUPPORT.
- ** A MAXIMUM 2 INCH GAP BETWEEN THE BOTTOM OF THE BOTTOM RAIL AND THE SURFACE MAY BE USED TO PROVIDE DRAINAGE.
- *** THE HAND-TRAILING EDGE AND DETECTION PLATE SHALL BE CONTINUOUS THROUGHOUT THE LENGTH OF THE PATH SUCH THAT A PEDESTRIAN USER WITH A LONG CANE CAN FOLLOW IT.



TEMPORARY CURB RAMP

- * LANDING AREA USED TO OVERLAP NON-ADA COMPLIANT SURFACES.
- ** DETECTABLE EDGE REMOVED IF A CONTINUOUS SIDEWALK.
- *** 60 IN. IF AN OBSTRUCTION IS AT BACK OF SIDEWALK.



PAGE 18

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED
WORK NEAR CURVE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. ** = EXTEND ENOUGH SO TAPER IS BEFORE CURVE

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

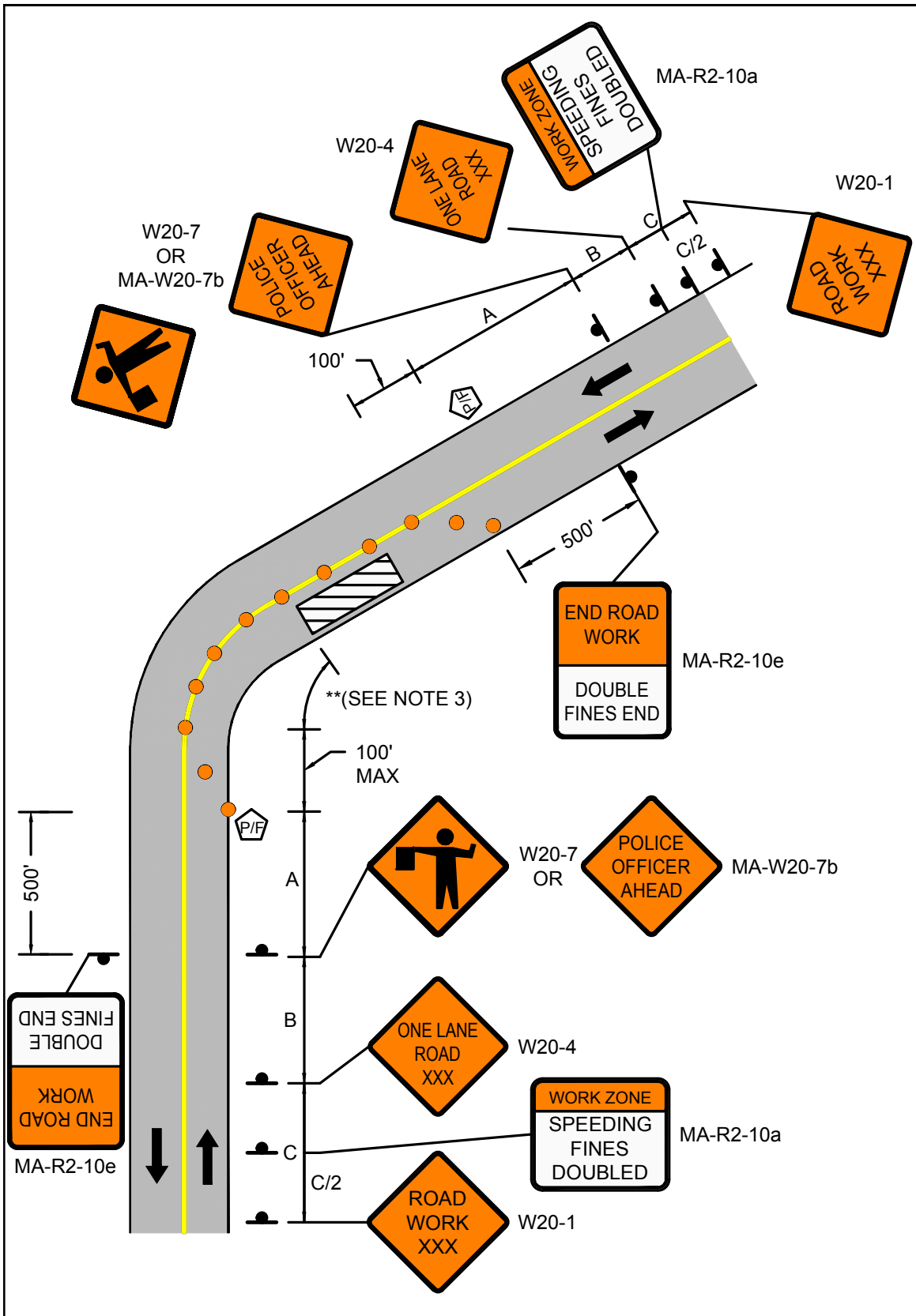


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 20

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	50	100	20	30
45-55	500 / 1000 / 1000	100	150	40	20

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
36-mph to 55-mph	15-feet
35-mph and under	10-feet

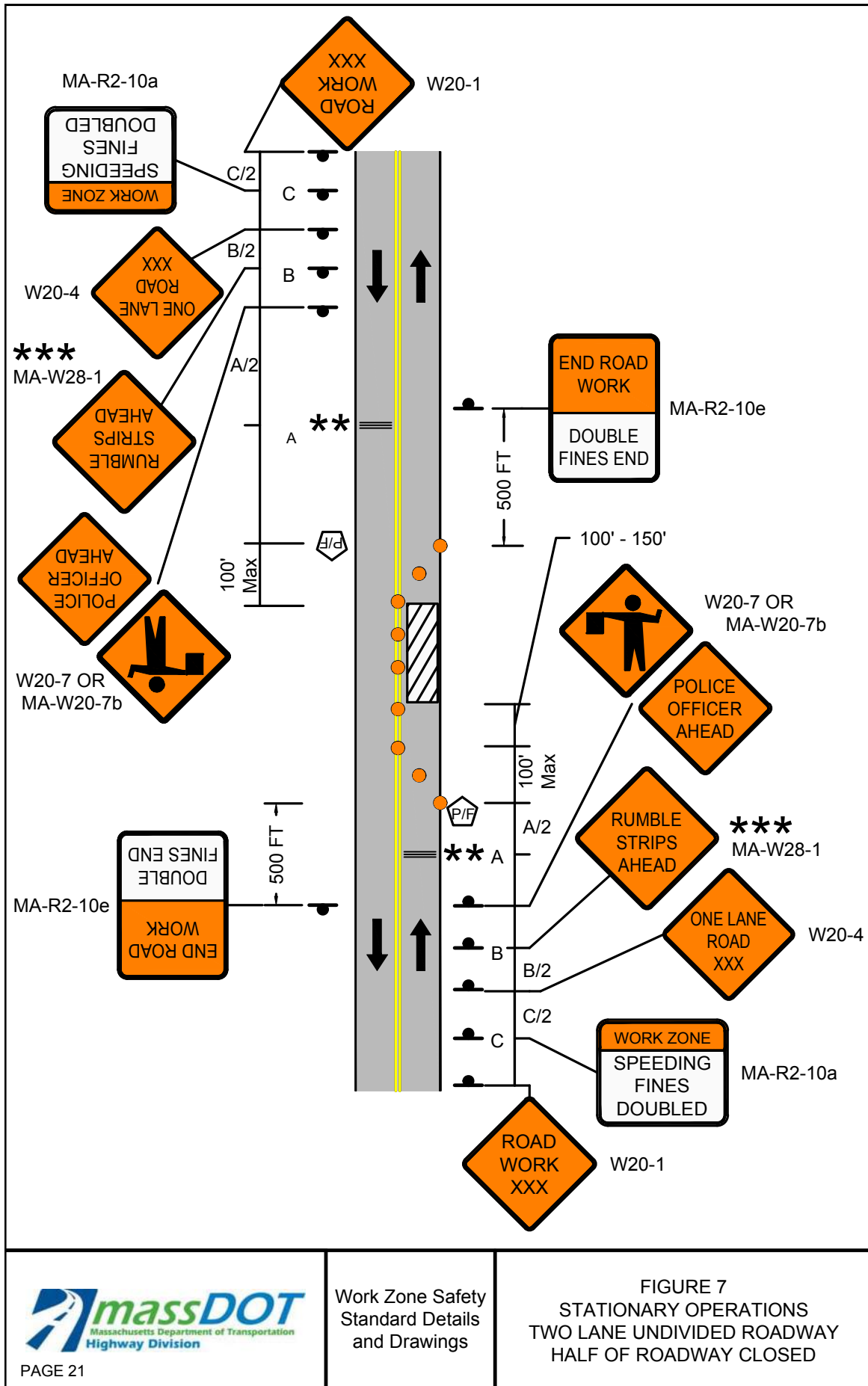
NOTES

1. IF POLICE DETAIL/UNIFORMED FLAGGER SUPPORT IS REQUIRED, PROVIDE TWO UNITS.
2. MA-R2-10a LOCATED AT C/2.
3. ** OPTIONAL AT THE ENGINEER'S DISCRETION.
4. *** SHALL BE DEPLOYED IF RUMBLE STRIPS ARE PRESENT.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 22

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
SHOULDER CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a at C/2 and A/2.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

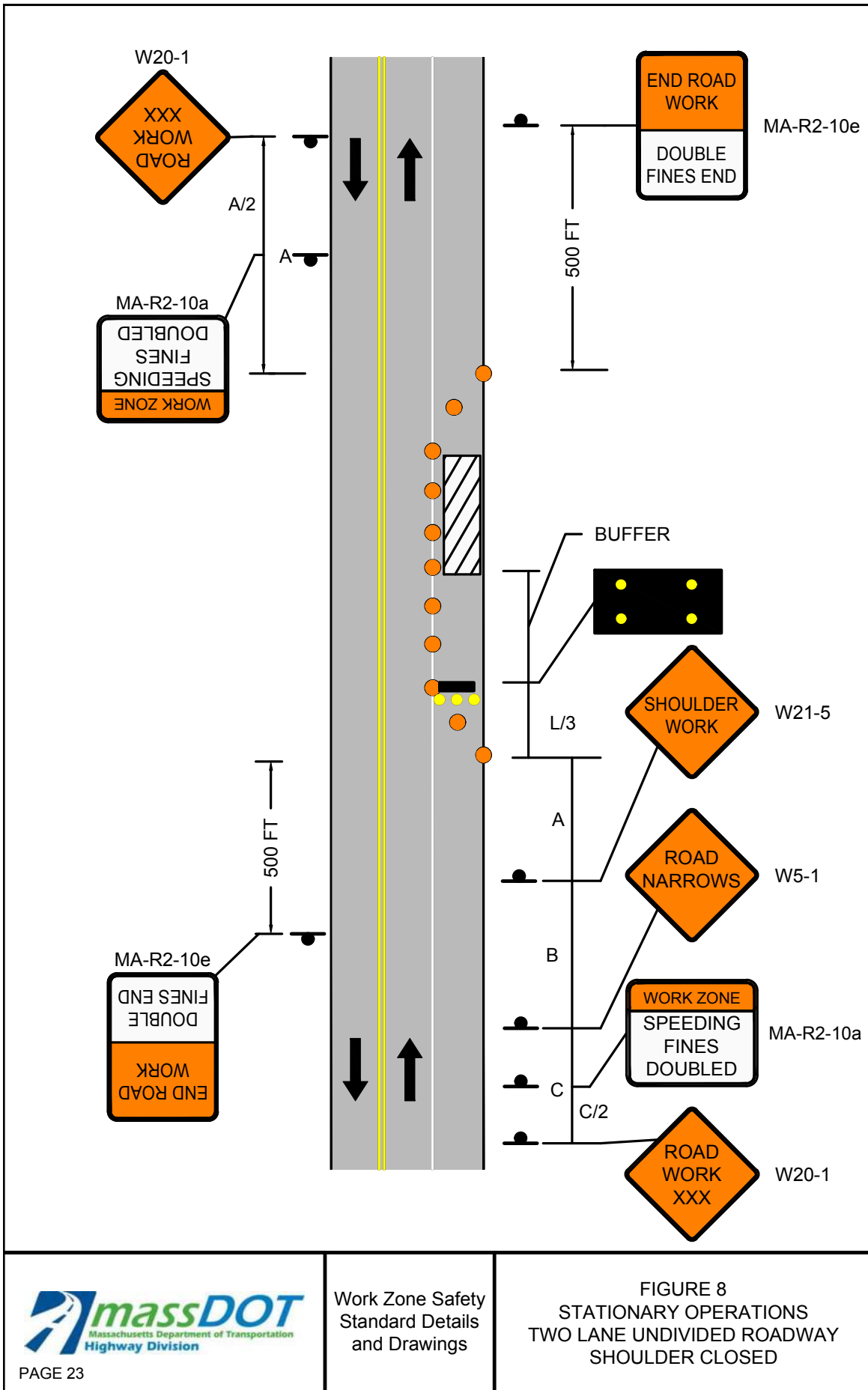


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 24

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
TWO LANE UNDIVIDED ROADWAY
WITH TRAVERSABLE SHOULDER
HALF OF ROADWAY CLOSED
MAINTAIN TWO-WAY TRAFFIC

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	160	305	20	125
45-55	220	330	495	40	100
60-65	260	390	645	40	115

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

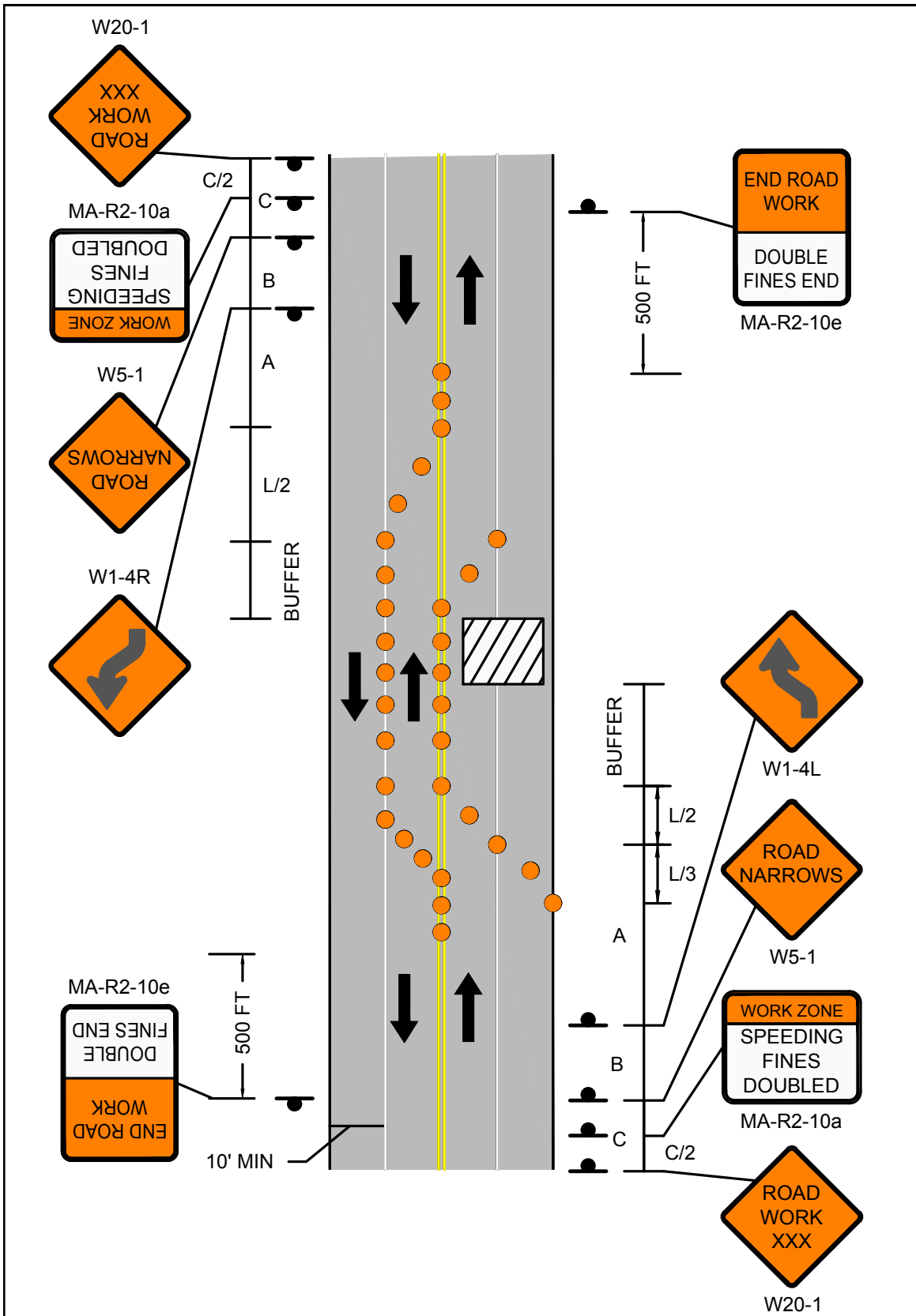


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 26

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
FOUR LANE UNDIVIDED ROADWAY
RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

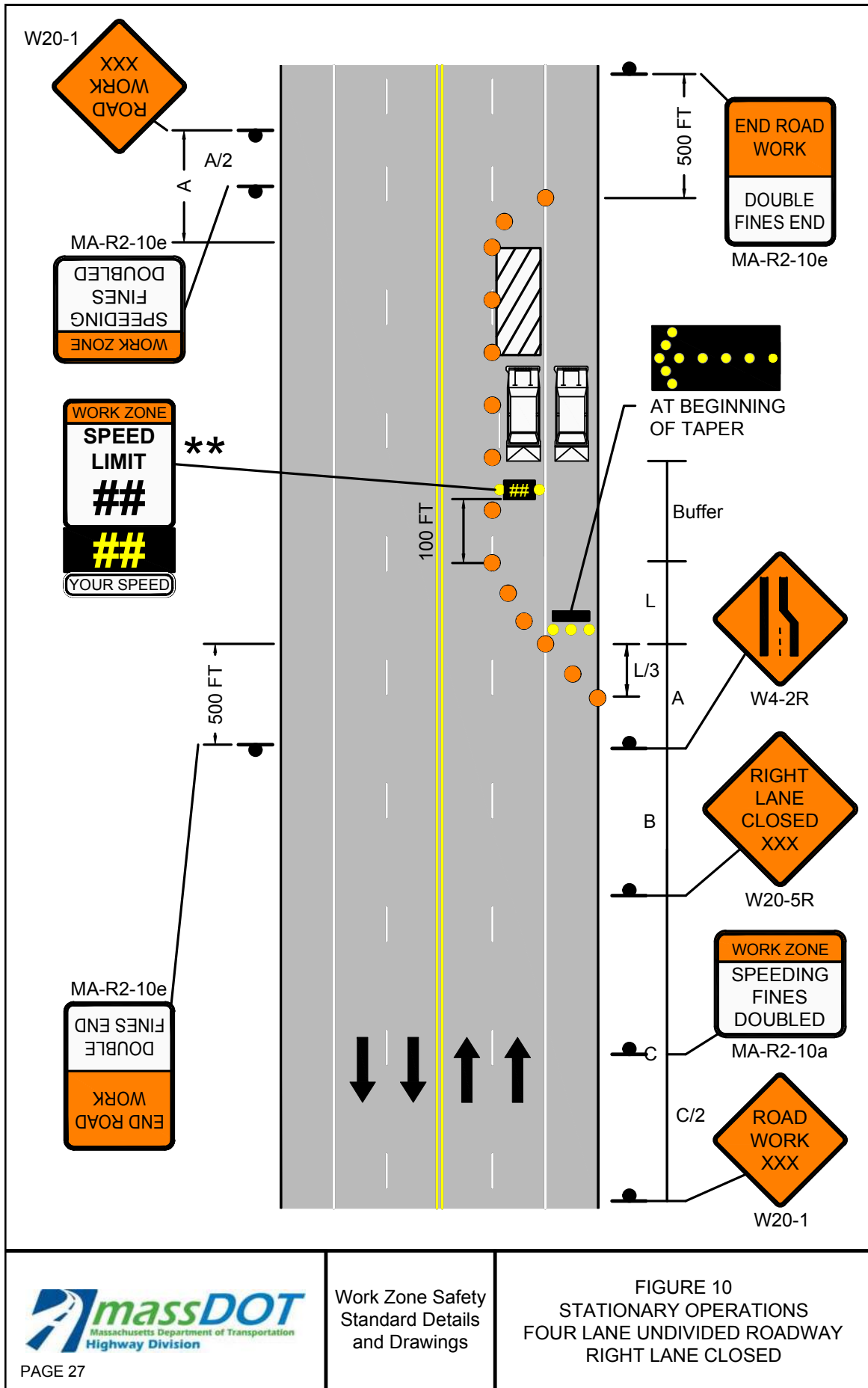
NOTES

1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. **OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 28

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
FOUR LANE UNDIVIDED ROADWAY
LEFT LANE CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	320	305	20	105
45-55	500 / 1000 / 1000	660	495	40	80
60-65	1000 / 1600 / 2600	780	645	40	100

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

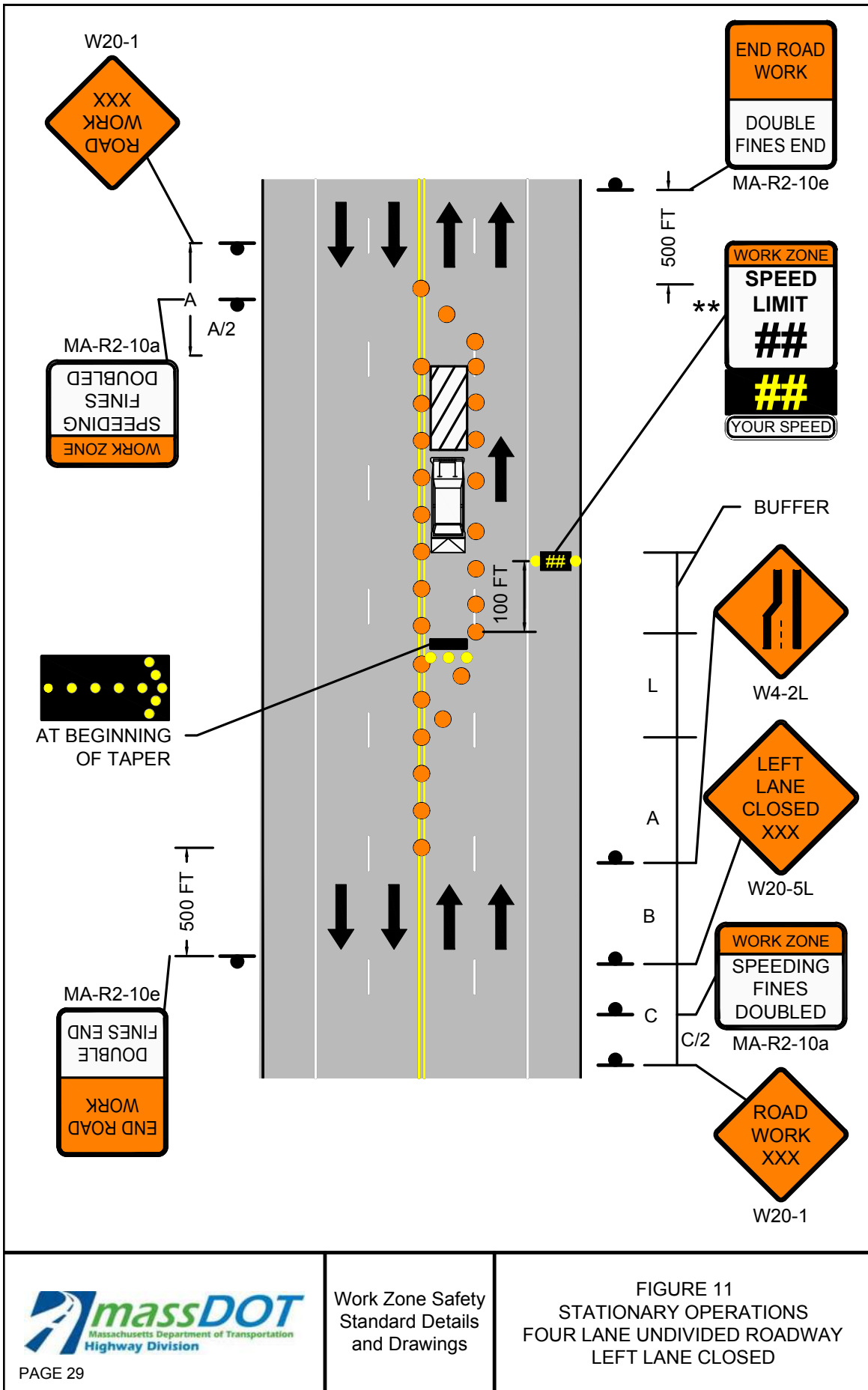
NOTES

1. MA-R2-10a LOCATED AT A/2 AND C/2.
2. **OPTIONAL AT THE ENGINEER'S DISCRETION. 2' OFFSET FROM EDGE OF TRAVEL LANE TO RADAR SPEED FEEDBACK BOARD IS REQUIRED. BOARD MAY BE MOVED FULLY OR PARTIALLY OFF PAVED SHOULDER, IF REQUIRED.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 30

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
FOUR LANE UNDIVIDED ROADWAY
HALF OF ROADWAY CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	140
45-55	220	660	330	495	40	120
60-65	260	780	390	645	40	140

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. **OPTIONAL AT THE ENGINEER'S DISCRETION.
3. W1-4L SHALL BE PLACED AT THE MIDDLE OF THE TANGENT.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

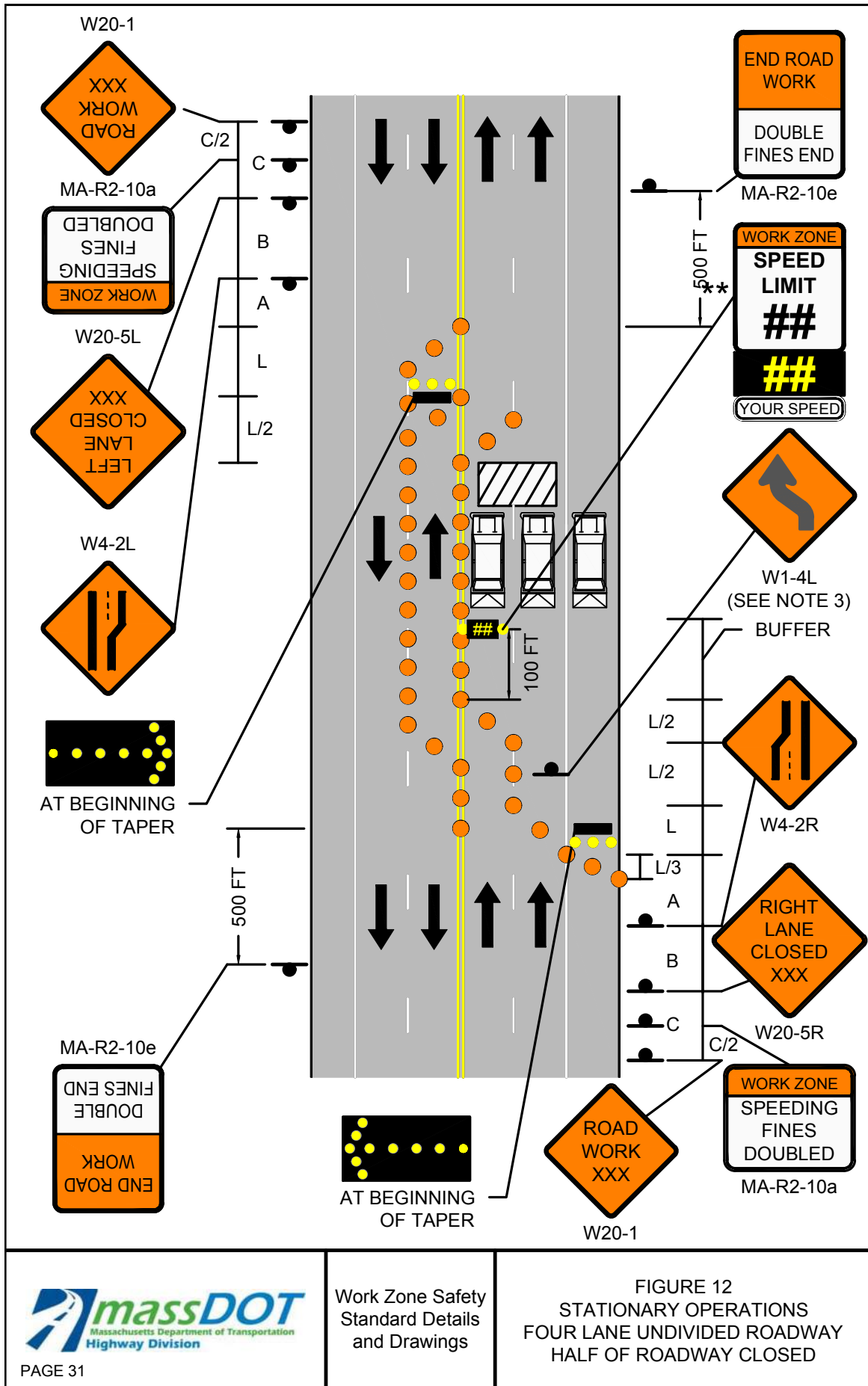


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 32

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
RIGHT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. **OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER



TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE



PAGE 34

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
LEFT LANE CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	60
45-55	220	660	495	40	50
60-65	260	780	645	40	55

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

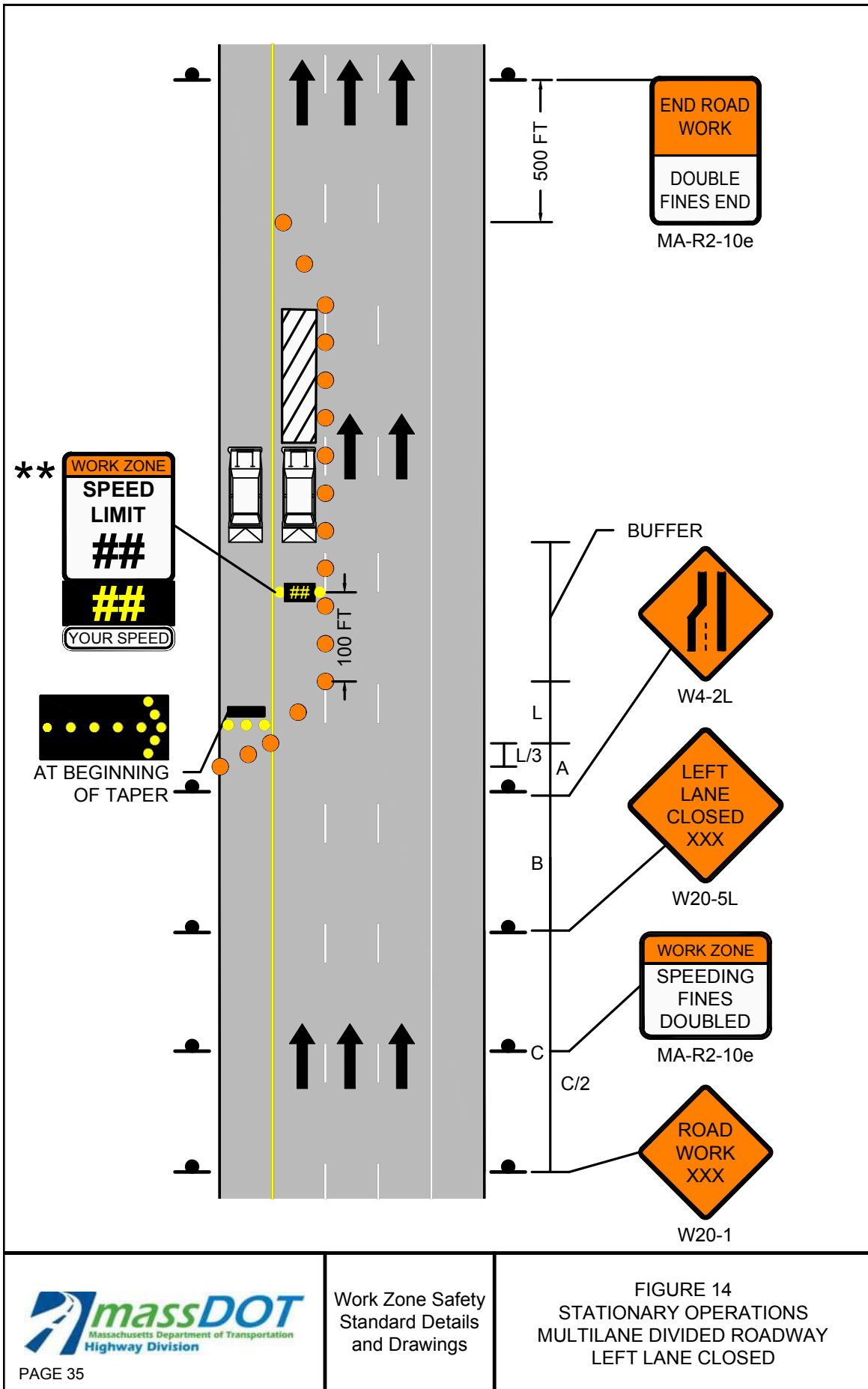
NOTES

1. MA-R2-10a LOCATED AT C/2.
2. **OPTIONAL AT THE ENGINEER'S DISCRETION.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 36

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
CENTER LANE OR RIGHT/CENTER
LANES CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

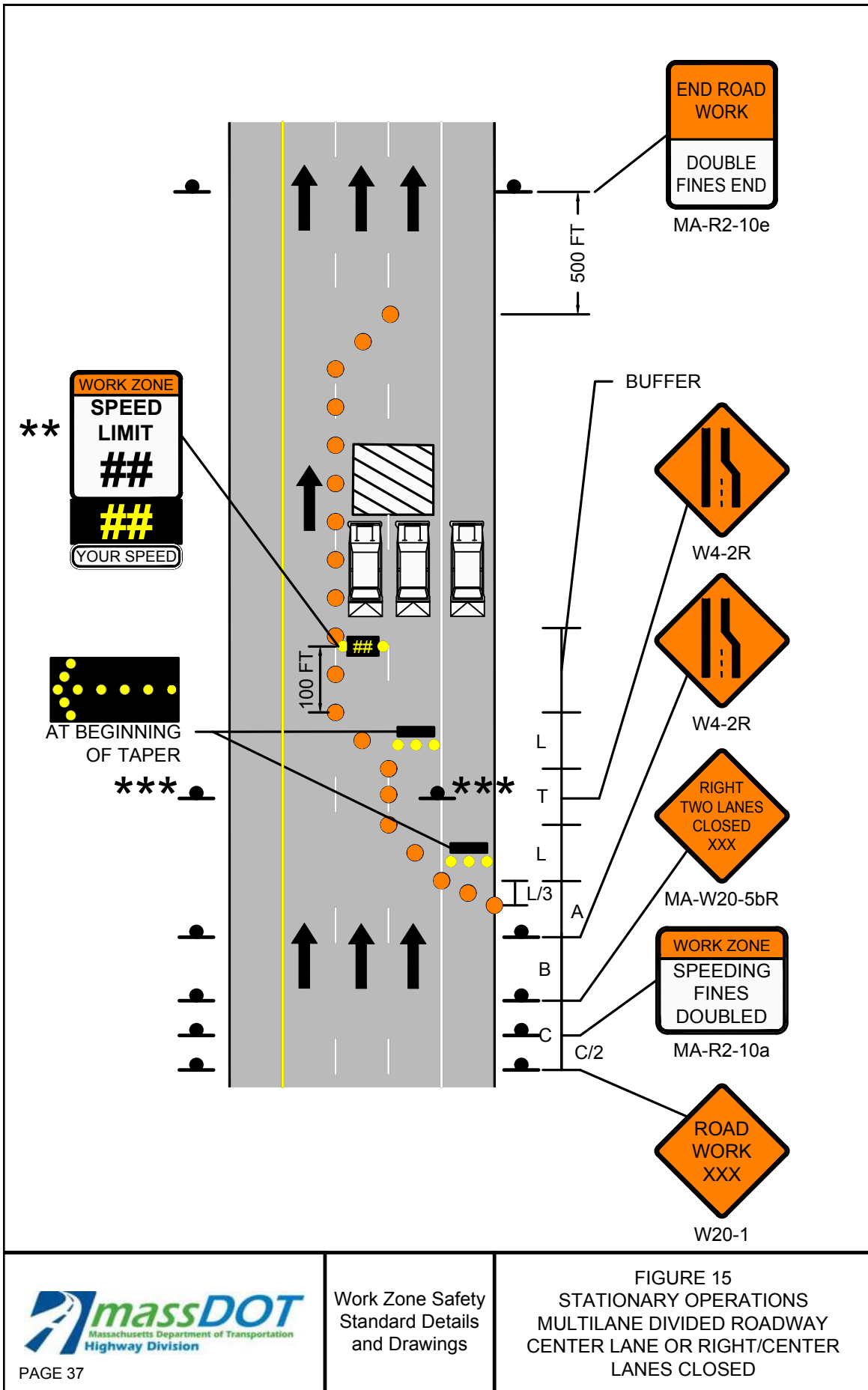
NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ***OPTIONAL AT THE ENGINEER'S DISCRETION.
3. ***THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 38

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
CENTER LANE OR LEFT/CENTER LANES
CLOSED

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TANGENT LENGTH BETWEEN TAPERS T (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	640	305	20	110
45-55	220	660	1320	495	40	100
60-65	260	780	1560	645	40	115

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. ***OPTIONAL AT THE ENGINEER'S DISCRETION.
3. ****THIS SET OF SIGNS SHALL BE LOCATED AT T/2.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

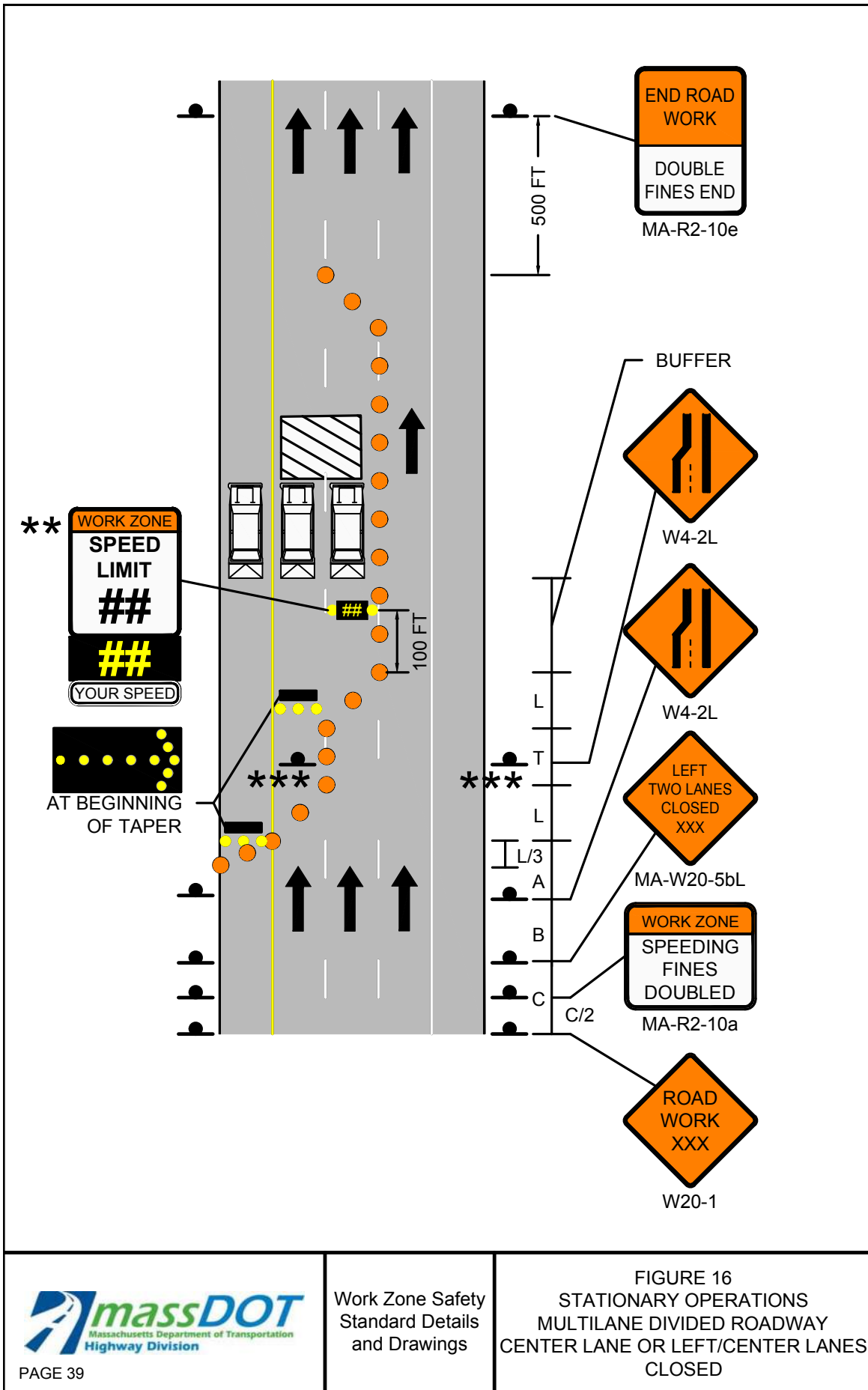


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 40

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
RIGHT SIDE OF OFF RAMP CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

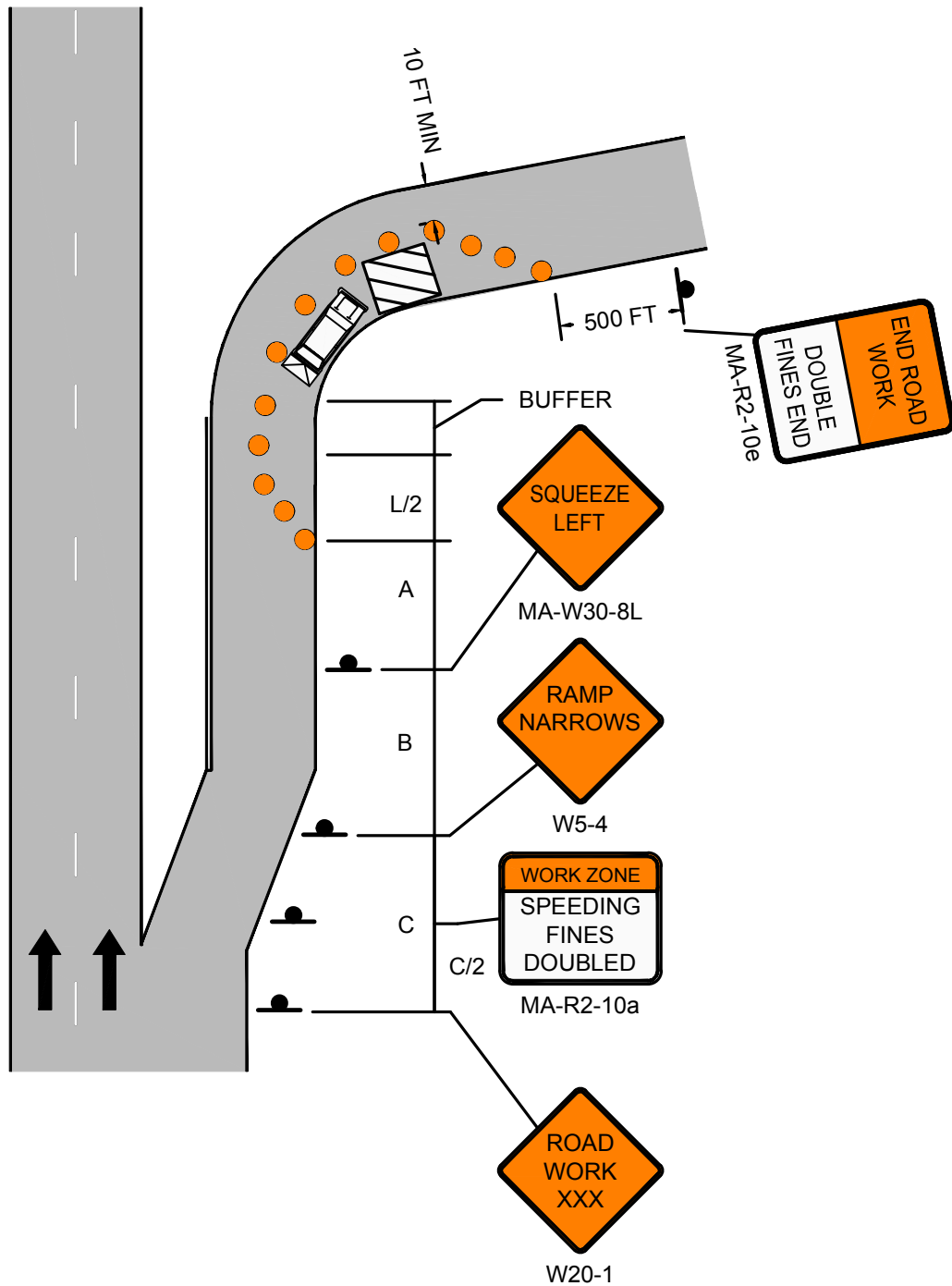


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 42

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
LEFT SIDE OF OFF RAMP CLOSED

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	500 / 500 / 500	160	305	20	45
45-55	500 / 1000 / 1000	330	495	40	35

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

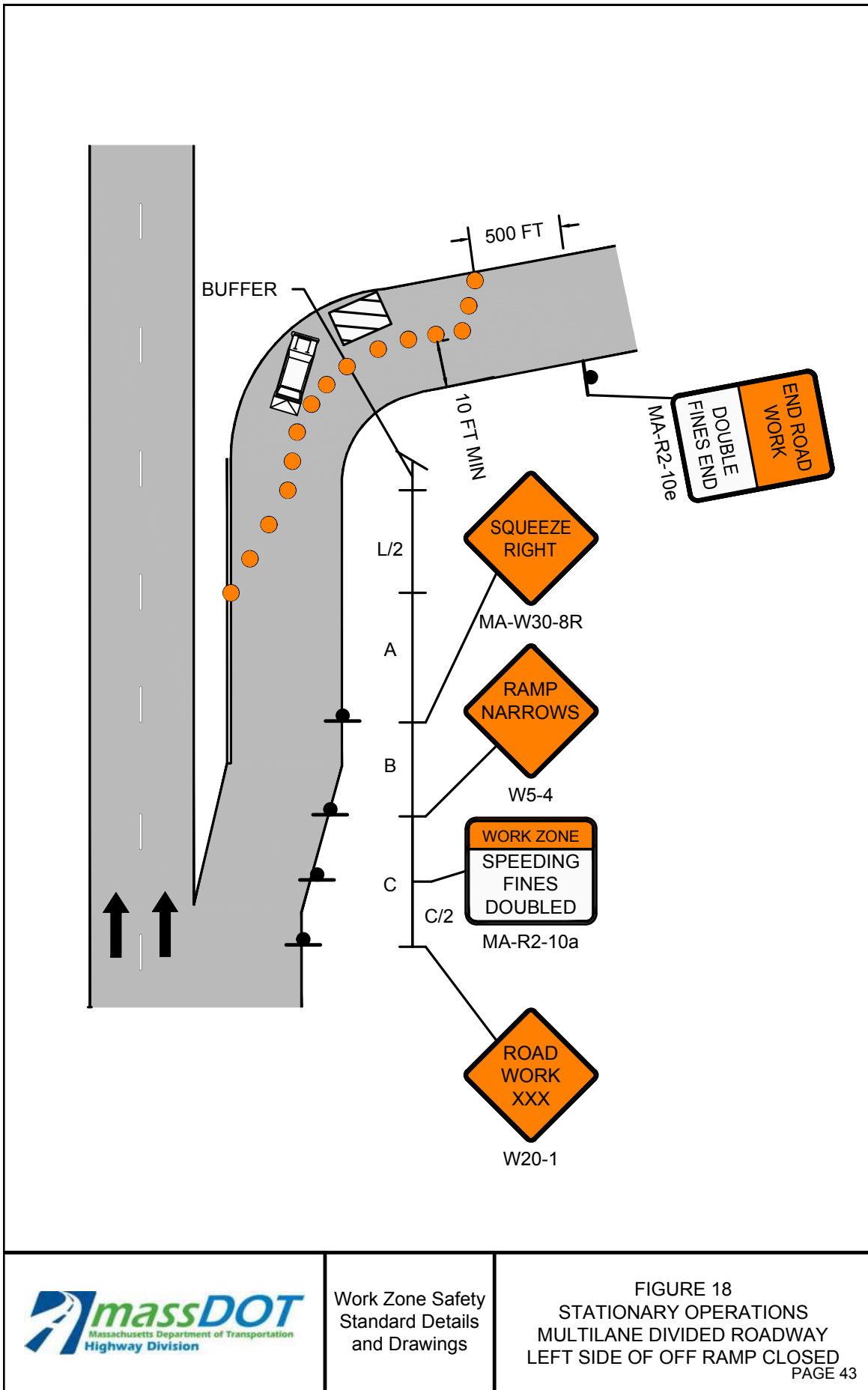


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 44

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
ROADWORK BEYOND ON RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)				
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	305	20	175
45-55	220	660	495	40	135
60-65	260	780	645	40	155

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

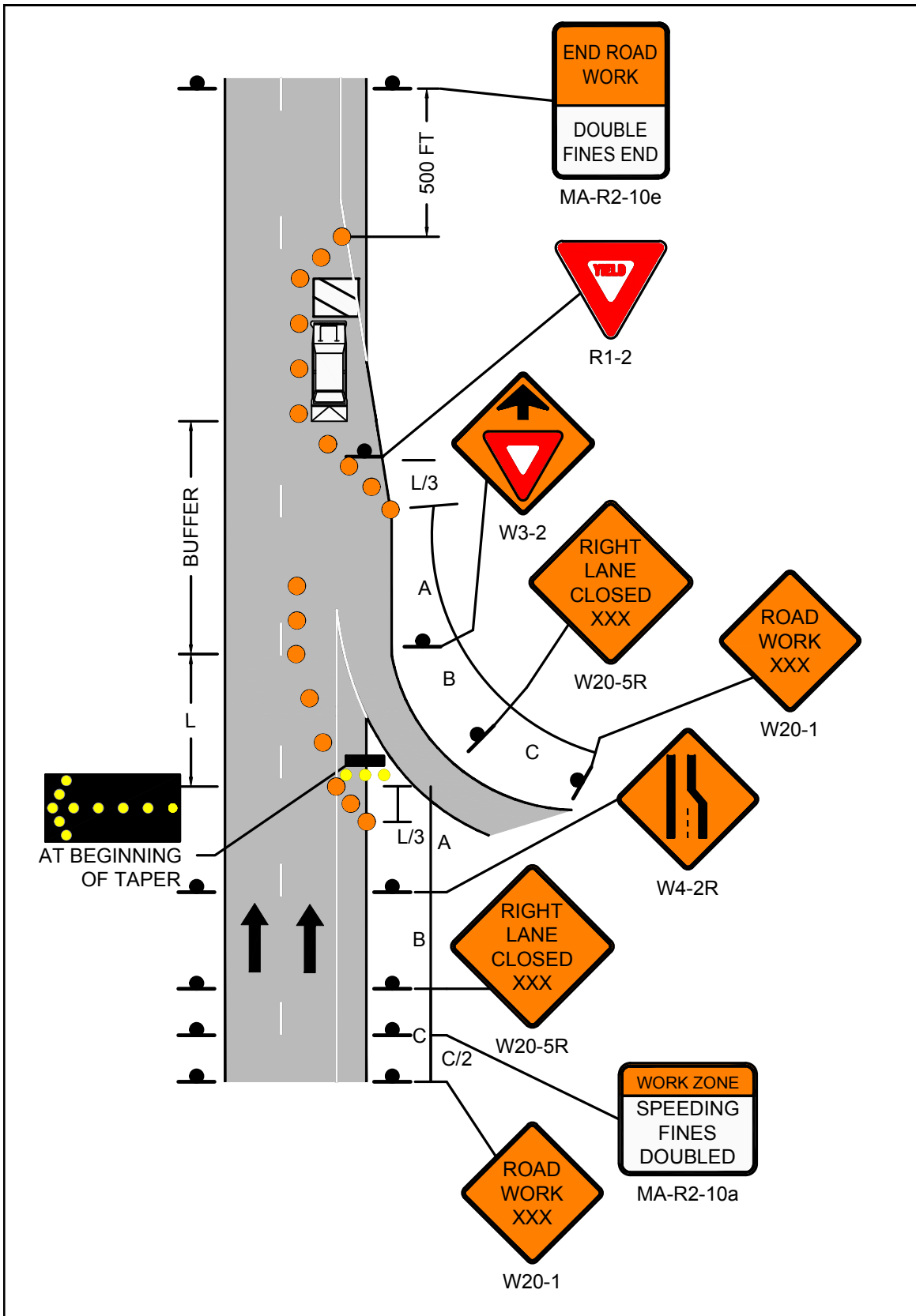


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 46

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
MULTILANE DIVIDED ROADWAY
ROADWORK BEYOND OFF RAMP

POSTED SPEED LIMIT (MPH)	CHANNELIZATION DEVICES (DRUMS OR CONES)					
	SHOULDER TAPER LENGTH (L/3) (FT)	TRAVEL LANE CLOSURE LENGTH (L) (FT)	TRAVEL LANE SHIFT LENGTH (L/2) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	110	320	160	305	20	70
45-55	220	660	330	495	40	55
60-65	260	780	390	645	40	65

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)
25-40	500 / 500 / 500
45-55	500 / 1000 / 1000
60-65	1000 / 1600 / 2600

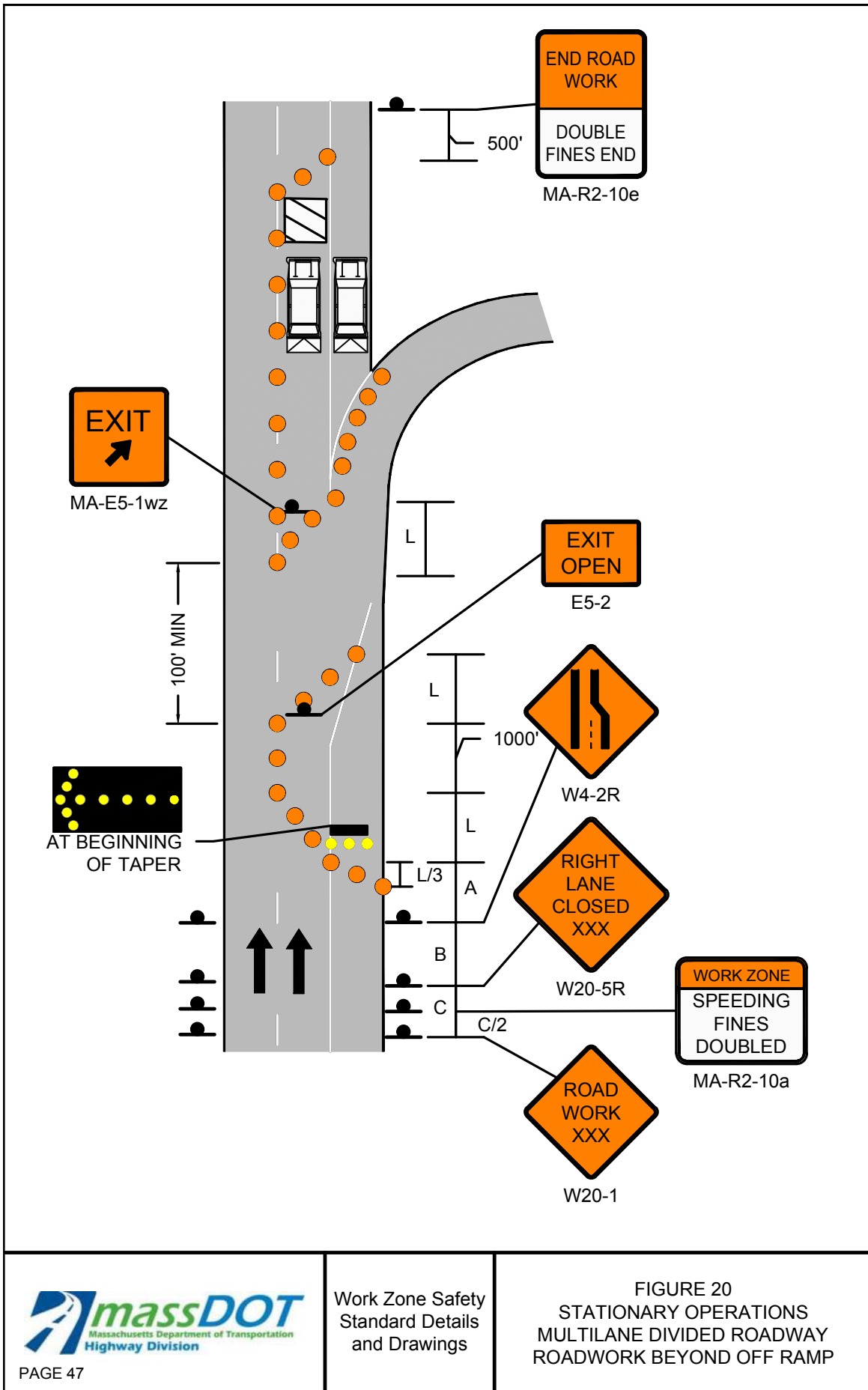
NOTES

1. MA-R2-10a LOCATED AT C/2.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 48

Work Zone Safety
Standard Details
and Drawings

MULTILANE DIVIDED ROADWAY
TYPICAL RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

NOTES

1. MA-R2-10a LOCATED AT C/2.
2. * NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. ** OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

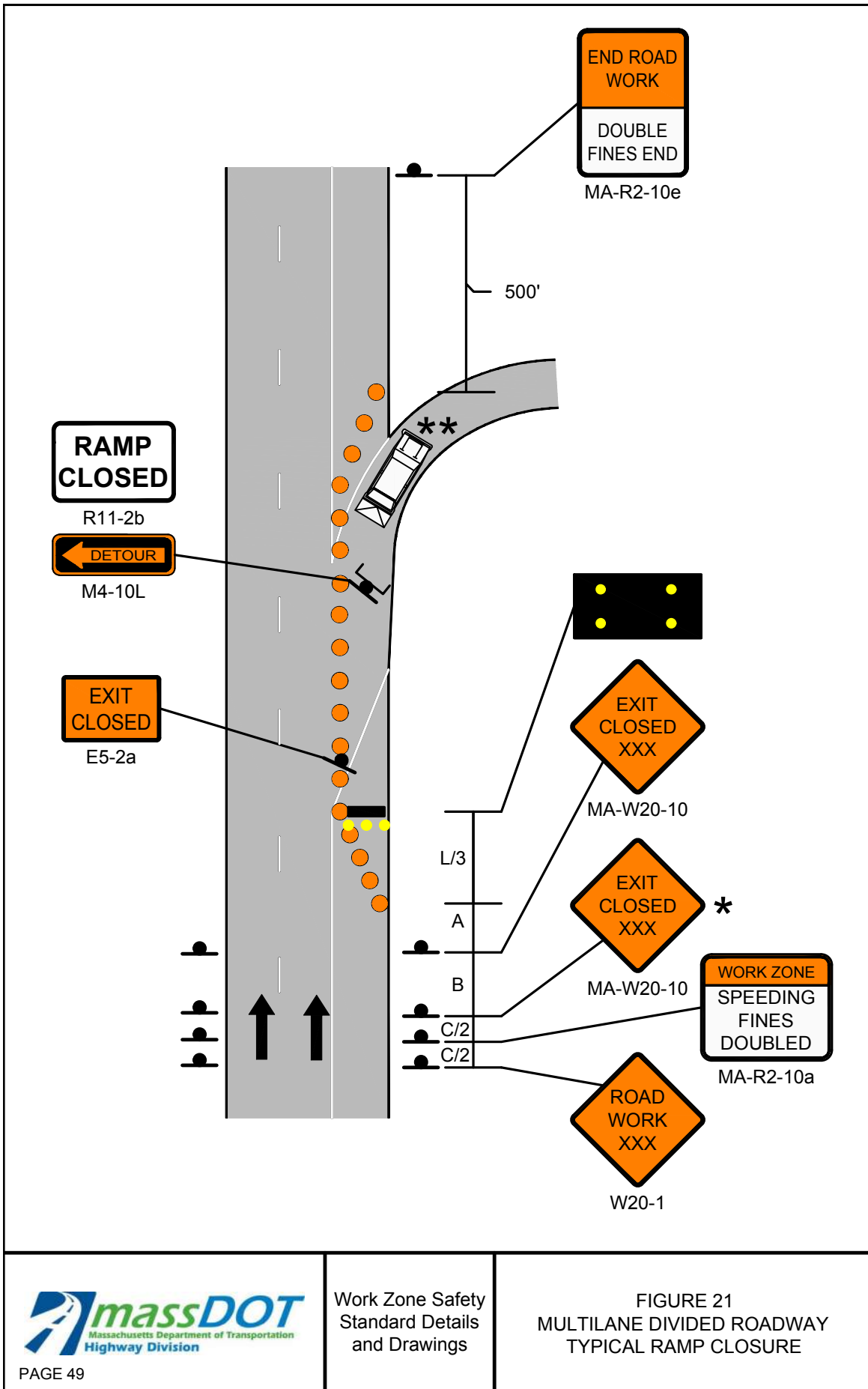


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 50

Work Zone Safety
Standard Details
and Drawings

MULTILANE DIVIDED ROADWAY
TYPICAL CLOVERLEAF RAMP CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		SHOULDER TAPER LENGTH (L/3) (FT)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES
25-40	500 / 500 / 500	110	305	20	45
45-55	500 / 1000 / 1000	220	495	40	30
60-65	1000 / 1600 / 2600	260	645	40	35

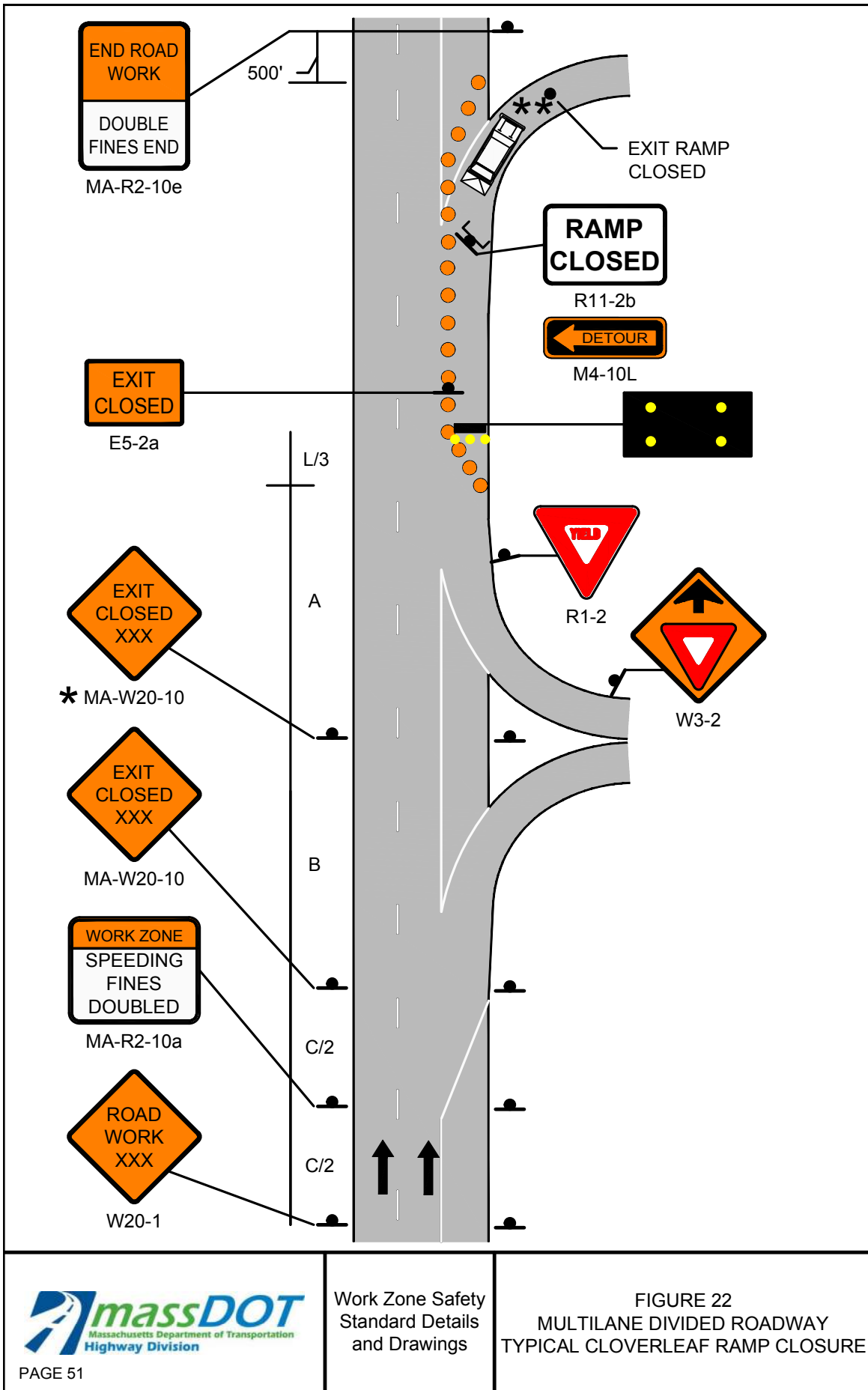
NOTES

1. MA-R2-10a LOCATED AT C/2.
2. * NOT REQUIRED IF RIGHT LANE IS CLOSED IN ADVANCE OF EXIT.
3. ** OPTIONAL AT ENGINEER'S DISCRETION.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





PAGE 52

Work Zone Safety
Standard Details
and Drawings

MULTILANE DIVIDED ROADWAY
TYPICAL RAMP CLOSURE
ADVANCE SIGNING

NOTES

1. IF THE CLOSED RAMP IS LOCATED DOWNSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED AT A SUFFICIENT DISTANCE IN ADVANCE OF THE DETOUR ROUTE/RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.
2. IF THE CLOSED RAMP IS LOCATED UPSTREAM FROM THE PROPOSED DETOUR ROUTE/RAMP, A PCMS SHALL BE POSITIONED PRIOR TO THE CLOSED RAMP AND SHOULD STATE WHICH RAMP IS CLOSED AND WHICH SHALL BE USED FOR THE DETOUR.
3. A SUFFICIENT NUMBER OF DETOUR SIGNS (M4-9 SERIES) SHOULD BE DEPLOYED TO PROPERLY DIRECT DETOURED TRAFFIC. SIGN SPACING SHALL BE AT THE DIRECTION OF THE ENGINEER.

LEGEND



WORK ZONE



CHANNELIZATION DEVICE



FLASHING ARROW BOARD



PORTABLE CHANGEABLE MESSAGE SIGN



TRUCK MOUNTED ATTENUATOR



RADAR SPEED FEEDBACK BOARD



POLICE DETAIL OR UNIFORMED FLAGGER

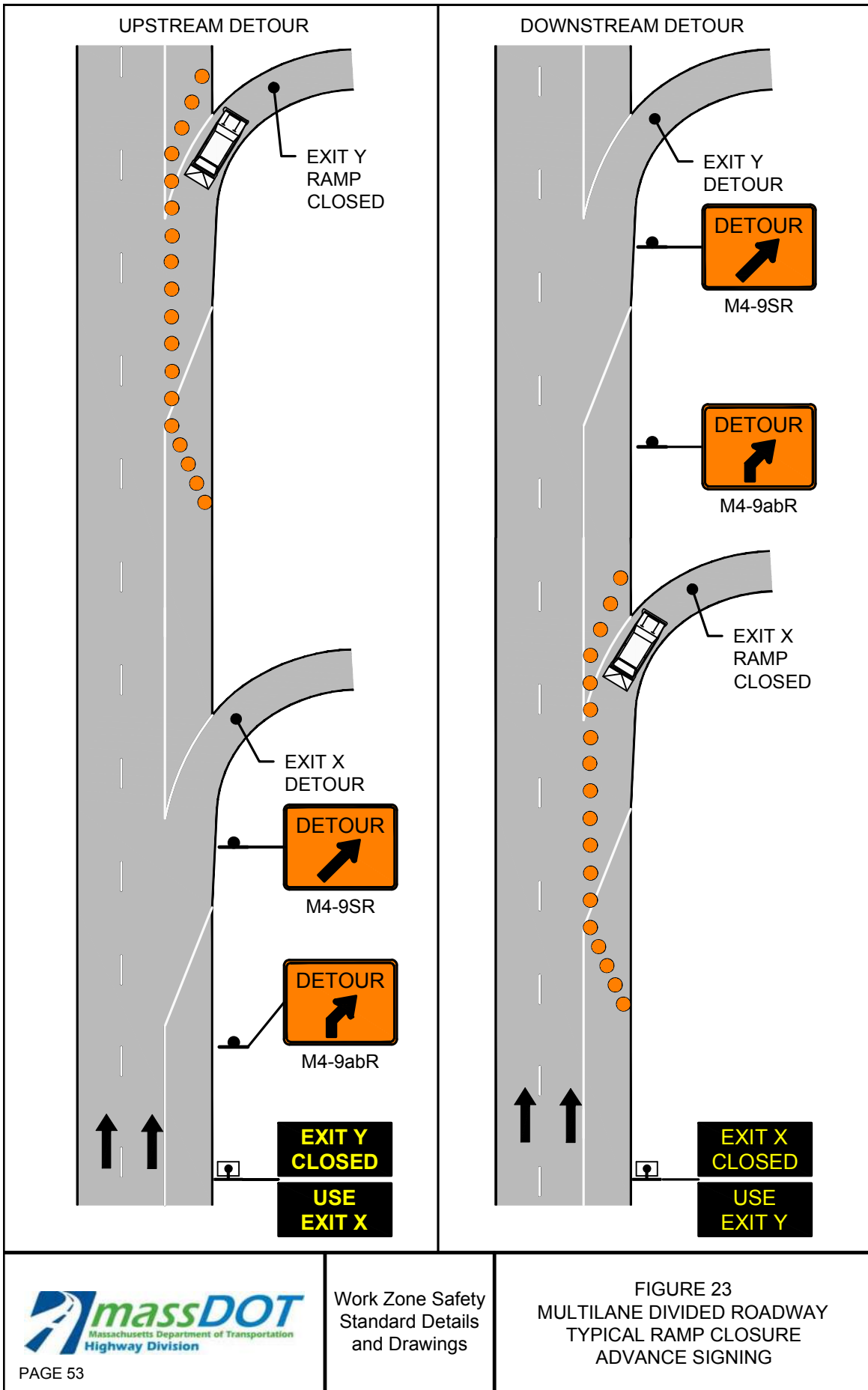


TEMPORARY PORTABLE RUMBLE STRIP



TYPE III BARRICADE

NOT TO SCALE





PAGE 54

Work Zone Safety
Standard Details
and DrawingsFIGURE 24-1
MULTILANE DIVIDED ROADWAY
PLACEMENT OF TEMPORARY
PORTABLE RUMBLE STRIPS
SHEET 1 OF 2


POSTED REGULATORY OR WORK ZONE SPEED	SEPARATION BETWEEN RUMBLE STRIPS
Above 55-mph	20-feet
36-mph to 55-mph	15-feet
35-mph and under	10-feet

POSTED SPEED LIMIT (MPH)	SPACING FOR ADVANCE WARNING SIGNS (FT) (A,B,C)	TANGENT LENGTH BETWEEN TAPERS (T) (FT)
25-40	500 / 500 / 500	640
45-55	500 / 1000 / 1000	1320
60-65	1000 / 1600 / 2600	1560

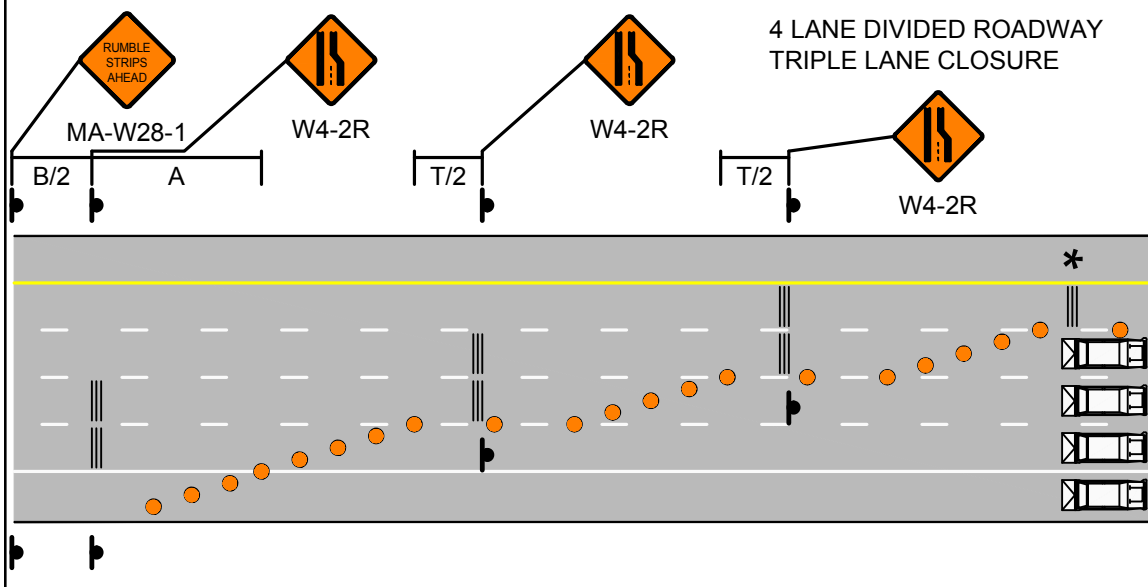
NOTES

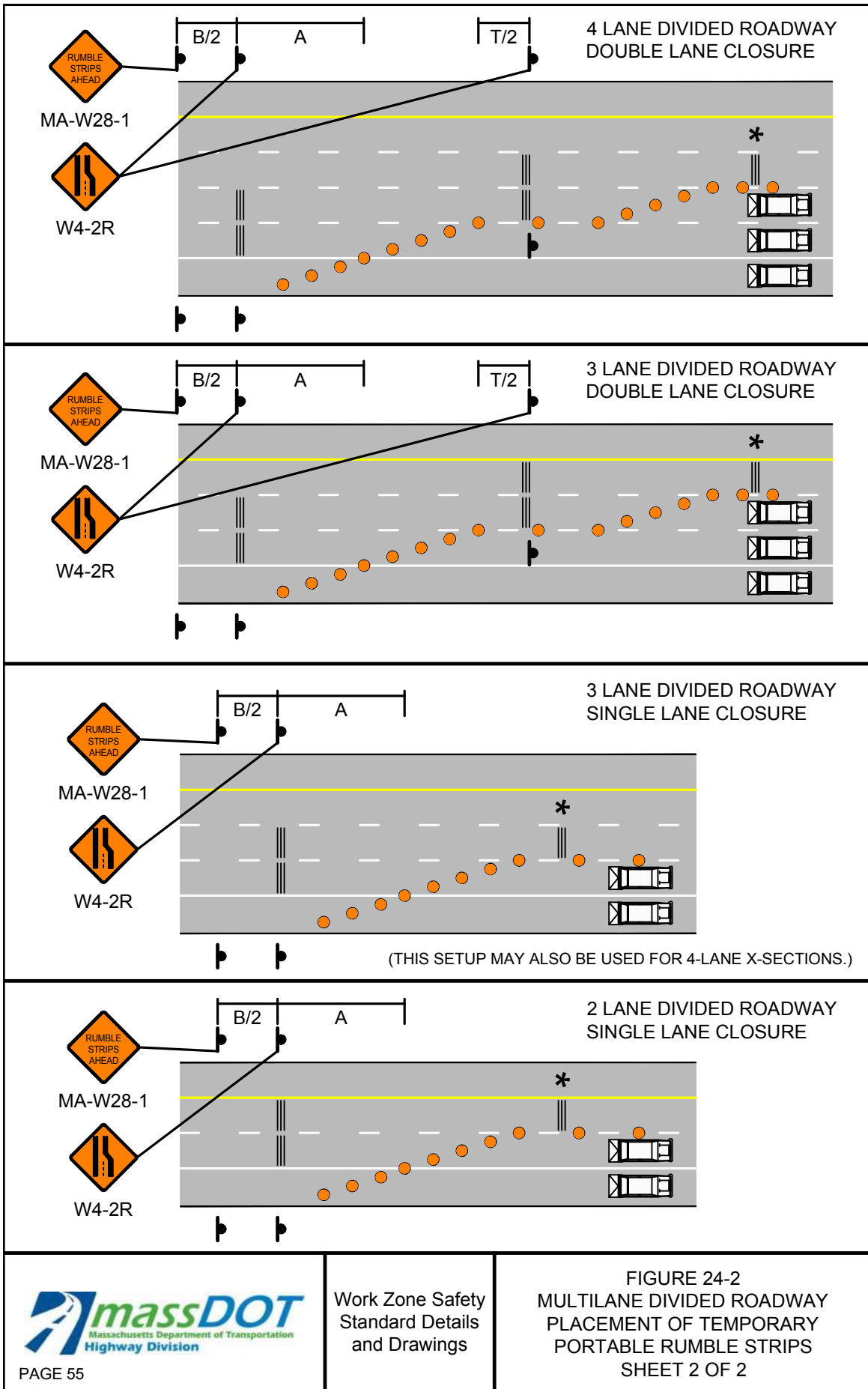
1. THE INTENTION OF THESE DETAILS IS ONLY TO DEPICT THE PLACEMENT OF TEMPORARY PORTABLE RUMBLE STRIPS (TPRS) IN RELATIONSHIP TO THE TAPER AND THE BUFFER OF A SINGLE- OR MULTI-LANE CLOSURE. THE DEPICTION OF THE NUMBER AND SPACING OF ALL OTHER TRAFFIC CONTROL DEVICES IS NOT TO SCALE. REFER TO OTHER DETAILS FOR LANE CLOSURES FOR THE PLACEMENT AND NUMBER OF ALL OTHER TRAFFIC CONTROL DEVICES.
2. THESE DETAILS ONLY DEPICT RIGHT LANE CLOSURES. LEFT LANE CLOSURES SHOULD UTILIZE A MIRROR IMAGE OF THESE SETUPS, STARTING WITH CLOSURE OF THE LEFTMOST LANE.
3. ★ THIS TPRS ARRAY IS OPTIONAL AT THE ENGINEER'S DISCRETION. IF USED, IT SHOULD BE PLACED ADJACENT TO THE BUFFER.
4. DETAILS SHOW THE MINIMUM NUMBER OF TPRS REQUIRED. ADDITIONAL MAY BE USED IF CONDITIONS WARRANT.


LEGEND

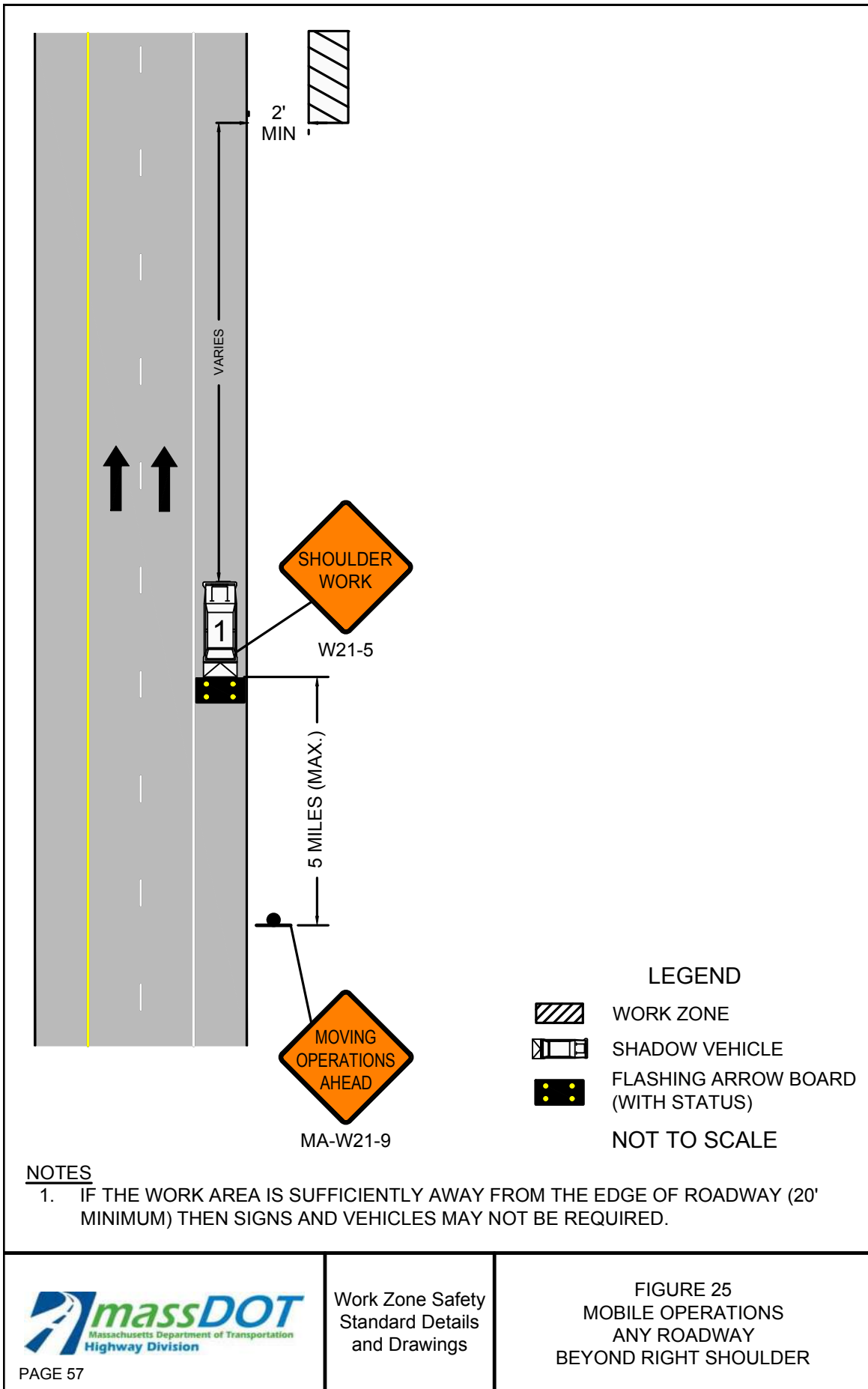
- CHANNELIZATION DEVICE
-  TRUCK MOUNTED ATTENUATOR
- ≡≡≡ TEMPORARY PORTABLE RUMBLE STRIP

NOT TO SCALE





 <p>PAGE 56</p>	<p>Work Zone Safety Standard Details and Drawings</p>	<p>NOTES FOR MOBILE OPERATIONS</p>
<p style="text-align: center;">Notes for Mobile Operations</p> <ul style="list-style-type: none"> • Unless otherwise stated, these notes shall apply to all Mobile Operation setups. • Additional, setup-specific notes may be found on individual sheets. <ol style="list-style-type: none"> 1. The Supervisor shall travel the designated roadway prior to scheduling the work to ensure that sufficient and appropriate traffic control devices will be available. Special consideration shall be exercised to ensure that appropriate traffic controls be placed in areas that will have limited visibility of the work areas or any associated traffic queues. 2. Vehicles used for these operations shall be made highly visible with appropriate equipment such as flashing lights, rotating beacons, flags, signs, flashing arrow boards, and/or portable changeable message signs. Any signs mounted to these vehicles shall not obscure the visibility of other devices. 3. All vehicles shown may not be required based upon roadway conditions. However, when needed and practical, additional shadow vehicles and equipment to warn and protect motorists and workers should be used. Based upon roadway conditions, the addition of a police detail with cruiser may be used for additional protection or warning for the traveling public. 4. The distance between the work and shadow vehicle(s) may vary according to the terrain and other factors. Shadow vehicles are used to warn traffic of the operations ahead. Whenever adequate sight distance exists, the shadow vehicle(s) should maintain the minimum appropriate distance and maintain the same speed to prevent non-work related vehicles from entering the work convoy. If this formation cannot be maintained then additional traffic control devices should be deployed in advance of any vertical or horizontal curves that may restrict the sight distance of an oncoming vehicle to either the work vehicle or associated traffic queue. 5. All shadow vehicles shall be equipped with a truck or trailer mounted attenuator (TMA) and a flashing arrow board. 6. Signs should be covered or turned from view when work is not in progress. 7. Portable changeable message signs may be used in lieu of MA-W21-9 signs and any signs mounted directly to a shadow vehicle. 		

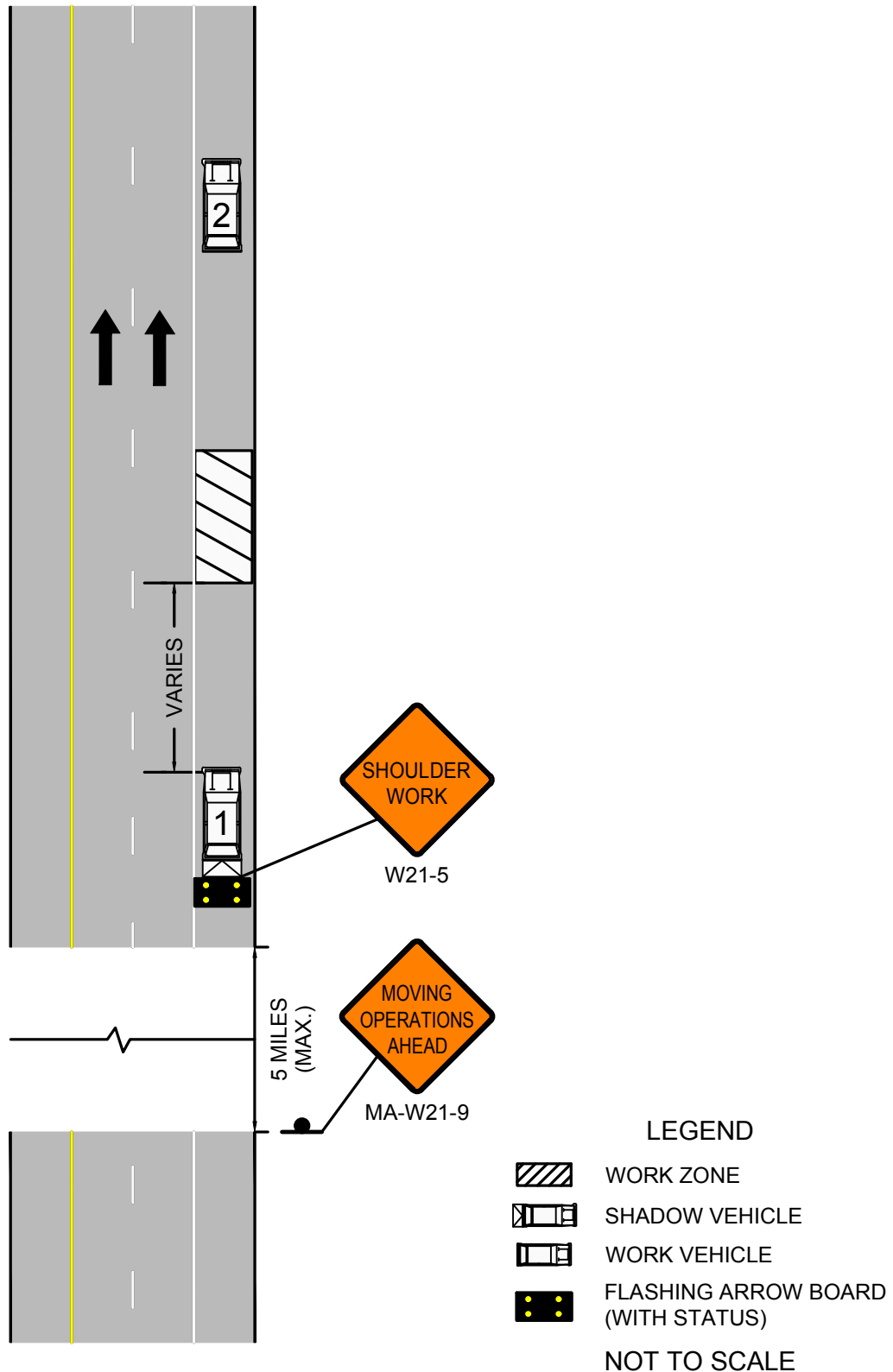


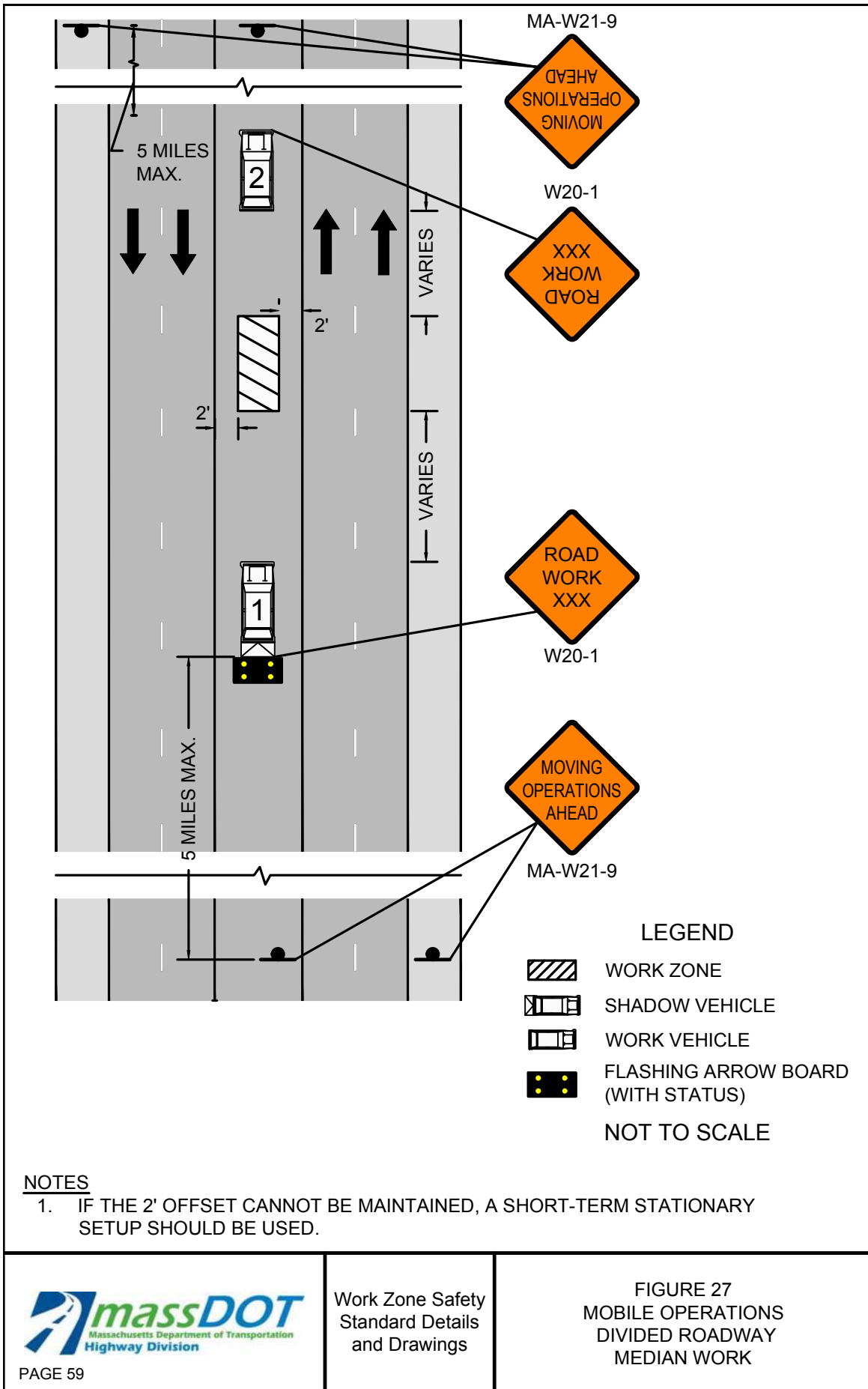


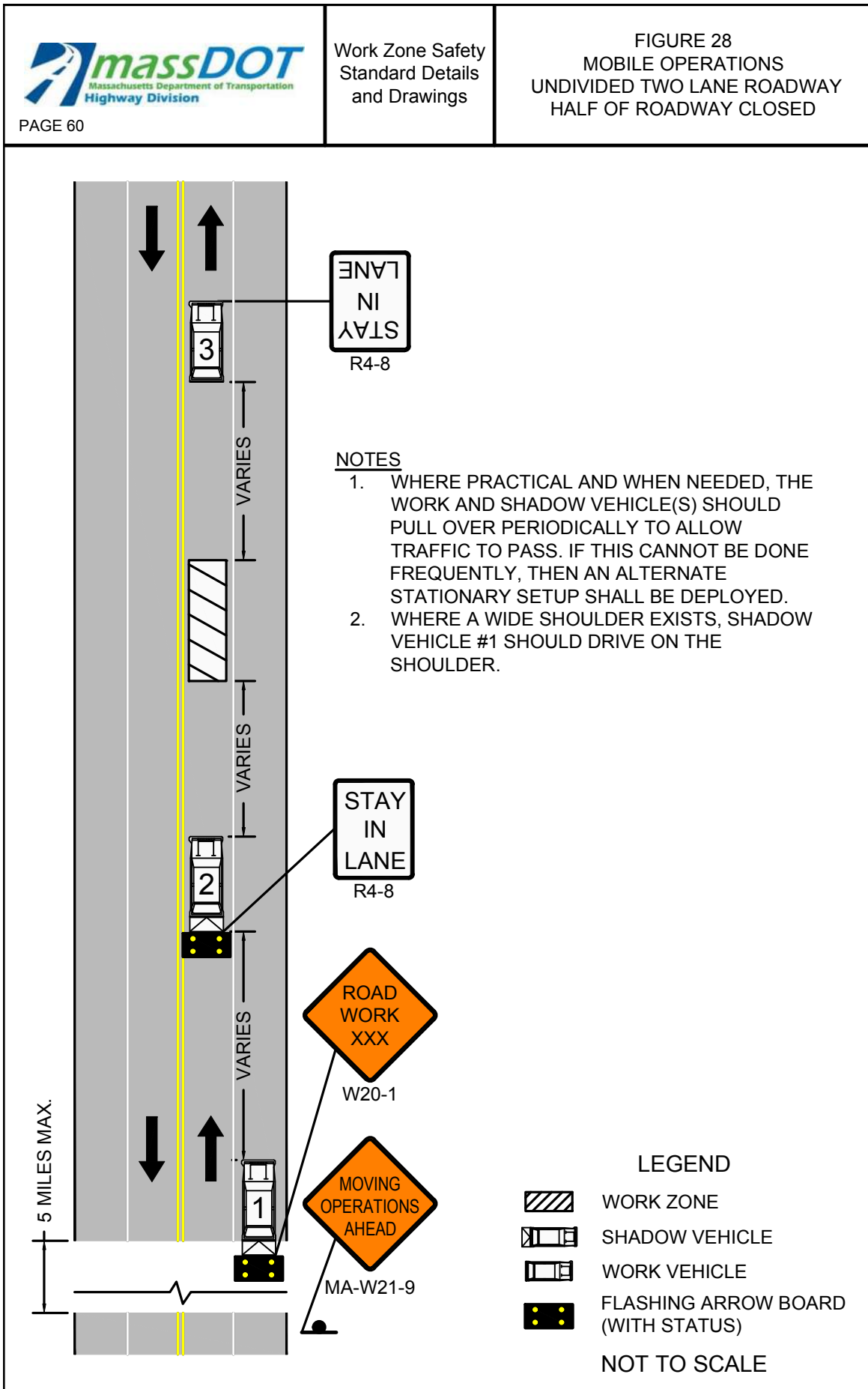
PAGE 58

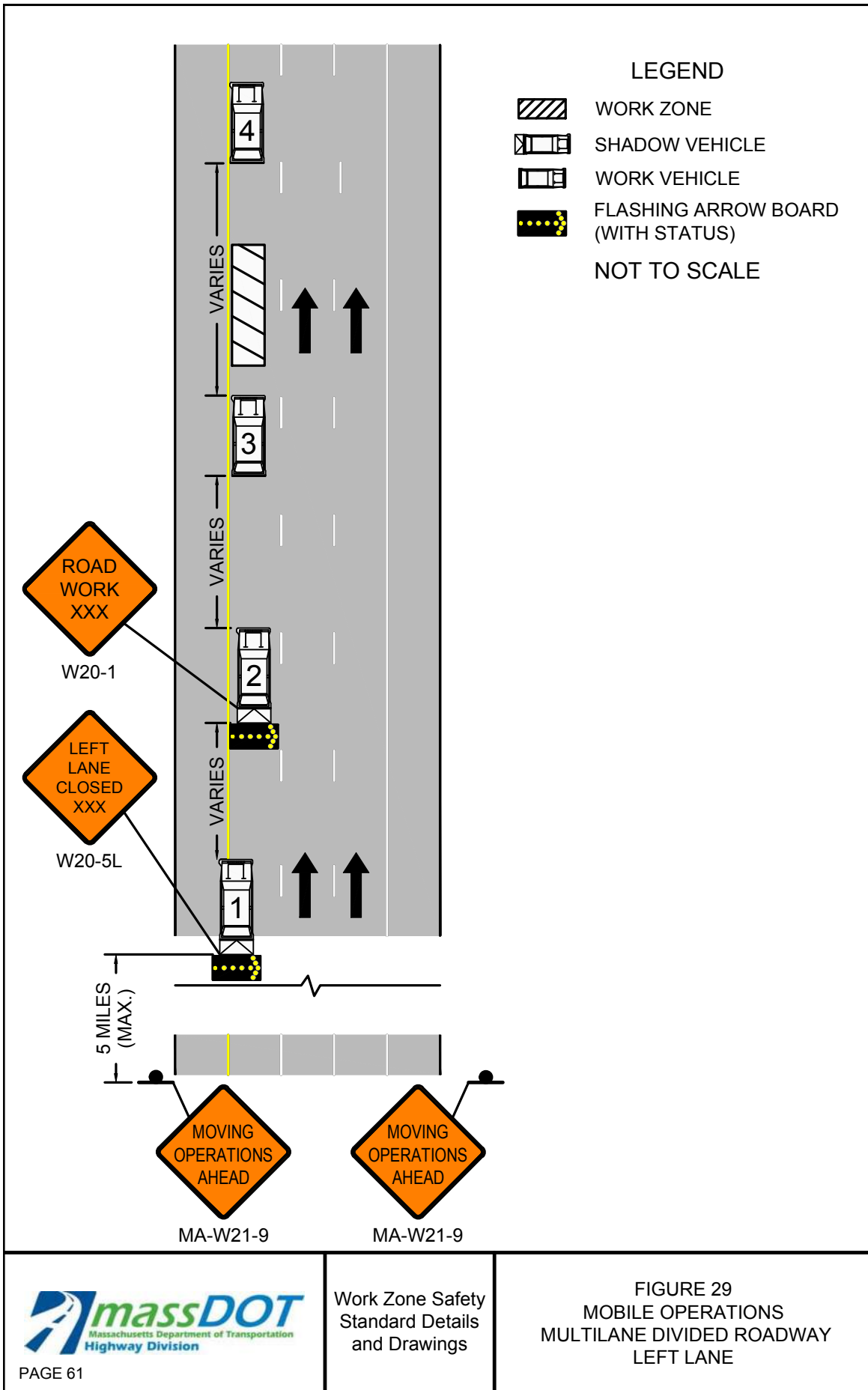
Work Zone Safety
Standard Details
and Drawings

FIGURE 26
MOBILE OPERATIONS
ANY ROADWAY SHOULDER







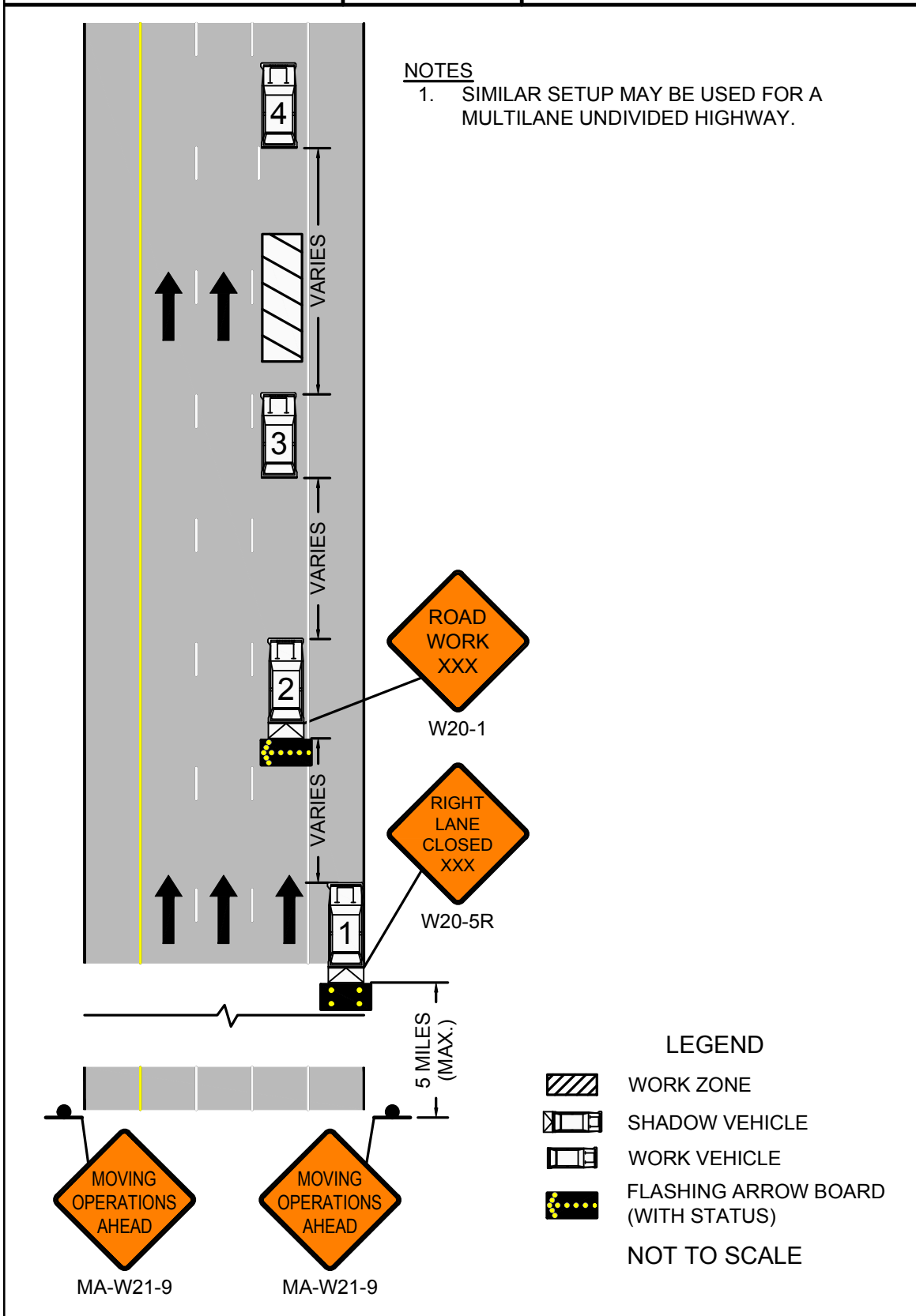


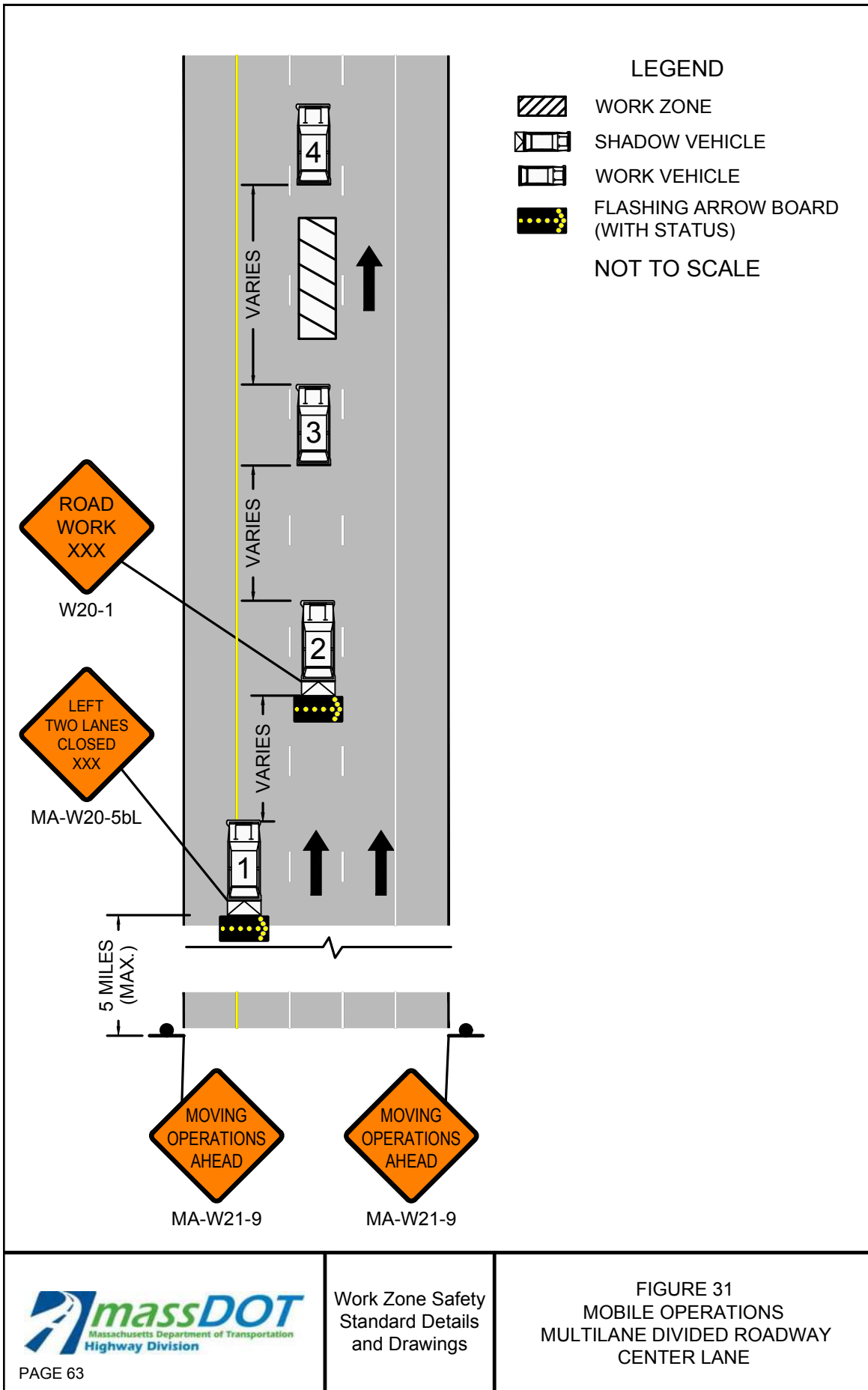


PAGE 62

Work Zone Safety
Standard Details
and Drawings

FIGURE 30
MOBILE OPERATIONS
MULTILANE DIVIDED ROADWAY
RIGHT LANE



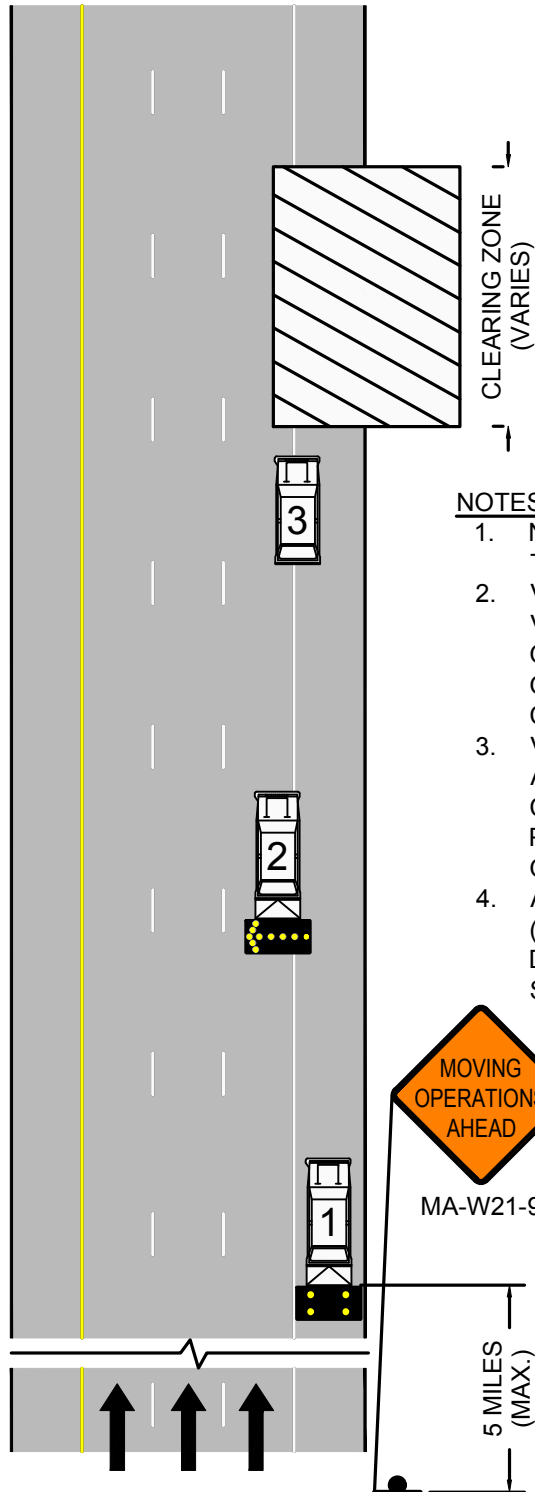




PAGE 64

Work Zone Safety
Standard Details
and Drawings





FIGURE 32
MOBILE OPERATIONS
POST-STORM CLEANUP OPERATION



NOTES

1. NO OTHER NOTES ARE APPLICABLE TO THIS DETAIL.
2. VEHICLE #3 IS A SNOW/DEBRIS REMOVAL VEHICLE AND SHALL ALWAYS BE AWARE OF THE SURROUNDINGS. MORE THAN ONE VEHICLE MAY BE USED IN THE CLEARING ZONE.
3. VEHICLE #1 SHOULD BE EQUIPPED WITH A PCMS, A TMA, AND STAY IN VISUAL CONTACT WITH VEHICLE #3 WHILE PROVIDING AMPLE WARNING TO ONCOMING TRAFFIC.
4. A POLICE DETAIL WITH BLUE LIGHTS (OPTIONAL) SHALL REMAIN DOWNSTREAM OF VEHICLE #1 IN THE SHOULDER.

LEGEND

-  WORK ZONE
-  SHADOW VEHICLE
-  WORK VEHICLE
-  FLASHING ARROW BOARD (WITH STATUS)

NOT TO SCALE

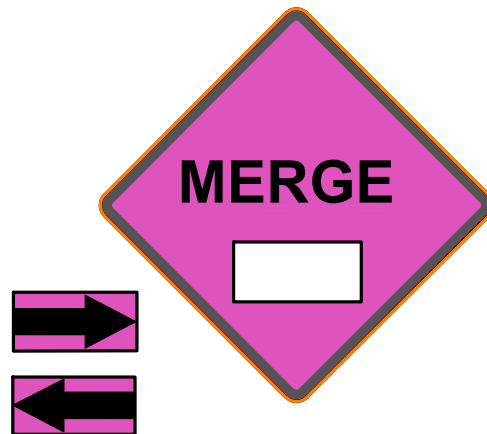
Notes for Traffic Emergency or Incident Operations

- The goal is to increase awareness of during traffic emergencies or incidents.
- These signs are to be used to differentiate from the traditional construction work zone and an emergency or incident.
- Upon arrival MassDOT First Responders shall assess the magnitude of the scene to determine if the incident is likely to last an hour or more in duration which would trigger the requirement to use these signs.
- Place the "Emergency Ahead" sign on the same side of the road as the incident, if possible, for up to an hour. Emergency response signs should be put up for all incidents and emergencies as soon as possible.
- Place the emergency sign 500 to 1000 feet before the first channelization devices.
- As an incident evolves this sign would be used as a secondary sign with all other emergency controls put in place.
- Only use "MERGE" signs where applicable (Not on 2 lane roads).
- Use MERGE signs on Multi-lane Roads to move traffic away from the incident and keep them in a safe lane.
- Place the MERGE sign about 500 feet before the closure.
- If additional signs are available, they should be placed accordingly as a sign informing people coming in the other direction or on the opposite side of the roadway.
- Use 12 emergency cones spaced 40 to 80 feet apart to form a taper and protect the scene.
- Sequential flashing lights/flares may be used in lieu of or to supplement cones.
- During a major incident that will last for a long duration, the EMERGENCY AHEAD sign should be moved back before an intersecting road or ramp to alert travelers and give them an option of using an alternate route. (Be sure all other devices are in place before moving this sign).

Standard Emergency Signs (36"x36" or 48"x48")



MA-W20-9



MA-W4-2aR/L





PAGE 66

Work Zone Safety
Standard Details
and Drawings

FIGURE 33
EMERGENCY RESPONSE
ANY ROADWAY
SHOULDER ENCROACHMENT

LEGEND



EMERGENCY AREA

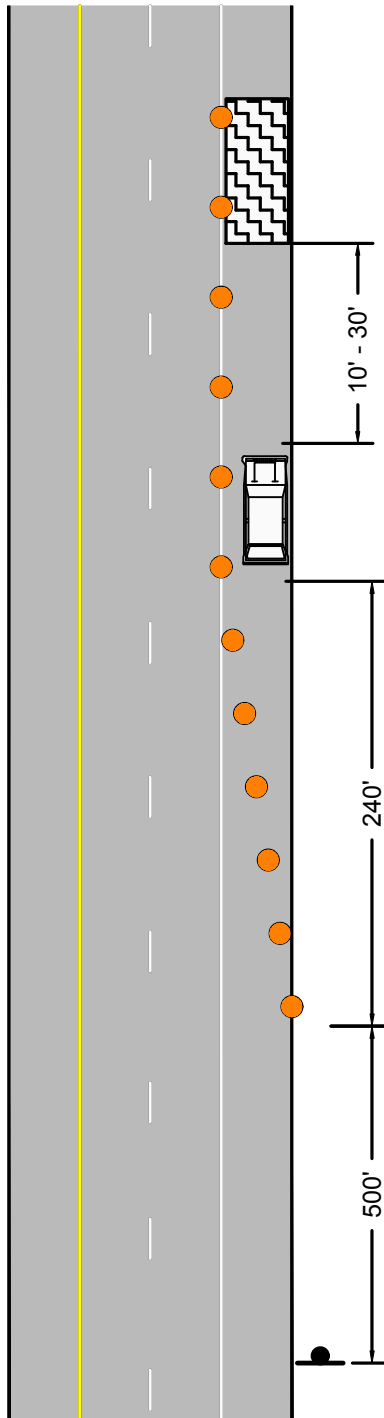


CHANNELIZATION DEVICE



EMERGENCY RESPONSE
VEHICLE

NOT TO SCALE



ORDER OF RESPONSE ACTIVITIES

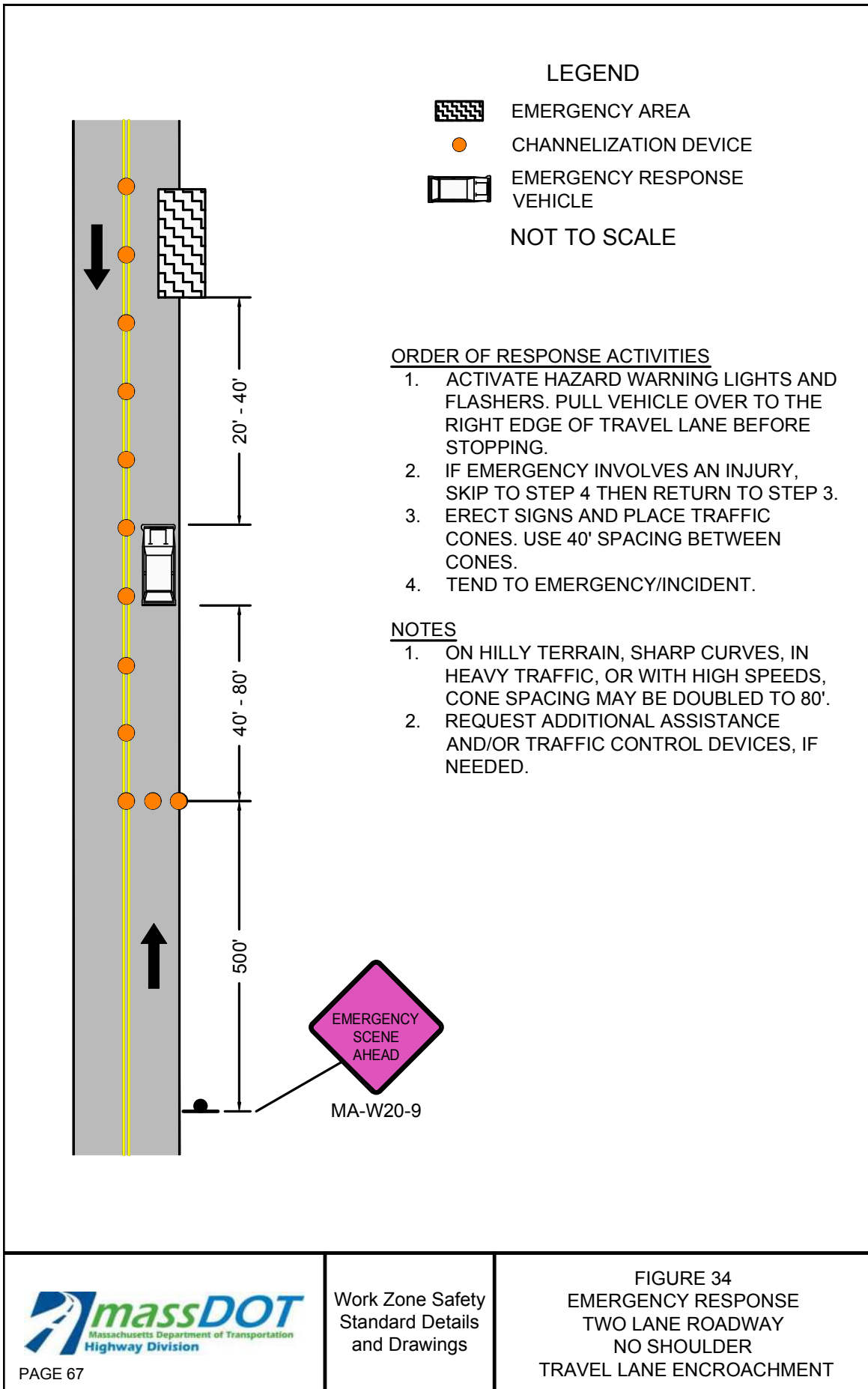
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE RIGHT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



MA-W20-9





PAGE 68

Work Zone Safety
Standard Details
and Drawings

FIGURE 35
EMERGENCY RESPONSE
TWO LANE ROADWAY
TRAVERSABLE SHOULDER
SINGLE LANE ENCROACHMENT

LEGEND



EMERGENCY AREA

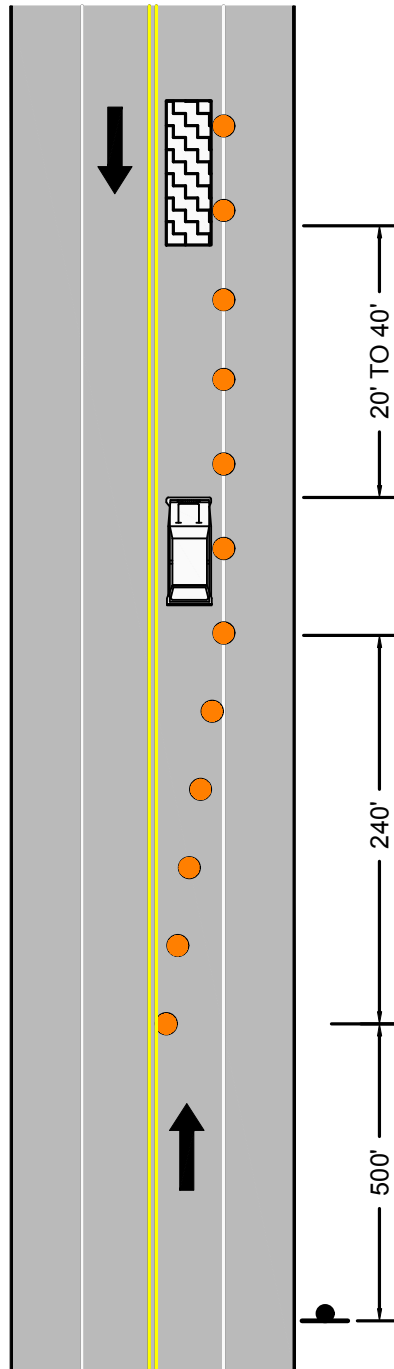


CHANNELIZATION DEVICE



EMERGENCY RESPONSE
VEHICLE

NOT TO SCALE

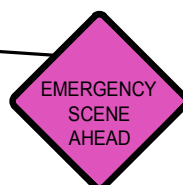


ORDER OF RESPONSE ACTIVITIES

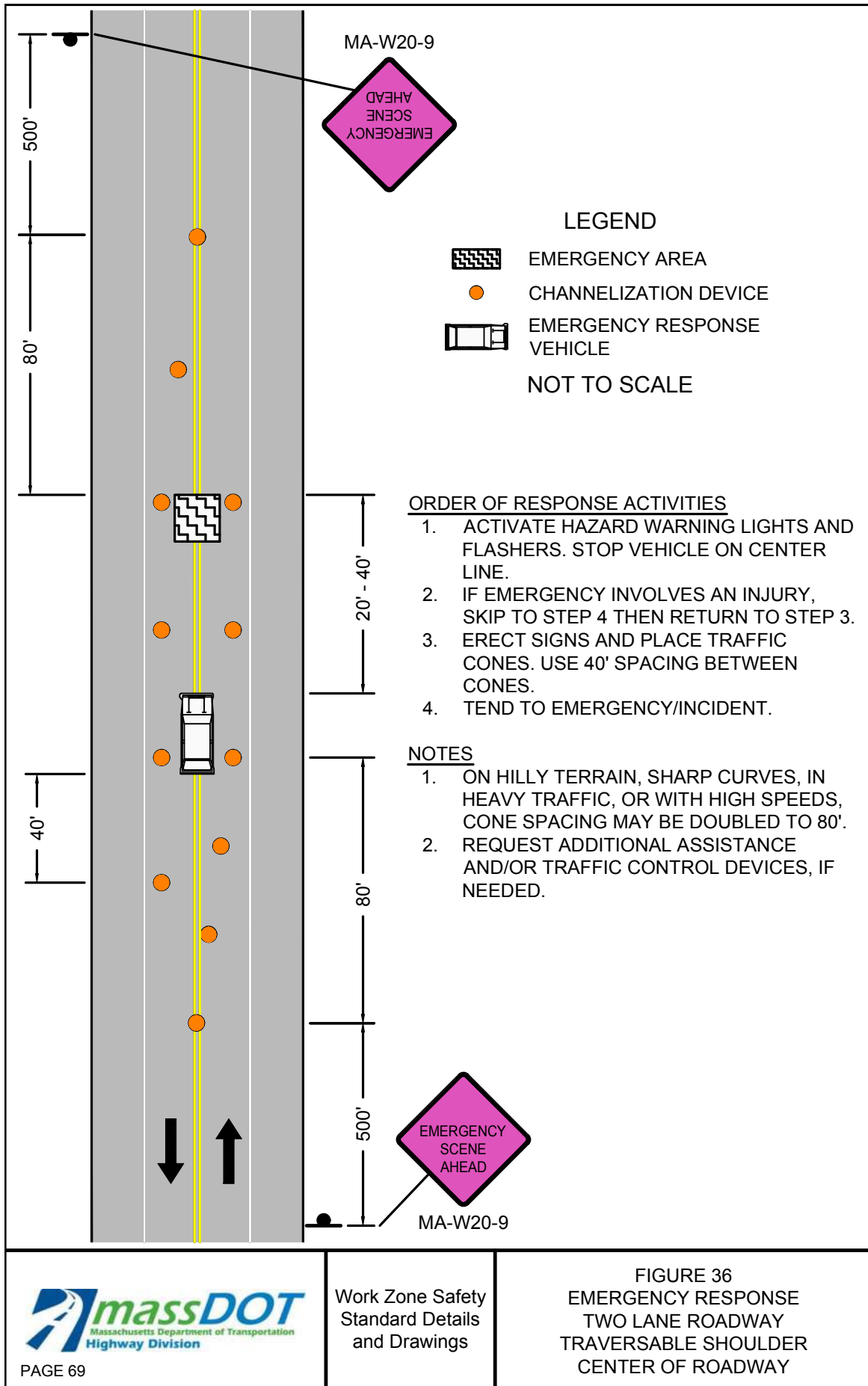
1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. PULL VEHICLE OVER TO THE LEFT EDGE OF TRAVEL LANE BEFORE STOPPING.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 4 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. TEND TO EMERGENCY/INCIDENT.

NOTES

1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



MA-W20-9

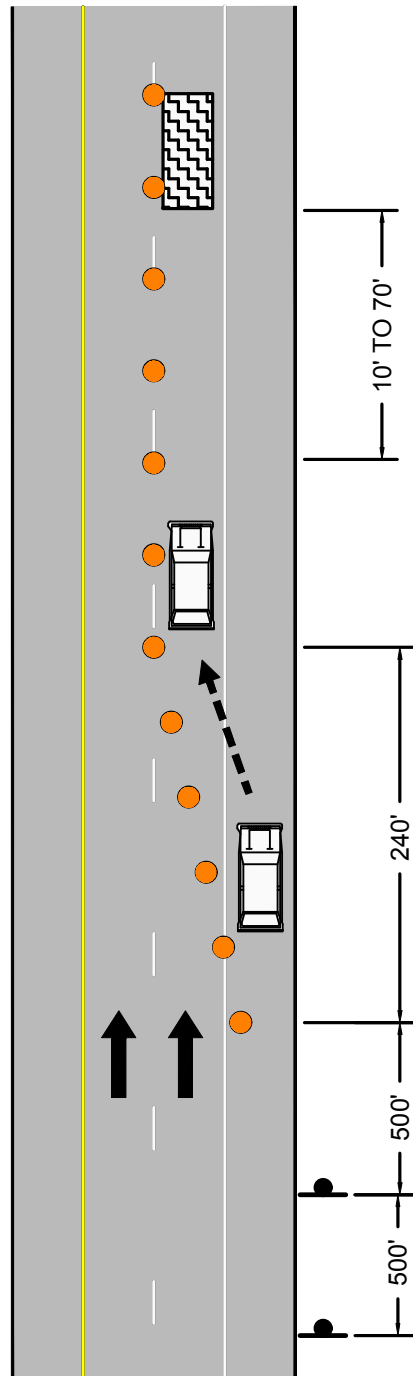




PAGE 70

Work Zone Safety
Standard Details
and Drawings

FIGURE 37
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
RIGHT LANE



LEGEND

- EMERGENCY AREA
- CHANNELIZATION DEVICE
- EMERGENCY RESPONSE VEHICLE
- RESPONSE VEHICLE MOVEMENT

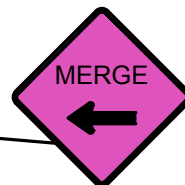
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

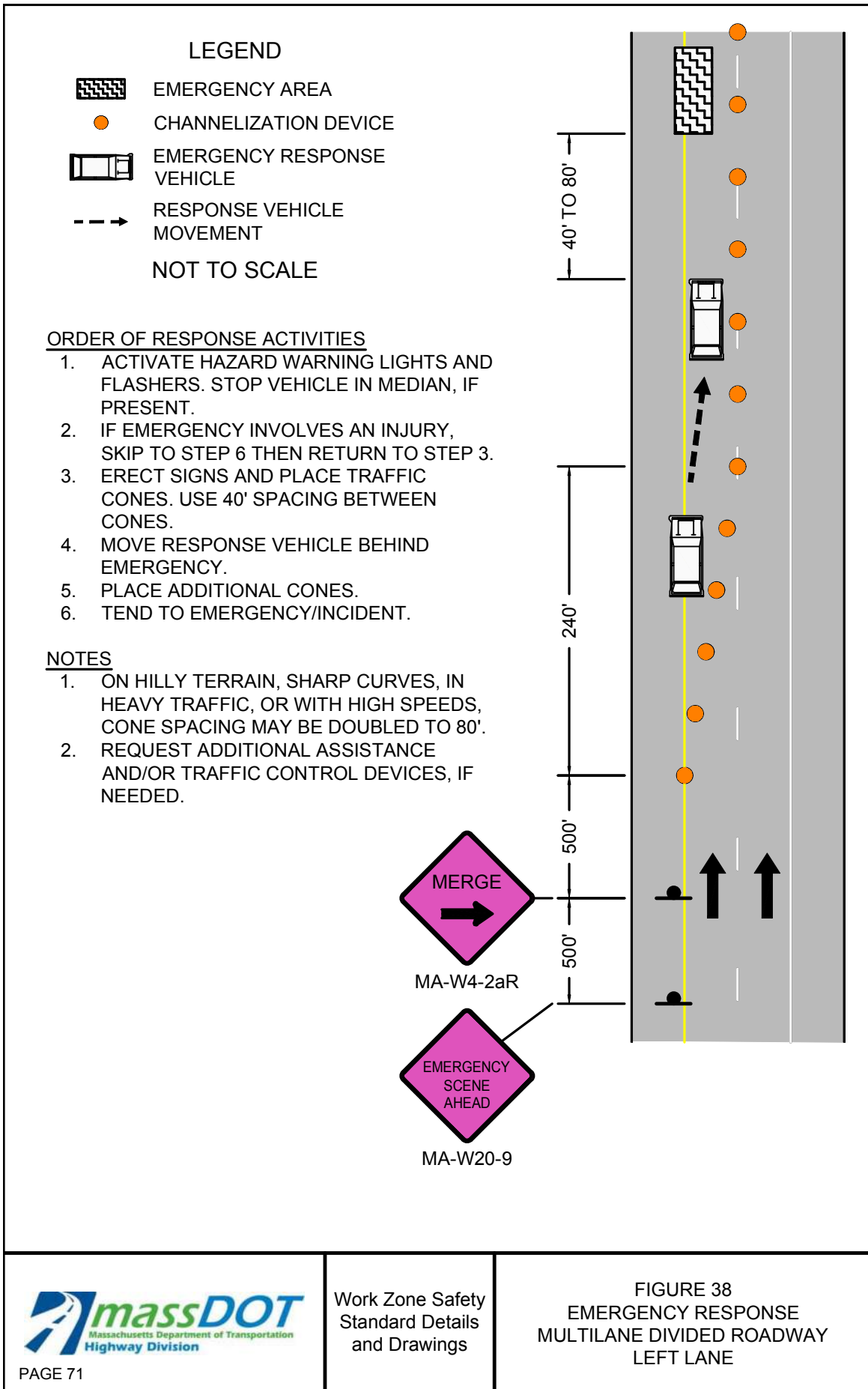
1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



MA-W4-2aL



MA-W20-9

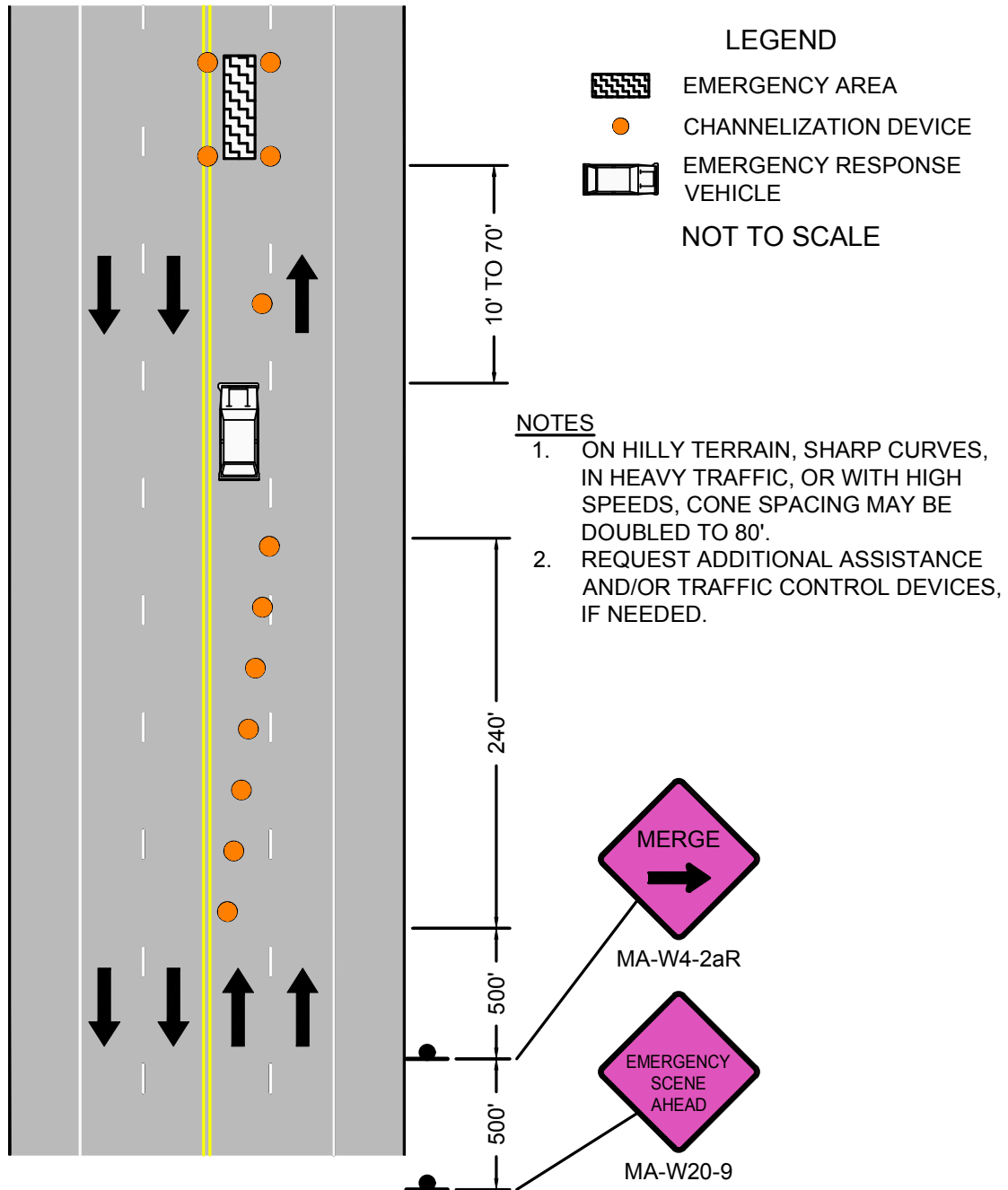


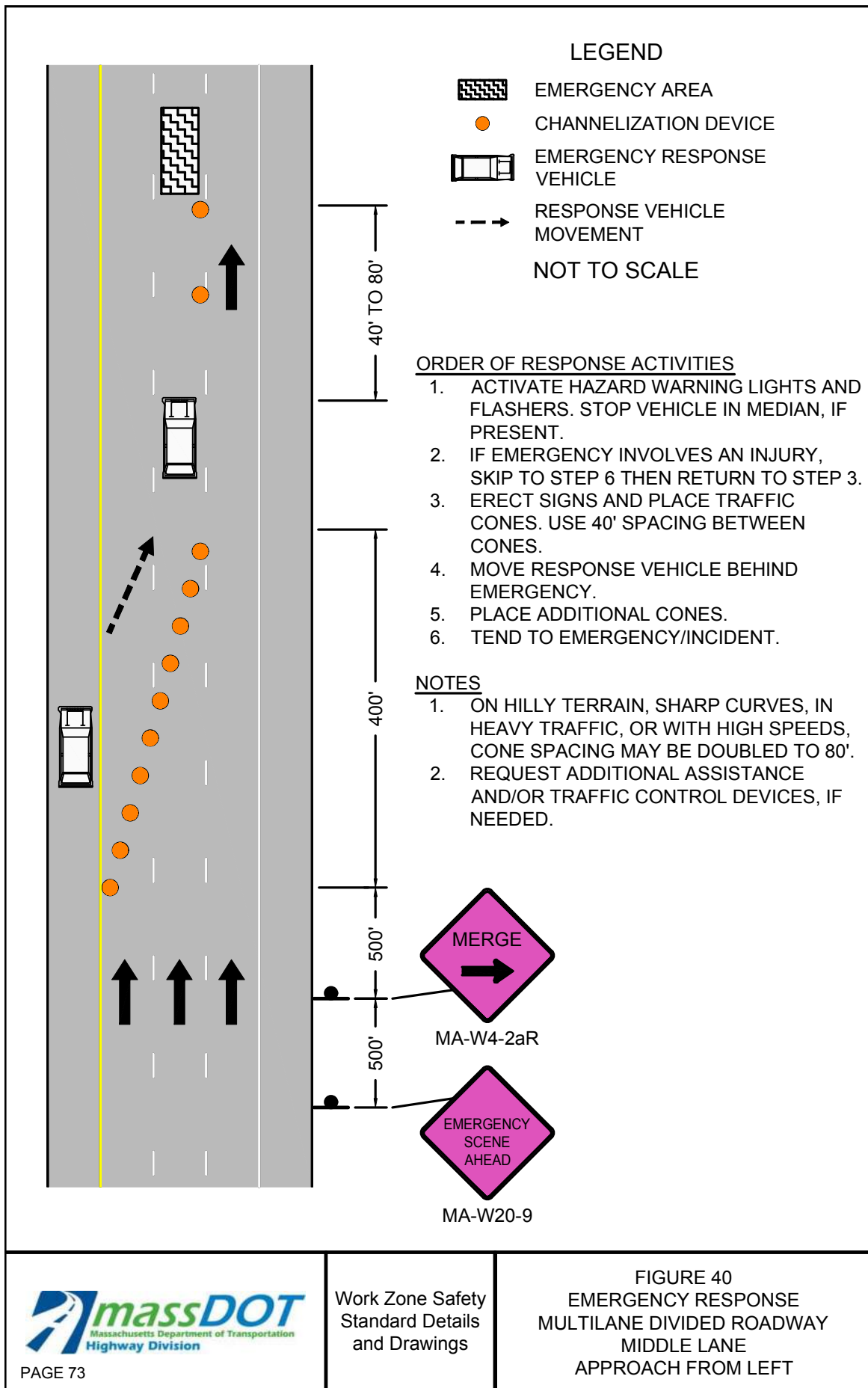


PAGE 72

Work Zone Safety
Standard Details
and Drawings

FIGURE 39
EMERGENCY RESPONSE
MULTILANE UNDIVIDED
ROADWAY
LEFT LANE



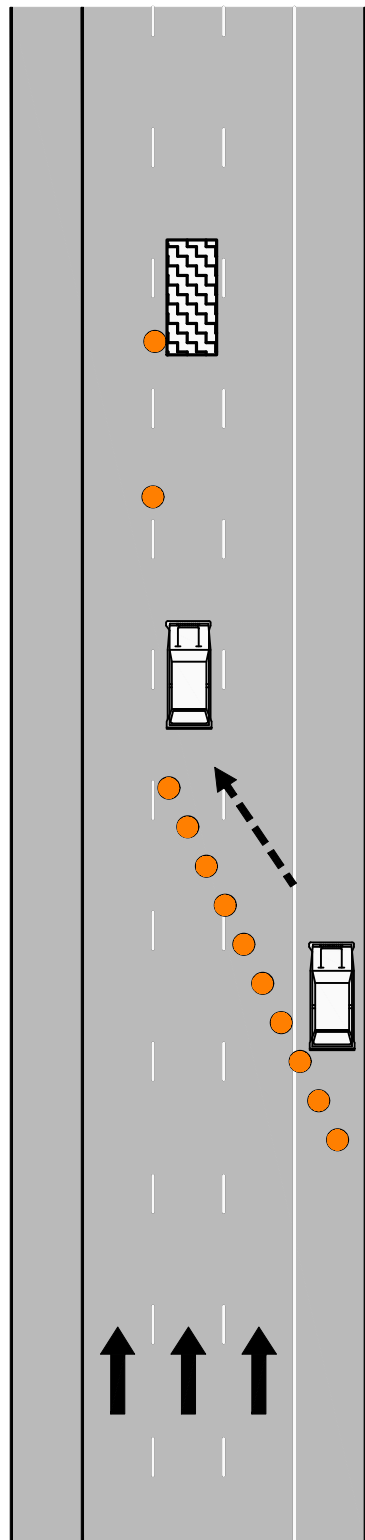








PAGE 74

Work Zone Safety
Standard Details
and Drawings

FIGURE 41
EMERGENCY RESPONSE
MULTILANE DIVIDED ROADWAY
MIDDLE LANE
APPROACH FROM RIGHT



LEGEND

-  EMERGENCY AREA
-  CHANNELIZATION DEVICE
-  EMERGENCY RESPONSE VEHICLE
-  RESPONSE VEHICLE MOVEMENT

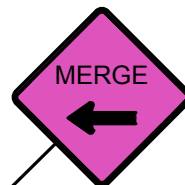
NOT TO SCALE

ORDER OF RESPONSE ACTIVITIES

1. ACTIVATE HAZARD WARNING LIGHTS AND FLASHERS. STOP VEHICLE IN BREAKDOWN LANE.
2. IF EMERGENCY INVOLVES AN INJURY, SKIP TO STEP 6 THEN RETURN TO STEP 3.
3. ERECT SIGNS AND PLACE TRAFFIC CONES. USE 40' SPACING BETWEEN CONES.
4. MOVE RESPONSE VEHICLE BEHIND EMERGENCY.
5. PLACE ADDITIONAL CONES.
6. TEND TO EMERGENCY.

NOTES

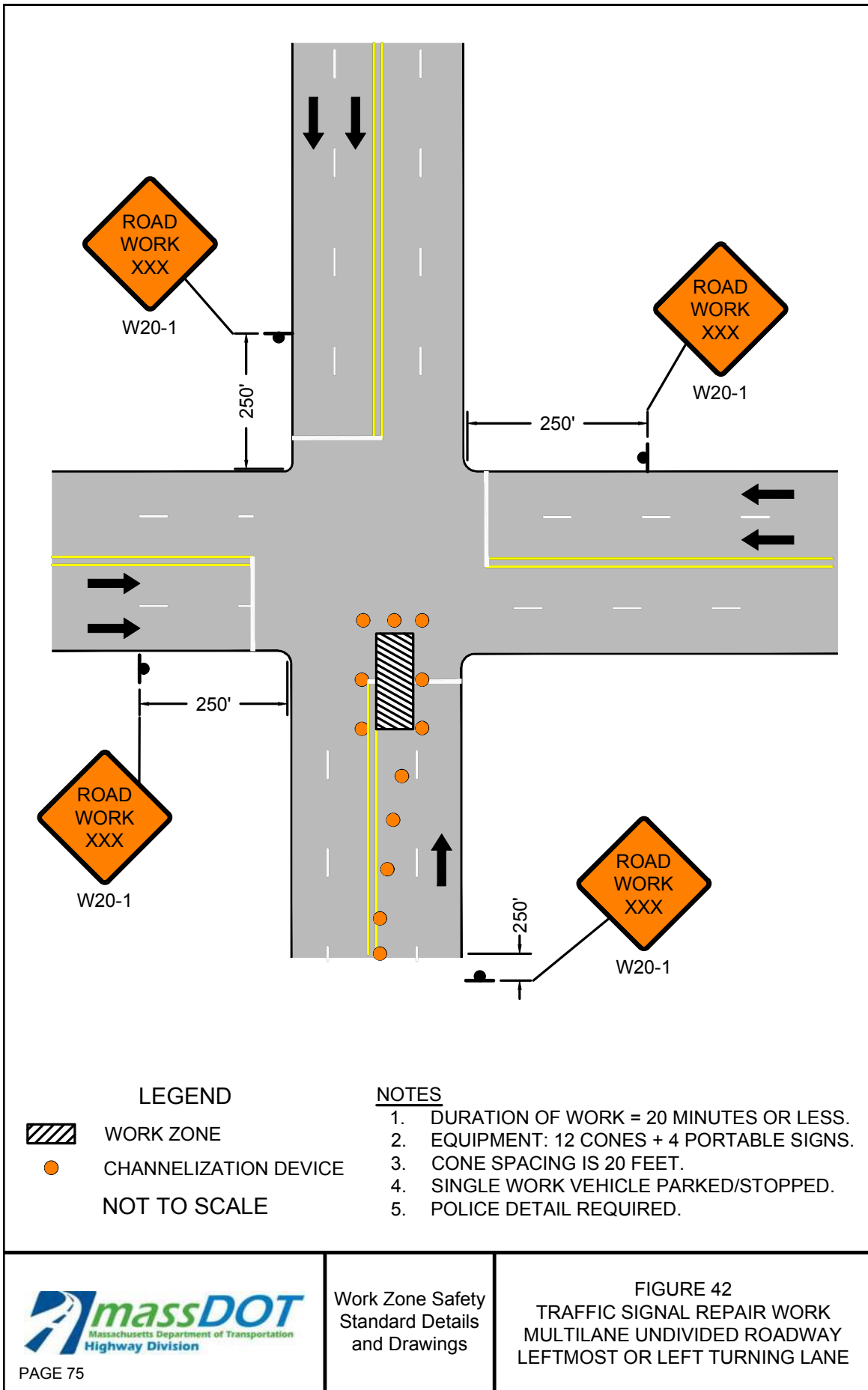
1. ON HILLY TERRAIN, SHARP CURVES, IN HEAVY TRAFFIC, OR WITH HIGH SPEEDS, CONE SPACING MAY BE DOUBLED TO 80'.
2. REQUEST ADDITIONAL ASSISTANCE AND/OR TRAFFIC CONTROL DEVICES, IF NEEDED.



MA-W4-2aL



MA-W20-9

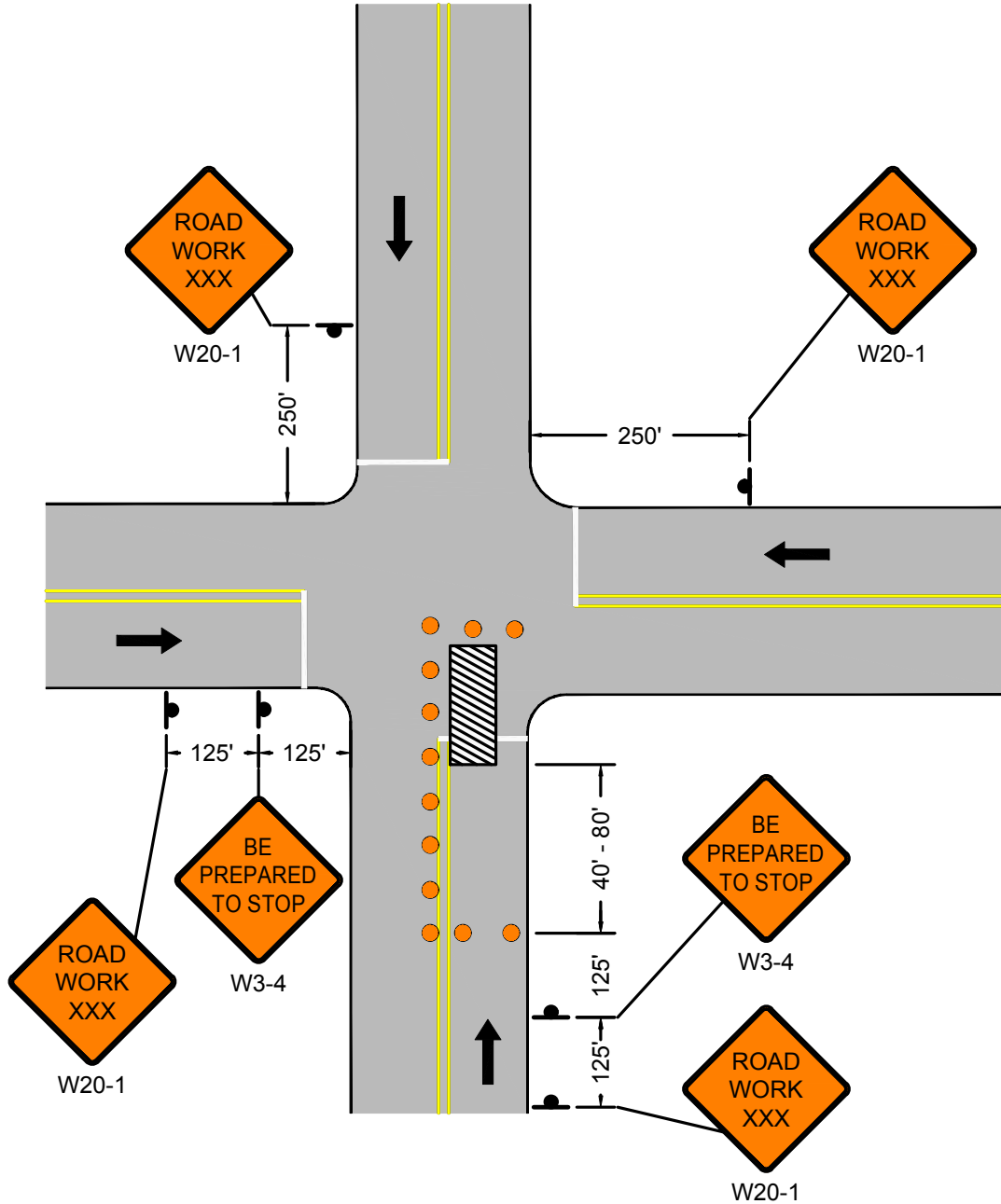




PAGE 76

Work Zone Safety
Standard Details
and Drawings

FIGURE 43
TRAFFIC SIGNAL REPAIR WORK
TWO LANE UNDIVIDED ROADWAY
ONE LEG OF INTERSECTION



LEGEND



WORK ZONE

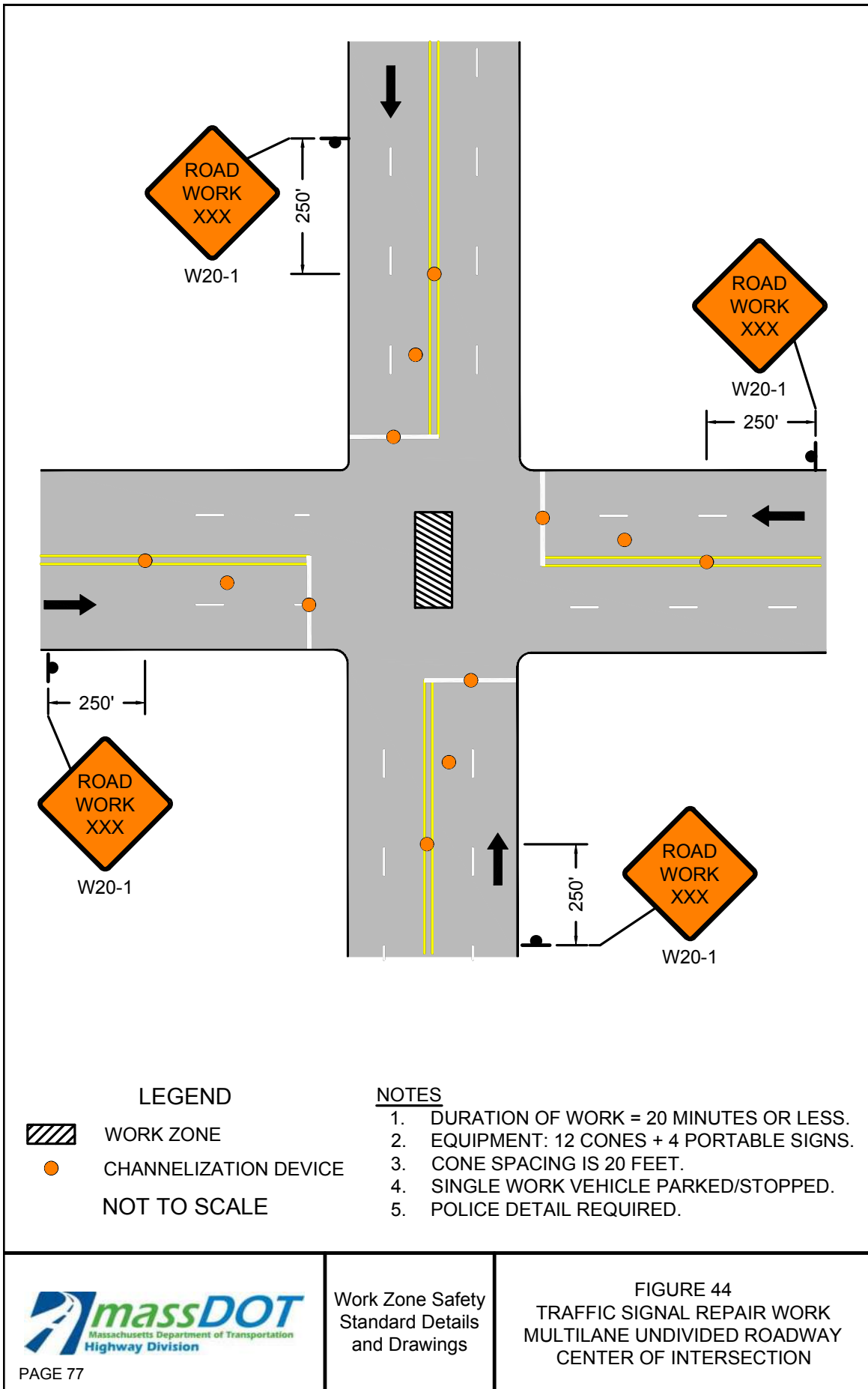


CHANNELIZATION DEVICE

NOT TO SCALE

NOTES

1. DURATION OF WORK = 20 MINUTES OR LESS.
2. EQUIPMENT: 12 CONES + 6 PORTABLE SIGNS.
3. CONE SPACING IS 20 FEET.
4. SINGLE WORK VEHICLE PARKED/STOPPED.
5. POLICE DETAIL REQUIRED.

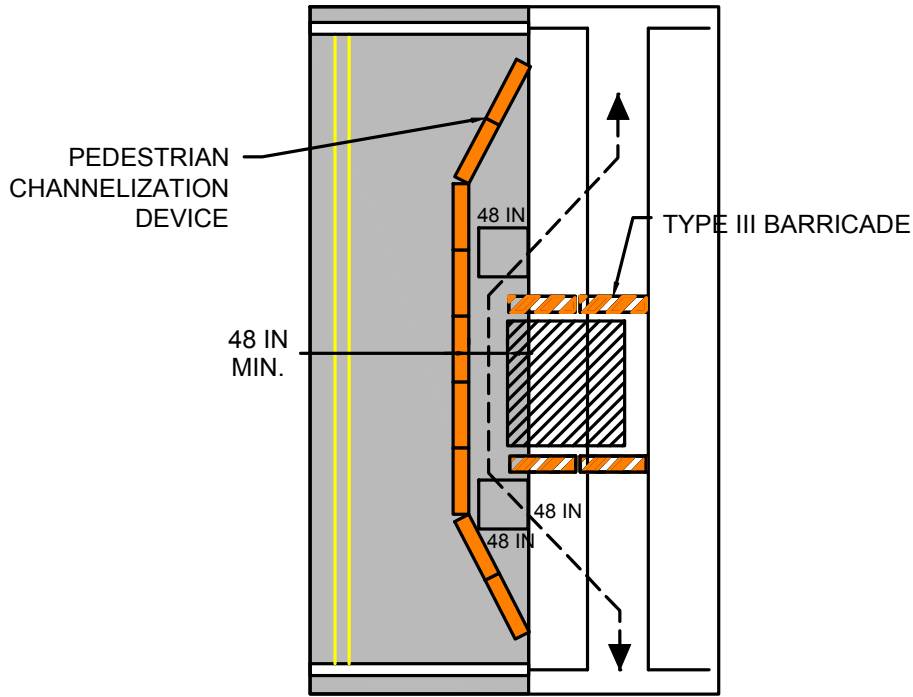




PAGE 78

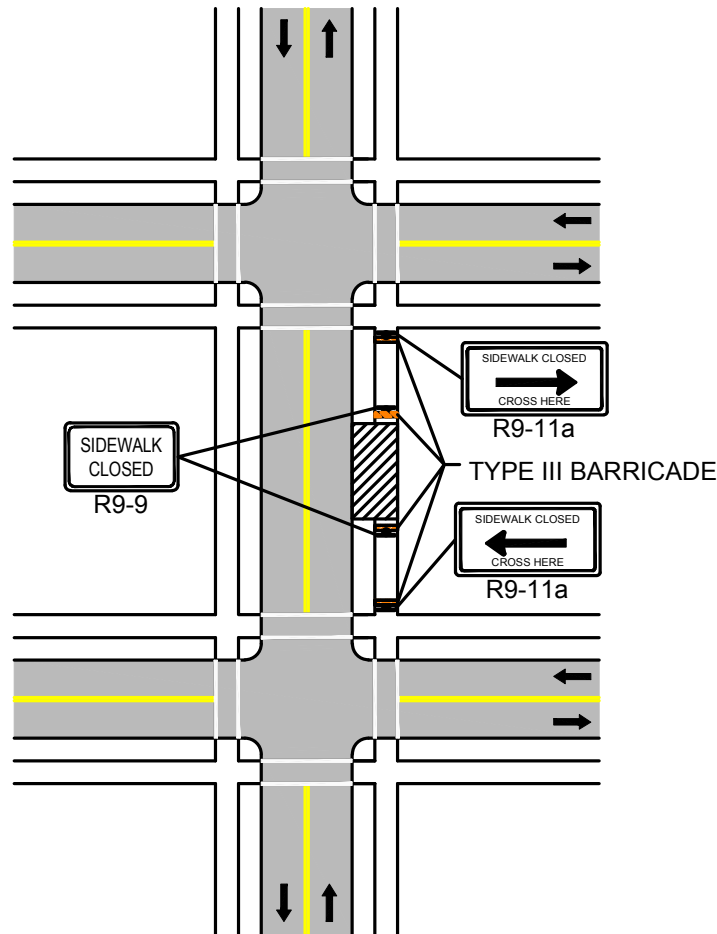
Work Zone Safety
Standard Details
and Drawings

FIGURE 45
PEDESTRIAN BYPASS



NOTES:

1. WHEN EXISTING PEDESTRIAN FACILITIES ARE DISRUPTED, CLOSED, OR RELOCATED IN A TTC ZONE, TEMPORARY FACILITIES SHALL BE PROVIDED AND THEY SHALL BE DETECTABLE AND INCLUDE ACCESSIBILITY FEATURES CONSISTENT WITH THE FEATURES PRESENT IN THE EXISTING PEDESTRIAN FACILITY.
2. A PEDESTRIAN CHANNELIZATION DEVICE THAT IS DETECTABLE BY A PERSON WITH A VISUAL DISABILITY TRAVELING WITH THE AID OF A LONG CANE SHALL BE PLACED ALONG THE FULL LENGTH OF THE TEMPORARY PEDESTRIAN ROUTE.
3. WHEN USED, TEMPORARY RAMPS SHALL COMPLY WITH AMERICANS WITH DISABILITIES ACT.
4. THE ALTERNATE PATHWAY SHOULD HAVE A SMOOTH CONTINUOUS HARD SURFACE FOR THE ENTIRE LENGTH OF THE TEMPORARY PEDESTRIAN FACILITY.
5. THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THE SIDEWALK EXCEEDS 200 FEET THEN A 5 FOOT BY 5 FOOT PASSING ZONE SHALL BE PROVIDED NEAR THE MID-POINT OF THE CLOSURE.
6. THE PROTECTIVE REQUIREMENTS OF A TTC WORK ZONE MAY HAVE AN IMPACT IN DETERMINING THE NEED FOR TEMPORARY TRAFFIC BARRIERS AND THEIR USE IN PROVIDING PEDESTRIAN DELINEATION SHOULD BE BASED ON ENGINEERING JUDGMENT.
7. ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL TO ASSIST WITH NAVIGATION AROUND THE CLOSURE/WORK AREA MAY BE CONSIDERED AS AN OPTION IN PLACE OF PROVIDING ADA/AAB DEVICES FOR WORK FOR CLOSURES LASTING 4 HOURS OR LESS.
8. CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN; VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE. THESE DETAILS ARE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DETERMINED BY THE ENGINEER.



NOTES:

1. CLOSURE OF A SIDEWALK FACILITY SHALL CONSTITUTE THE PROVISION FOR MANAGING PEDESTRIAN TRAFFIC AND ACCOMMODATING ALL USERS. IF THE EXISTING PEDESTRIAN ACCESS ROUTE(S) CAN BE TEMPORARILY RELOCATED ALONG THE EXISTING SIDEWALK , AND SAID FACILITY PROVIDES A MINIMUM WIDTH OF 48-INCHES OF SOLID, SMOOTH UNOBSTRUCTED SURFACE, THEN NO DETOURING OF THE ROUTE SHALL BE REQUIRED. DELINEATION OF THE WORK AREA IS STILL REQUIRED.
2. IF IT IS NECESSARY TO DIVERT PEDESTRIAN TRAFFIC TO AN ALTERNATE ROUTE ACROSS THE ROADWAY FROM THE EXISTING FACILITY, THE FIGURE ABOVE SHALL BE FOLLOWED TO PROVIDE ADEQUATE DIRECTION TO PEDESTRIANS. ALTERNATE ROUTE SHALL PROVIDE THE SAME LEVEL OF ACCOMMODATION AS THE FACILITY THAT IS BEING DETOURED AND RETAIN ADA COMPLIANCE IN ITS ENTIRETY.
3. FOR EMERGENCY OR SHORT-DURATION SIDEWALK CLOSURES OF 4-HOURS OR LESS, IT IS OPTIONAL TO HAVE ON-DEMAND PEDESTRIAN ASSISTANCE PERSONNEL AVAILABLE AT ALL TIMES DURING THE CLOSURE TO ASSIST THOSE MOBILITY CHALLENGED PERSONS WHO REQUIRE ADDITIONAL ASSISTANCE TO SAFELY NAVIGATE AROUND THE WORK AREA IN LIEU OF A FULL DETOUR.



PAGE 80

Work Zone Safety
Standard Details
and Drawings

STATIONARY OPERATIONS
BIKE LANE CLOSURE

POSTED SPEED LIMIT (MPH)	SPACING FOR BIKE ADVANCE WARNING SIGNS (FT) (A,B))	CHANNELIZATION DEVICES (DRUMS OR CONES)			
		TRANSITION LENGTH (L/3)	BUFFER ZONE LENGTH (FT)	DEVICE SPACING (FT)	MIN # OF DEVICES*
25-40	150 / 150	100	305	20	45
45-55	150 / 150	220	495	40	35
60-65	150 / 150	260	645	40	40

* NUMBER OF DEVICES BASED ON 400 FT WORK ZONE.

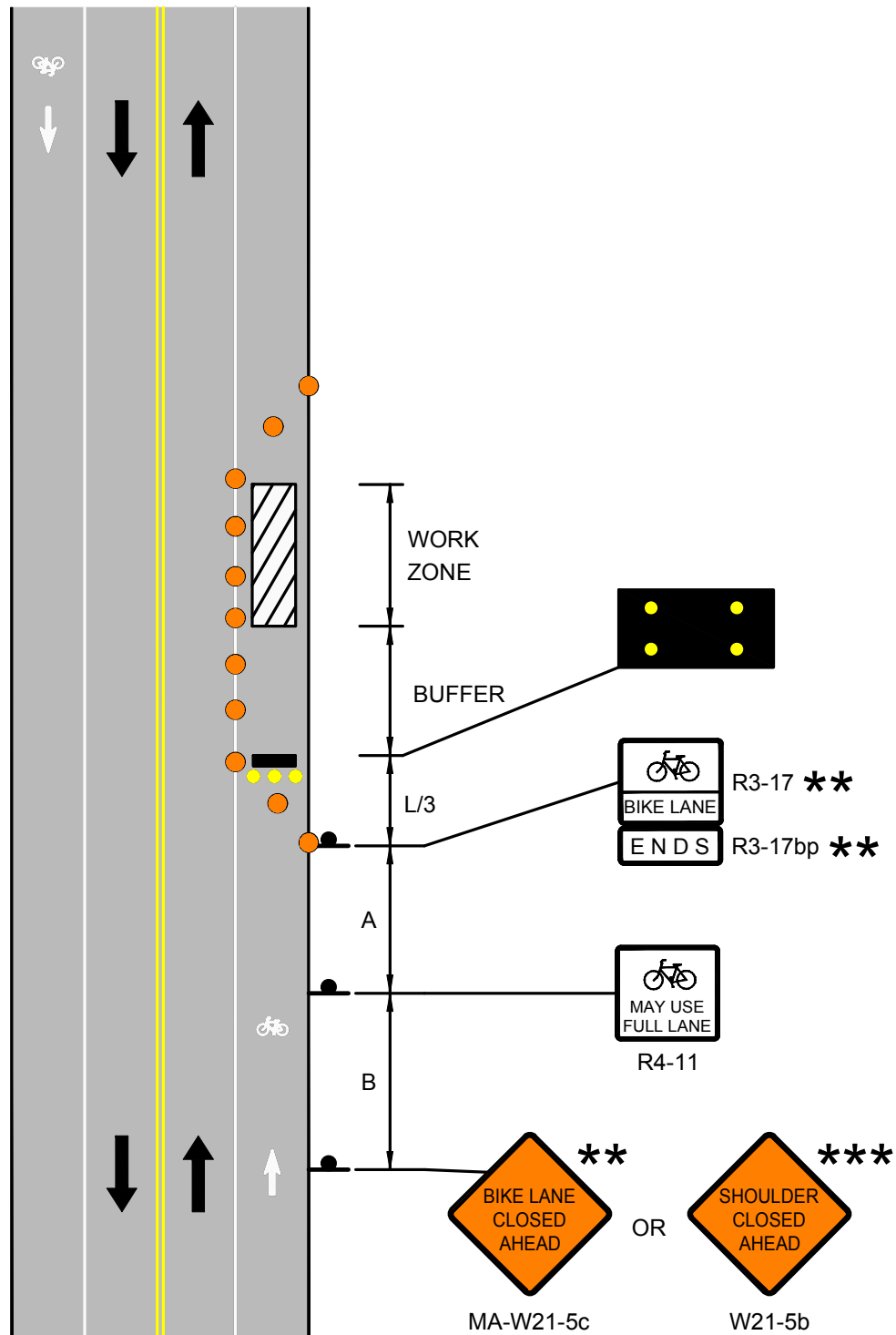
NOTES

1. DETAIL SHALL BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS. SIGNING SHOWN ONLY FOR BIKE TRAFFIC. FOLLOW ALL OTHER RELEVANT DETAILS FOR TTC DEVICES FOR VEHICULAR TRAFFIC.
2. ** SIGN SHALL BE USED ONLY IF THERE IS A MARKED BIKE LANE.
3. *** SIGN SHALL BE USED ONLY IF THERE IS NO MARKED BIKE LANE.

LEGEND

	WORK ZONE
	CHANNELIZATION DEVICE
	FLASHING ARROW BOARD
	PORTABLE CHANGEABLE MESSAGE SIGN
	TRUCK MOUNTED ATTENUATOR
	RADAR SPEED FEEDBACK BOARD
	POLICE DETAIL OR UNIFORMED FLAGGER
	TEMPORARY PORTABLE RUMBLE STRIP
	TYPE III BARRICADE

NOT TO SCALE





Rev. June, 2017

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)

Contract Number: 114724 Project File Number: 606272City/Town: BarnstableProject Description: Intersection Improvements and Related Work (Including Signals) at Iyannough Road
(Route 28) and Yarmouth Road

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Highway Design Engineer at the MassDOT -Highway Division at the following email address:

DOTHighwayDesign@dot.state.ma.us

Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

Telephone number: _____

Email address: _____

Signature/Date: _____

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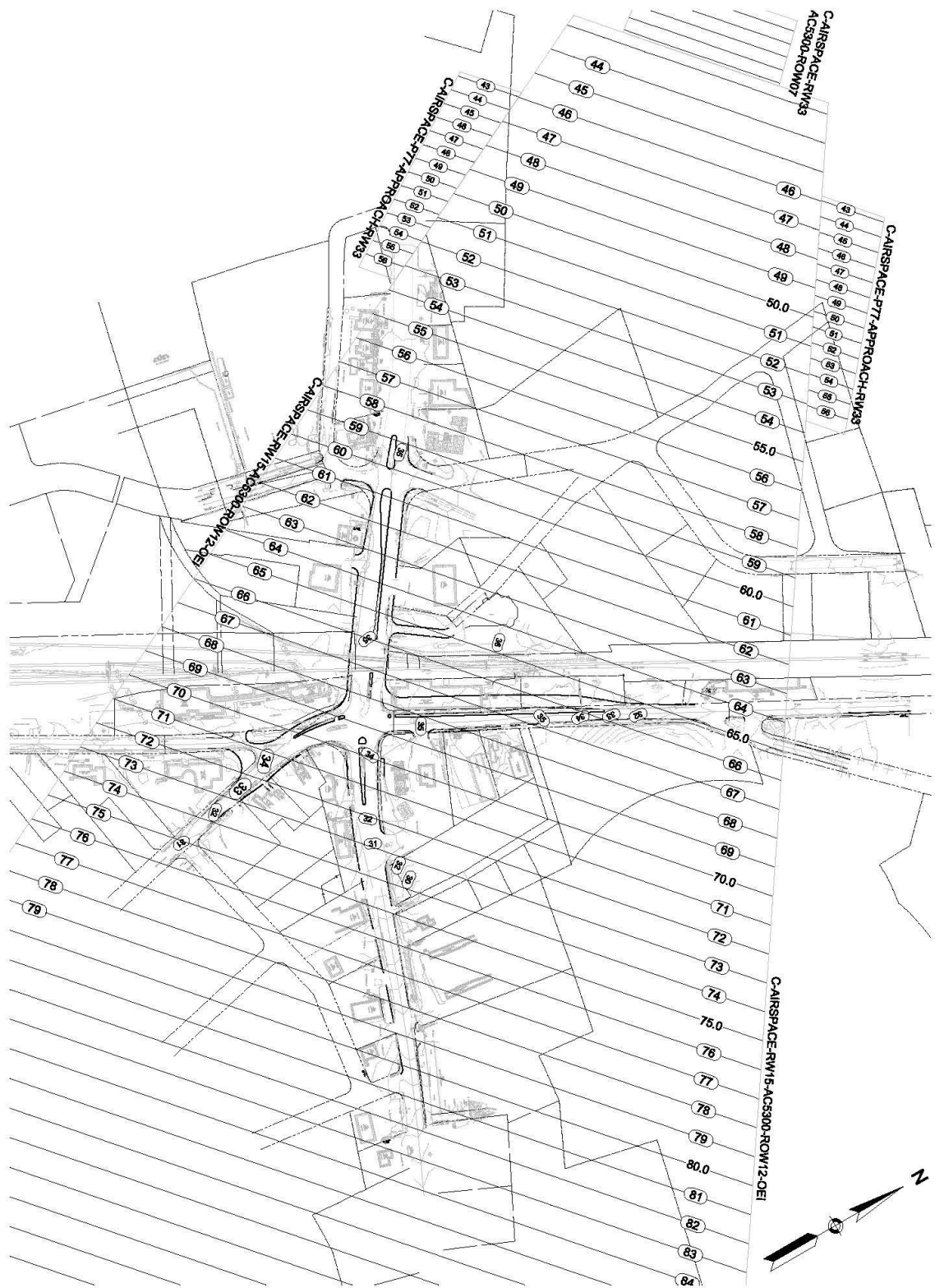
DOCUMENT A00885

ATTACHMENTS AND APPENDIXES

ATTACHMENT A – AIRSPACE RESTRICTIONS	A00885-1 through 4
ATTACHMENT B – HAZARDOUS MATERIAL SURVEY	A00885-5 through 70
APPENDIX A HYANNIS WATER SPECIFICATIONS	A00885-71 through 112
APPENDIX B EVERSOURCE STANDARD DOCUMENTS	A00885-113 through 285
APPENDIX C TOWN OF BARNSTABLE MUNICIPAL SEWER SPECIFICATIONS	A00885-286 through 312

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ATTACHMENT A – AIRSPACE RESTRICTIONS



ATTACHMENT B – HAZARDOUS MATERIAL SURVEY



HAZARDOUS BUILDING MATERIALS INSPECTION REPORT

PHASE 1

**KAM APPLIANCES
201 YARMOUTH ROAD
BARNSTABLE, MASSACHUSETTS**

PREPARED FOR:

**MASSACHUSETTS DEPARTMENT OF TRANSPORTATION – HIGHWAY DIVISION
1050 COUNTY STREET
TAUNTON, MASSACHUSETTS**

PREPARED BY:

**ATC GROUP SERVICES LLC
10 STATE STREET, SUITE 100
WOBURN, MASSACHUSETTS 01801**

ATC PROJECT 60DOTAS073

AUGUST 13, 2020

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	2
1.1	ASBESTOS	2
1.2	LEAD DETERMINATION	3
1.3	PCB, MERCURY AND OTHER HAZARDOUS MATERIALS SURVEY (OHM)	4
2.0	ASBESTOS CONTAINING MATERIALS SURVEY.....	7
2.1	SAMPLING METHODOLOGY	7
2.2	ASBESTOS-CONTAINING MATERIALS	8
	Table 1: Summary of Identified Asbestos Containing Materials	8
	Table 2: Cost Estimates for Abatement of Identified ACM	9
	Table 3: Summary of Non-ACM.....	10
2.3	ANALYTICAL METHOD.....	11
2.4	CONSIDERATION FOR HIDDEN MATERIALS	11
2.5	RECOMMENDATIONS	12
3.0	LEAD PAINT DETERMINATION	13
3.1	TESTING PROCEDURES - HEURESIS LPA-1 XRF ANALYZER	13
3.2	SUMMARY OF FINDINGS	13
	Table 4: Lead Paint Testing Results by XRF	13
3.3	REGULATORY IMPLICATIONS AND REGULATIONS	14
4.0	PCBS IN BUILDING MATERIALS SURVEY.....	16
4.1	OVERVIEW OF PCB-CONTAINING MATERIALS REGULATORY REQUIREMENTS	16
4.2	FIELD ACTIVITIES	17
4.3	LABORATORY ANALYTICAL RESULTS.....	18
	Table 5: PCB Sampling Summary	18
	Table 6: PCB Excluded Bulk Product Cost Estimate	19
5.0	PCB, MERCURY AND OTHER HAZARDOUS MATERIALS (OHM) SURVEY.....	20
5.1	OBJECTIVE	20
5.2	SCOPE OF WORK	20
5.3	RESULTS	20
	Table 7: OHM Summary	21
5.3.1	Fluorescent and High Intensity Discharge (HID) Light Ballasts	21
5.3.2	Fluorescent and HID Light Bulbs	22
5.3.3	Other Potential PCB-Containing Equipment/Materials	22
5.3.4	Mercury-Containing Equipment	22
4.3.5	Other Hazardous Materials	22
5.4	CONCLUSIONS.....	22

APPENDICES

Appendix A	Asbestos Bulk Sample Analysis Results By PLM
Appendix B	PCB Analysis Results

1.0 EXECUTIVE SUMMARY

ATC Group Services LLC (ATC) was retained by the Massachusetts Department of Transportation – Highway Division (MassDOT) to perform a hazardous building materials survey of the KAM Appliance commercial building (District 5), which is located at 201 Yarmouth Road, in Barnstable, Massachusetts. ATC understands that the Building is scheduled for demolition. The inspection was performed in accordance with ATC Proposal 2020-0259, dated July 27, 2020. Since the Building was occupied and as requested by MassDOT, ATC did not perform limited exploratory demolition in the building, in representative areas that may be impacted by the upcoming demolition project during Phase 1. This survey included an inspection for Asbestos-Containing Materials (ACM), Polychlorinated Biphenyls (PCBs), Lead Based Paint (LBP) and Other Hazardous Materials (OHM).

MassDEP requires a destructive survey prior to the demolition of a structure as to minimize the risk of inadvertently disturbing ACMs. In this case Phase 2 inspection must be performed prior demolition.

Although the asbestos contractor is required to follow the requirements outlined in Federal, Massachusetts State, and local regulations regarding asbestos during any abatement project, ATC recommends the development of a project specification and the use of project oversight to ensure compliance with all applicable regulations as well as protect the interest of the client for all abatement work performed at the Site. The project specification shall reference the regulations pertinent to each project, including those work procedures that shall be followed by asbestos abatement personnel.

The Specifications will be set up with a Base Bid, which will include all identified known ACMs. This Section will be bid by the potential Contractors as a Lump Sum. The assumed ACMs will be included in the Additional/ Alternate Section of the Specification, and will require a separate cost for each line item.

As described in proposal 2020-0259, during Phase 2 of the inspection, ATC will perform exploratory demolition in representative interior, exterior, and roof areas to uncover potentially hidden hazardous materials. Note that this will be required by MassDEP prior to demolition activities. If ACMs are found to be present on the Building Façade and /or foundation wall areas, a Non-Traditional Work Plan (NTWP) will need to be prepared and approved by the MassDEP in order to properly remove these areas during demolition activities. As part of the NTWP MassDEP requires laboratory sample results to be included in the document.

The building is primarily constructed of wood framing with a CMU and masonry exterior. Interior finishes included a combination of CMU block, brick, wood paneling and gypsum board. Floor finish materials include carpet, floor tiles, ceramic tiles, hardwood flooring, and concrete.

1.1 Asbestos

Section 2.0 discusses the ACM survey and sampling methodology. The Phase 1 portion of this survey involved a visual inspection, bulk sampling and inventory of suspect ACM, including locating and quantifying the identified ACM in representative interior and exterior areas. ATC did not perform exploratory demolition throughout the interior and exterior of the building, to the degree feasible in an attempt to identify the presence of hidden ACMs. Please note that ATC did not disassemble mechanical equipment or electrical gear that may have suspect ACM internal components or inspect roof or foundation areas below grade as a part of the Phase 1 inspection.

The asbestos survey was performed by Massachusetts Division of Labor Standards (DLS) certified Asbestos Inspector, Ms. Elizabeth Jane Fuller (AI-054778), on July 29, 2020 and Mr. Michael Puyana (AI-061157) on August 5, 2020. A total of seventy-five (75) samples of suspect ACM were collected with

sixty-five (65) samples analyzed to determine asbestos content. The ATC inspectors performed both the visual inspection and bulk sampling in the building according to methods outlined in the U.S. Environmental Protection Agency (EPA) guidance document titled, "Guidance for Controlling Asbestos-Containing Materials in Buildings" (Document No. 560/5-85/024). Please find the EMSL Analytical, Inc. Polarized Light Microscopy (PLM) bulk sample results included as Appendix A. See Table 1 for confirmed ACM materials.

The estimated cost to remove identified ACMs is approximately **\$14,700.00**. The cost to remove the assumed ACMs is approximately **\$601,000.00**.

The following is a summary of the Assumed ACMs that ATC has encountered in similar Buildings. Please see Tables 1 and 2 for additional information.

- Built Up Roofing Insulation – This material has been assumed to contain asbestos as it is a suspect ACM and ATC was unable to collect samples of the materials during this inspection.
- Wood Panel Mastic - This material has been assumed to contain asbestos as it is a suspect ACM and ATC was unable to access the material without causing damage to the interior finish to collect samples of the materials during this inspection.
- Pipe Insulation – This material has been assumed to contain asbestos as ATC observed this material to be present in the basement and was unable to access the mechanical chases to confirm if this material was present.
- Black Vapor Barrier Under Hardwood Flooring - This material has been assumed to contain asbestos as it is a suspect ACM and ATC was unable to drill holes in the floors to confirm if this material is present.
- Waterproofing Behind Masonry Façade - This material has been assumed to contain asbestos as it is a suspect ACM and ATC was unable to remove bricks from the façade to confirm if this material is present.
- Waterproofing on Foundation Wall - This material has been assumed to contain asbestos as it is a suspect ACM and ATC was unable to access the material to confirm if this material is present.
- Sound Dampening Insulation - This material has been assumed to contain asbestos as it is a suspect ACM and ATC was unable to drill holes in the CMU block walls to confirm if this material is present.
- 9" x 9" Floor Tile and Mastic – These materials likely contain asbestos. ATC has assumed these materials to contain asbestos as there was not a discrete location to collect the samples.

1.2 Lead Determination

ATC performed a lead paint determination on representative interior and exterior painted surfaces that will be impacted by the proposed demolition project. Using X-Ray Fluorescence (XRF) Analysis with a Heuresis Lead Paint Analyzer, the lead determination was performed by Mr. Logan Fitzgerald on August 5, 2020.

Results of the lead determination indicate that lead is present on the Basement - doors, columns, metal pipes, Stairwell components, Center Stairwell components and, 2nd Floor – windows and doors. Note that contractors performing work at the building where the painted surfaces will be disturbed must comply with the Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62, Lead in Construction regulations. Additional waste disposal requirements may apply in accordance with EPA and Massachusetts Department of Environmental Protection (MassDEP) regulations. Table 4 in Section 3 presents the results of the lead determination.

OSHA recognizes that construction type work on surfaces coated with lead-containing paint has a **potential** to expose workers to hazardous levels of lead and requires that appropriate safety and health measures be followed as stated in 29 CFR 1926.62. OSHA states that until the employer performs an exposure assessment and documents that employees are not exposed above the permissible exposure limit (PEL) of greater than 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air, the employer must treat employees as if they were exposed above the PEL.

The cost for demolition of building components coated with lead paint is approximately **5%** above the cost for general demolition.

1.3 PCB, Mercury and Other Hazardous Materials Survey (OHM)

ATC performed a representative survey of accessible building sealants suspected to contain PCBs in support of the upcoming demolition project. The survey was completed by ATC Inspector Mr. Michael Puyana, on August 5, 2020. Accessible sealants such as caulking and glazing compound were sampled and submitted to a laboratory for PCB analysis using Soxhlet extraction and EPA analytical Method 8082.

The results of the PCB sealant surveys are provided in Section 4.0. PCBs were detected in two (2) of the twelve (12) sealants sampled. Sealant materials not containing PCBs can be classified as regular demolition debris and are not regulated under TSCA. Note that if a sealant is identified as an ACM, the ACM management requirements presented in this report must be followed. Please see PCB sample results in table 5 for more information.

PCBs are often present in building material sealants such as caulking and glazing compounds manufactured prior to July 1979. In general, the PCBs were used in these materials as plasticizers and/or flame retardants. EPA TSCA regulations stipulate procedures by which PCB-contaminated materials must be handled and disposed. The management of PCB-containing materials is regulated by TSCA and associated 40 CFR §761 Regulations, as administered by the EPA. Depending upon PCB concentrations and source; sealants, paints, and building materials with detectable PCBs are classified under TSCA as either PCB Bulk Product Wastes, PCB Remediation Wastes, or Excluded PCB Products, as noted below:

- PCB Bulk Product Wastes: Materials manufactured with PCBs at concentrations ≥ 50 ppm are classified as a PCB Bulk Product Waste and require special management practices in accordance with TSCA (40 CFR § 761). All PCB Bulk Product Waste must be removed and disposed at a licensed facility which can accept PCB Bulk Product Wastes. PCB Bulk Product Waste is managed in accordance with 40 CFR 761.62 and most often under 761.62(b) – Disposal in solid waste landfills. This includes TSCA landfills and some non-TSCA landfills. Removal and disposal of PCB Bulk Product Waste in accordance with 40 CFR 761.62(b) does not require EPA approval.
- PCB Remediation Wastes: Materials that contain PCBs because they have been contaminated by nearby PCB Bulk Product Wastes are classified as a PCB Remediation Waste. These materials must be disposed at a licensed facility which can accept PCB Remediation Wastes, unless they are removed and disposed together with the nearby PCB Bulk Product Waste, in which case they too may be considered PCB Bulk Product Wastes. EPA approval is required if decontamination/treatment of PCB Remediation Wastes will occur on-site or if PCB Remediation Waste will remain on-site.
- Excluded PCB Products: Materials with PCBs at concentrations < 50 ppm can be classified as an Excluded PCB Product if these levels are not due to contamination from sealants, paints or other materials that are considered a PCB Bulk Product Waste.

Please see Section 4 for additional information.

The estimated cost to remove and dispose of identified PCB caulks and sealants identified during the inspection is approximately **\$3,250.00**, which includes a 10% contingency.

ATC also performed a visual hazardous materials survey in representative interior and exterior areas throughout the building located at 201 Yarmouth Road in Barnstable, Massachusetts. The Building is currently scheduled for demolition and was occupied at the time of the inspection. The survey was performed by Ms. Elizabeth Jane Fuller, ATC Inspector on July 29, 2020. The objective of the hazardous materials survey was to evaluate for the presence of polychlorinated biphenyl (PCB)-containing ballasts, sealants (i.e., caulk and glazing), electrical equipment, mercury-containing electrical and building components, and other potentially hazardous materials that will require disposal as part of the proposed demolition. The scope of work for this project did not include inspection of the Site for the presence of underground storage tanks (USTs) or other underground structures that may contain hazardous materials, soil or groundwater testing. ATC inspected accessible areas of the building for potentially hazardous materials.

Various confirmed and potential hazardous material-containing building components and items were observed within the surveyed areas. It is assumed that mobile items (i.e. cleaning and maintenance supplies etc.) observed will be removed prior to building demolition. Therefore, their disposal cost is not included. The inspection and results are discussed in Section 5.0. The estimated cost to dispose of other hazardous materials (OHM) identified during the inspection is approximately **\$1,200.00**, which includes a 10% contingency. This estimated cost does not include costs associated with underground structures, and soil or groundwater, if present.

Limitations

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the field of environmental science and engineering. This statement is in lieu of other statements either expressed or implied. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

Environmental evaluations are limited in the sense that conclusions and recommendations are developed and information obtained from limited research and secondary sources. Except as set forth in this report, ATC has made no independent investigations as to the accuracy or completeness of the information derived from the secondary sources and personal interviews and has presumed that such information was accurate and complete.

This report is intended for the sole use of MassDOT. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document or the findings, conclusions, or recommendations, is at risk of said user.

CERTIFICATION OF RESULTS

This report has been prepared for the exclusive use of MassDOT. Photocopying of this document by parties other than those designated by the Client, or use of this document for purposes other than it is intended, is prohibited.

Respectfully submitted 11th day of August, 2020

ATC Group Services, LLC



Ricardo Nunes
Senior Project Manager



Bryan Thompson
Division Manager, Building Sciences

2.0 ASBESTOS CONTAINING MATERIALS SURVEY

2.1 Sampling Methodology

The survey was performed by an EPA-accredited and Commonwealth of Massachusetts DLS certified Asbestos Inspectors on July 29 and August 5, 2020. Bulk samples, representing individual homogenous areas of suspect materials, were collected in a randomly distributed manner, in accordance with the methods outlined below.

Building materials exist in the form of thermal systems insulation (TSI), surfacing materials, and miscellaneous materials.

The following generally illustrates the sampling strategy employed by ATC where feasible:

- (a) Surfacing materials - In a randomly distributed manner, collect bulk samples of surfacing materials, representative of each homogeneous area, and not assumed to be ACM.
 - (1) Collect at least three bulk samples from each homogeneous area that is less than or equal to 1,000 ft².
 - (2) Collect at least five bulk samples from each homogeneous area that is greater than 1,000 ft², but less than or equal to 5,000 ft².
 - (3) Collect at least seven bulk samples from each homogeneous area that is greater than 5,000 ft².
- (b) Thermal systems insulation.
 - (1) In a randomly distributed manner, collect at a minimum, three (3) bulk samples of thermal systems insulation material, representative of each homogeneous area, and not assumed to be ACM.
 - (2) Collect, at a minimum, one (1) bulk sample of patched thermal systems insulation, representative of each homogenous area, and not assumed to be ACM, providing the section of patch was less than 6 linear or square feet.
 - (3) Collect, at a minimum, three (3) representative bulk samples of each insulated mechanical system not assumed to be ACM, including, but not limited to cementitious material used on pipe fittings such as tees, elbows, or valves. Representative sampling was conducted in a manner sufficient as to identify whether each homogenous area is either asbestos or non-asbestos containing.
 - (4) Bulk samples are not required to be collected from any homogeneous area where the accredited asbestos inspector has determined that the thermal systems insulation is a non-suspect material (i.e., fiberglass, foam glass, rubber, or any other non-ACM).
- (c) Miscellaneous materials - Collect, at a minimum, two (2) representative bulk sample of each miscellaneous material not assumed to be ACM, including, but not limited to ceiling tiles, floor tiles, associated floor tile mastic, roofing materials, waterproofing, etc. Representative sampling was conducted in a manner sufficient as to identify whether each homogenous area is either asbestos or non-asbestos containing.

2.2 Asbestos-Containing Materials

ATC conducted the asbestos survey in representative interior and exterior areas throughout the Building, located at 201 Yarmouth Road, in Barnstable, Massachusetts. Since the Building was occupied and as requested by MassDOT, ATC did not perform limited exploratory demolition in the building, in representative areas that may be impacted by the upcoming demolition project during Phase 1.

ATC has assumed that hazardous materials will be present in the hidden areas of the Building. It is the recommendation of ATC that the Phase 2 portion of the inspection, which includes exploratory demolition to uncover potentially hidden ACMs, be performed prior to the project bidding process. This will allow potential contractors to better understand the scope of work and provide more competitive pricing.

Table 1 presents a list of the identified, confirmed ACMs and assumed ACMs inspected based upon laboratory analysis of the samples and visual inspections. The Phase 1 laboratory report is attached in Appendix A.

**Table 1: Summary of Identified Asbestos Containing Materials
201 Yarmouth Road
Barnstable, Massachusetts**

Sample Location	Material	Estimated Quantity	Result
Basement			
Basement – Water Heater/ Storage Room	White Paper Pipe Insulation	300 ln ft	40% Chrysotile
	White Pipe Insulation Wrap		40% Chrysotile
	White Pipe Insulation Fitting		10% Chrysotile
	White Pipe Insulation Fitting		50% Chrysotile
Basement – Main Area (10 Pane Window)	Gray Window Glazing Compound	10 (2' x 5') Windows	2% Chrysotile
1st Floor			
1st Floor – North Showroom	Interior Gray Window Glazing Compound	2 (5' x 6') Windows	2% Chrysotile
Potentially Concealed ACMs			
Exterior Roof	Built-Up Asphaltic Roof Material	10,000 sq ft	N/A ¹
2 nd Floor – Under Hardwood Flooring	Black Vapor Barrier	8,700 sq ft	N/A ¹
2 nd Floor – Restroom Hallway	Wood Wall Panel Mastic	500 sq ft	N/A ¹
1st & 2nd Floor – Perimeter Wall Chases	White Pipe Insulation and Pipe Insulation Fittings	3,000 ln ft	N/A ¹
1st Floor – Under Hardwood Flooring	Black Vapor Barrier	8,700 sq ft	N/A ¹
Exterior Facade	Black Waterproofing on CMU/ Brick Wall	15,000 sq ft	N/A ¹
Exterior Foundation	Black Waterproofing on Foundation Wall	5,000 sq ft	N/A ¹
Interior CMU	Sound Dampening Insulation	15,000 sq ft	N/A ¹

Sample Location	Material	Estimated Quantity	Result
Center Stairwell Landings	9" x 9" Blue Painted Floor Tiles and Associated Mastic	50 sq ft	N/A ²

In ft = Linear Feet
General Notes:

sq ft = Square Feet

¹ ATC has assumed that this material may be present and recommends that future exploratory demolition be performed to confirm if the materials are present prior to the demolition project. Confirming non-presence of these assumed ACMs will reduce the overall demolition cost and determine a more defined scope for bidding purposes.

²This Floor Tile and Associated Mastic material could not be sampled without causing damage to the stairwell landings.

Table 2 presents ATC's cost estimates for removal and disposal of the identified ACM.

Table 2: Cost Estimates for Abatement of Identified ACM
201 Yarmouth Road
Barnstable, Massachusetts

ACM Material Location	Material	Estimated Quantity	Unit Cost	Total Estimated Cost
Basement				
Basement – Water Heater/ Storage Room	White Paper Pipe Insulation	300 ln ft	\$ 35.00/ ln ft	\$10,500.00
	White Pipe Insulation Wrap			
	White Pipe Insulation Fitting			
	White Pipe Insulation Fitting			
Basement – Main Area (10 Pane Window)	Gray Window Glazing Compound	10 (2' x 5') Windows	\$ 350.00/ Window	\$3,500.00
1st Floor				
1st Floor – North Showroom	Interior Gray Window Glazing Compound	2 (5' x 6') Windows	\$ 350.00/ Window	\$700.00
Total Estimated Cost for Removal/Abatement of Identified ACM:				\$14,700.00
Potentially Concealed ACMs				
Exterior Roof	Built-Up Asphaltic Roof Material	10,000 sq ft	\$5.00/ sq ft	\$50,000.00
2 nd Floor – Restroom Hallway	Wood Wall Panel Mastic	500 sq ft	\$10.00/ sq ft	\$5,000.00
1st & 2nd Floor – Perimeter Wall Chases and Ceiling Plenums	White Pipe Insulation and Pipe Insulation Fittings	3,000 ln ft	\$35.00/ ln ft	\$105,000.00
1st Floor – Under Hardwood Flooring	Black Vapor Barrier	8,700 sq ft	\$10.00/ sq ft	\$87,000.00
Exterior Facade	Black Waterproofing on CMU/ Brick Wall	15,000 sq ft	\$10.00/ sq ft	\$150,000.00

ACM Material Location	Material	Estimated Quantity	Unit Cost	Total Estimated Cost
Exterior Foundation	Black Waterproofing on Foundation Wall	5,000 sq ft	\$12.00/ sq ft	\$60,000.00
Interior CMU	Sound Dampening Insulation	15,000 sq ft	\$10.00/ sq ft	\$150,000.00
Center Stairwell Landings	9" x 9" Blue Painted Floor Tiles and Associated Mastic	50 sq ft	\$10.00/ sq ft	\$500.00
Total Estimated Cost for Removal/Abatement of Assumed ACM:				\$607,500.00

The estimated cost to remove and dispose of all identified and assumed ACM is **\$622,200.00**.

ATC's cost estimate for asbestos removal does not include the cost of on-site project monitoring and project management services during abatement activities.

The following table lists the suspect materials identified that were sampled and determined to be non-ACM.

**Table 3: Summary of Non-ACM
201 Yarmouth Road
Barnstable, Massachusetts**

Material	Sample Location(s)
EMSL Batch Number 132005094, July 29, 2020	
Multi-Color Gypsum Wall Board	1 st Floor – Elevator Storage Area, Restroom 2 nd Floor – Office Area
White Joint Compound Associated with Multi-Color Gypsum Wall Board	
Tan Window Glazing Compound (12 Pane)	2 nd Floor – Rear Storage Area
White Window Caulk (Interior)	
White Expansion Joint Caulk	Exterior Rear Concrete Slab above Steps
EMSL Batch Number 132005289, August 5, 2020	
White Vanity Caulk	2 nd Floor – Men's Restroom
Multi-Color Steel Window Glazing	2 nd Floor – Storage
Multi-Color Masonry/ Metal Caulk	Exterior – Front Entrance
Black Expansion Joint Caulk	Basement – Floor
Gray Door Frame Caulk	Exterior – North Entrance
Gray Steel Door Frame Caulk	Exterior Loading Dock – Overhead Door
Multi-Color Masonry/ Metal Caulk	Exterior – Track Side, Former Entrance
Gray Aluminum Window Frame Caulk	2 nd Floor – Storage
Gray Metal Door Frame Caulk	Exterior – Front Entrance
Gray Door Frame Caulk	Exterior – South Entrance
Black Aluminum Window Frame Caulk	Exterior – Front Entrance
Black Vapor Barrier under Hardwood Flooring	2 nd Floor – Showroom
Gray Ceramic Floor Tile Grout	1 st Floor – Showroom, South Section
Gray 2' x 4' Fissured Ceiling Tile	1 st Floor – Showroom, South Section
Multi-Color 2' x 4' Ceiling Tile	1 st Floor – Showroom, Center Section
Tan Carpet Mastic	1 st Floor – Showroom, North Section
Brown Sprinkler Pipe Thread Sealant	1 st Floor – Showroom, North And South Section

Material	Sample Location(s)
Gray 4" Cove Base	2 nd Floor – Men's Restroom
Tan Cove Base Mastic Associated with Gray 4" Cove Base	
Residual Tan Mastic on Steel Window Lintel	2 nd Floor – Offices
Multi-Color Sheet Flooring on Plywood	2 nd Floor – Men's Restroom

2.3 Analytical Method

Samples were placed in labeled containers, which were sealed and submitted to the laboratory for analysis. Bulk samples of suspect materials were analyzed by EMSL Analytical, Inc. (EMSL) of Woburn, Massachusetts, by means of the EPA-approved polarized light microscopy with dispersion staining (PLM/DS) method using the visual estimation technique for asbestos quantification. EMSL is fully accredited for bulk sample analysis under the National Voluntary Laboratory Accreditation Program (NVLAP), administered by the National Institute of Standards and Technology, and is also licensed by the Massachusetts DLS (License Nos. AA-000188). Bulk samples were analyzed for asbestos content using EPA Method 600/R-93/116. The visual estimation technique was used to quantify asbestos concentrations. The PLM/DS analytical method is modeled after 40 CFR Part 763, Subpart F, Appendix A: "Interim Method for the Determination of Asbestos in Bulk Insulation Samples." If a material contains 1% asbestos or greater, it is considered to be asbestos-containing material. Upon client request, or at the recommendation of the analyst, the 'Point Counting Method' may be used to verify the presence/absence of asbestos when a sample contains less than 10% asbestos by visual estimate.

2.4 Consideration for Hidden Materials

The Phase 1 portion of this survey involved a visual inspection, bulk sampling and inventory of suspect ACM, including locating and quantifying the identified ACM in representative interior and exterior areas. ATC did not perform exploratory demolition throughout representative interior and exterior of the building, to the degree feasible in an attempt to identify the presence of hidden ACM. Since the Building was occupied and as requested by MassDOT, ATC did not perform limited exploratory demolition in the building, in representative areas that may be impacted by the upcoming demolition project during Phase 1.

ATC has assumed that hazardous materials will be present in the hidden areas of the Building. It is the recommendation of ATC that the Phase 2 portion of the inspection, which includes exploratory demolition to uncover potentially hidden ACMs, be performed prior to the project bidding process. Phase 1 represents a conservative estimate for abatement and disposal. Phase 2 inspection of hidden areas and destructive testing will allow for more accurate cost estimating.

As described in proposal 2020-0259, during Phase 2 of the inspection, ATC will perform exploratory demolition in representative interior, exterior, and roof areas to uncover potentially hidden hazardous materials. Note that this will be required by MassDEP prior to demolition activities.

MassDEP and EPA require that if a suspect material has not been positively identified, but is similar in mode of occurrence or physical properties as other identified ACM, it should be considered asbestos containing. Only through sampling and analysis should a suspect material be identified as non-asbestos.

2.5 Recommendations

ATC understands that demolition activities are planned for the buildings. All identified ACM that will be impacted by the planned demolition project should be properly removed and disposed by a Commonwealth of Massachusetts licensed Asbestos Contractor prior to disturbance.

ATC recommends that precautions be taken to prevent unauthorized disturbance of identified ACM in this report.

ATC also recommends the following as part of the abatement process:

- Although the asbestos contractor is required to follow the requirements outlined in Federal, Massachusetts State, and local regulations regarding asbestos during any abatement project, ATC recommends the development of a project specification and the use of project oversight to ensure compliance with all applicable regulations as well as protect the interest of the client for all abatement work performed at the Site. The project specification shall reference the regulations pertinent to each project, including those work procedures that shall be followed by asbestos abatement personnel.
- The Specifications will be set up with a Base Bid, which will include all identified known ACMs. This Section will be bid by the potential Contractors as a Lump Sum. The assumed ACMs will be included in the Additional/ Alternate Section of the Specification, and will require a separate cost for each line item.
- As part of each abatement contractor bidding process, a unit price schedule for the abatement of asbestos-containing materials should be established. The unit price schedule should include costs for those materials identified within this report, as well as those materials that may potentially be uncovered during demolition/demolition activities. Included should be unit prices for the removal of asbestos-containing materials (e.g., floor tile, floor tile mastic, gray duct sealant), as well as those non-asbestos-containing materials, which may be asbestos contaminated (i.e. carpeting, plywood, etc.).
- Project oversight will provide MassDOT with on-site technical expertise during all phases of the abatement work. Project oversight provides a constant management of the abatement project to ensure that all identified asbestos-containing materials are removed in accordance with all applicable regulations and to prevent an asbestos fiber release. Tasks performed during project oversight should include periodic work inspections to ensure that all procedures employed by the abatement contractor are acceptable, and air monitoring around each work area to detect elevated asbestos fiber levels.

3.0 LEAD PAINT DETERMINATION

ATC performed a limited lead-containing paint (LCP) determination on representative interior and exterior painted surfaces that will be impacted by demolition. The lead determination was performed by ATC's Inspector, Mr. Logan Fitzgerald. The lead paint testing was performed via X-Ray Fluorescence (XRF) Analysis, using a Heuresis Lead Paint Analyzer.

3.1 Testing Procedures - Heuresis LPA-1 XRF Analyzer

The Heuresis Lead Paint Analyzer is a complete lead paint analysis system, which quickly, accurately and non-destructively measures the concentration of Lead Paint on surfaces. The Heuresis relies on the measurement of the L-shell and K-shell X-rays to determine the amount of lead present in the painted surface. K-shell X-rays can penetrate many layers of paint and allow a good measurement of the lead content of paint to be made without being significantly affected by the thickness or number of layers of paint on the surface of the sample. L-shell X-rays have less penetration and provide a measurement of the surface level lead content of paint.

The Heuresis has the ability to analyze and compute corrections for the differences in the energy spectrums relating to different substrates. This analysis of the energy spectrum means that the lead paint reading displayed on the instrument already accounts for any substrate effects and no correction is required by the operator.

Upon arrival at the job site, a "validation test" was performed to assure that the instrument was operating properly. A series of three test measurements using the nominal time which was used during the inspection were taken on the NIST Paint Film Standard (SRM No. 2579) as required by the instrument's Performance Characteristic Sheet (PCS). The individual readings and an average of the three readings were recorded and compared to the standards. In all cases the instrument was functioning within the standard deviation as defined by the manufacturer and the PCS. All validation readings were recorded in the field data of each unit where validation tests were performed. If for any reason the XRF does not pass the quality control procedures, it is ATC's policy to replace that instrument with an XRF that passes the above criteria for calibration.

3.2 Summary of Findings

The following XRF readings are in milligrams per square centimeter (mg/cm²). Readings above 0.0 have been highlighted.

Table 4: Lead Paint Testing Results by XRF
201 Yarmouth Road
Barnstable, Massachusetts

LOCATION	COMPONENT	SUBSTRATE	COLOR	XRF RESULT (MG/CM ²)
Basement				
Perimeter Wall	Upper Wall	Concrete	White	0.1
	Lower Wall	Concrete	Teal	0.0
Columns	Column	Concrete	Green	0.3
	Column	Concrete	Green	0.7
Ceiling	Ceiling	Concrete	White/ Beige	0.4
Doors	1 st Door	Metal	Gray	10.4

LOCATION	COMPONENT	SUBSTRATE	COLOR	XRF RESULT (MG/CM ²)
	Freight Door	Metal	Beige	1.0
	1 st Door Frame	Metal	Gray	0.8
	Freight Door Frame	Metal	Gray	0.7
	Interior Window	Wood	Teal	1.0
	Pipes	Metal	Beige	1.0
Stairwell	Stair Railing	Wood	Gray	0.9
	Stair Landing	Wood	Gray	0.5
	Newel Post	Wood	Gray	0.3
	Stair Tread	Wood	Gray	0.0
	Upper Wall	Brick	White	0.4
	Lower Wall	CMU	White	0.0
1st Floor				
1 st Floor	Upper Wall	Gypsum Board	White	-0.0
	Wall	Gypsum Board	Light Gray	0.0
	Column	Metal	Black	-0.1
	Structural Beam	Metal	Black	0.0
	Wall	Gypsum Board	Blue	0.1
	Cove Base	Wood	Black	0.0
	Door	Wood	White	-0.0
	Door Frame	Wood	White	-0.1
Center Stairwell	Stair Railing	Metal	Gray	0.9
	Stair Tread	Metal	Gray	0.8
	Wall	Brick	White	0.3
2nd Floor				
2 nd Floor	Upper Wall	Wood	White	0.1
	Lower Wall	Brick	White	0.3
	Wall	Gypsum Board	White	-0.1
	Column	Metal	Red	0.1
	Structural Beam	Metal	Red	0.2
	Freight Door	Metal	Red	0.6
	Old Windows	Metal	Black	0.4
	Door	Wood	Red	0.7
	Door Frame	Wood	Red	0.4

3.3 Regulatory Implications and Regulations

The implications of lead paint existing in a non-residential building are related to the future use of the facility and the need to impact these painted surfaces during the renovation and demolition process.

The Occupational Safety and Health Administrative (OSHA) does not acknowledge any quantitative threshold for a lead-based paint. Paint with a detectable amount of lead, regardless of the level, is recognized as a lead-containing paint. The possible exposure hazard to workers impacting these coated surfaces should be assessed and contractors and their employees must adhere to the OSHA Lead in Construction standard found at 29 CFR 1926.62.

OSHA recognizes that construction type work on surfaces coated with lead-containing paint has a **potential** to expose workers to hazardous levels of lead and requires that appropriate safety and health measures be followed as stated in 29 CFR 1926.62. OSHA states that until the employer performs an exposure assessment and documents that employees are not exposed above the permissible exposure limit (PEL) of greater than 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air, the employer must treat employees as if they were exposed above the PEL for the following operations:

- Manual renovation and demolition of structures, manual scraping, manual sanding, and use of heat gun where lead-containing coatings or paints are present;
- Abrasive blasting;
- Power tool cleaning;
- Lead burning;
- Using lead-containing mortar or spray painting with lead-containing paint;
- Abrasive blasting, rivet busting, or welding, cutting, or burning on any structure where lead-containing coatings or paint are present;
- Cleanup activities where dry expendable abrasives are used; and
- Any other task the employer believes may cause exposure in excess of the PEL.

Work precautions include providing respiratory protection, protective work clothing and equipment, change areas, hand washing facilities, biological monitoring, and training until an exposure assessment has determined that the work activity will result in an exposure below the PEL. Additional requirements under this standard include a written compliance program as well as record keeping.

4.0 PCBs IN BUILDING MATERIALS SURVEY

The survey objective was to visually evaluate for the presence of PCB-containing accessible sealants (i.e., various caulking and glazing compound materials) that would require special management as part of the planned Redevelopment project. ATC performed a representative visual inspection of accessible building sealants suspected to contain PCBs in support of the upcoming Redevelopment Project. The survey was completed by Mr. Michael Puyana, ATC Inspector, on August 5, 2020. Following is a summary of the survey field activities, analytical data and conclusions.

4.1 Overview of PCB-Containing Materials Regulatory Requirements

PCBs are often present in building material sealants such as caulking and glazing compounds manufactured prior to July 1979. In general, the PCBs were used in these materials as plasticizers and/or flame retardants. EPA TSCA regulations stipulate procedures by which PCB-contaminated materials must be handled and disposed. The management of PCB-containing materials is regulated by TSCA and associated 40 CFR §761 Regulations, as administered by the EPA. Depending upon PCB concentrations and source; sealants, paints, and building materials with detectable PCBs are classified under TSCA as either PCB Bulk Product Wastes, PCB Remediation Wastes, or Excluded PCB Products, as noted below:

- PCB Bulk Product Wastes: Materials manufactured with PCBs at concentrations ≥ 50 ppm are classified as a PCB Bulk Product Waste and require special management practices in accordance with TSCA (40 CFR § 761). All PCB Bulk Product Waste must be removed and disposed at a licensed facility which can accept PCB Bulk Product Wastes. PCB Bulk Product Waste is managed in accordance with 40 CFR 761.62 and most often under 761.62(b) – Disposal in solid waste landfills. This includes TSCA landfills and some non-TSCA landfills. Removal and disposal of PCB Bulk Product Waste in accordance with 40 CFR 761.62(b) does not require EPA approval.
- PCB Remediation Wastes: Materials that contain PCBs because they have been contaminated by nearby PCB Bulk Product Wastes are classified as a PCB Remediation Waste. These materials must be disposed at a licensed facility which can accept PCB Remediation Wastes, unless they are removed and disposed together with the nearby PCB Bulk Product Waste, in which case they too may be considered PCB Bulk Product Wastes. EPA approval is required if decontamination/treatment of PCB Remediation Wastes will occur on-site or if PCB Remediation Waste will remain on-site.
- Excluded PCB Products: Materials with PCBs at concentrations < 50 ppm can be classified as an Excluded PCB Product if these levels are not due to contamination from sealants, paints or other materials that are considered a PCB Bulk Product Waste. An Excluded PCB Product, as defined in 40 CFR 761.3, must also meet the following additional conditions:
 - The products or source of the products containing < 50 ppm concentration PCBs were legally manufactured, processed, distributed in commerce, or used before October 1, 1984;
 - The products or source of the products containing < 50 ppm concentrations PCBs were legally manufactured, processed, distributed in commerce, or used, i.e., pursuant to authority granted by EPA regulation, by exemption petition, by settlement agreement, or pursuant to other Agency-approved programs; and
 - The resulting PCB concentration (i.e. < 50 ppm) is not a result of dilution, or leaks and spills of PCBs in concentrations > 50 ppm.

Excluded PCB Products may be managed at any permitted waste management or recycling facility as long as they are made aware that the material being sent to them contains PCBs and their permit allows them to accept this type of material. Many solid waste and recycling facilities cannot accept materials that contain PCBs ≥ 2 ppm. Workers handling Excluded PCB Products must also be made aware that these materials are present.

Sealants, as well as other building materials, with PCBs < 1 ppm and not impacted by a PCB Bulk Product are not regulated under TSCA and may be managed as typical demolition debris.

Often when PCB Bulk Product sealants are present they have impacted adjacent materials (e.g., concrete, brick, CMU, metal window frames, glass, etc.). These impacted materials are classified as PCB Remediation Waste. The higher the PCB concentration in a particular sealant, the more extensive the contamination in adjacent materials is likely to be. In our experience, PCB impacts from sealants to adjoining building materials are most typically present in porous materials like masonry, often within one foot and up to 10 feet away from PCB-containing sealants. Non-porous building materials can have surface concentrations of PCBs above TSCA clean-up levels to similar distances. As with the assumed PCB-containing sealants, it can be assumed that all adjacent materials are impacted by the PCB Bulk Product waste and managed accordingly during future disturbance or removal of those materials. If the adjacent material is not assumed to be impacted, additional sampling of adjacent building materials should be conducted as outlined in EPA guidance to delineate the extent of the PCB contamination in these adjacent building materials. The delineation should be designed: 1) so that affected materials can be properly managed and disposed during future renovation or demolition work, and 2) so that exposure of building occupants to assumed PCBs in the buildings materials via direct contact or indoor air inhalation can be controlled. TSCA does not set a time-frame within which this delineation must be conducted. The EPA has stated that it should be “reasonable”.

4.2 Field Activities

As discussed with MassDOT, all sealants (e.g. caulk, glazing compounds) are considered suspect PCB-containing building materials. The PCB sealant visual survey consisted of a visual inspection of accessible interior and exterior sealants that will be affected (removed, disturbed) by the proposed demolition project. A sealant was identified as unique based upon its use (e.g. glazing compound vs. surround caulk, setting (what materials it was sealing), color, texture, location (interior, exterior), and what material it was between (e.g. metal to brick, metal to concrete). No sampling for PCB analysis of suspect materials, or surrounding building materials (i.e. masonry surrounds, frames, sills, etc.) adjacent to the suspect materials, was conducted. A total of twelve (12) unique homogenous sealants were observed, as described in the Table 5. All are conservatively assumed to contain PCBs at a concentration greater than 50 ppm, and therefore to be considered a PCB Bulk Product Waste under the federal Toxic Substances Control Act (TSCA). The sealants would also be considered a hazardous waste under the Massachusetts hazardous waste regulations, 310 CMR 30.000.

4.3 Laboratory Analytical Results

PCB Visual Estimates are summarized in the following table. In summary, two (2) unique homogenous materials were identified as PCB Bulk Product Waste (> 50 ppm PCBs), as listed below and highlighted in Blue in Table 5.

**Table 5: PCB Sampling Summary
201 Yarmouth Road
Barnstable, Massachusetts**

Sample ID	Sample Material	Material Location(s)	Materials Between	Quant.	ACM	Total PCBs (ppm)	PCB Type
01	White Vanity Caulk	2 nd Floor – Men's & Women's Restroom	Countertop/ Gypsum Board	25 ln ft	No	1.9 mg/Kg	Aroclor-1254
02	Multi-Color Steel Window Glazing Compound	2 nd Floor – Storage	Glass/ Metal	-	No	-	-
03	Multi-Color Expansion Joint Caulk	Exterior Front Entrance	Masonry/ Metal	-	No	-	-
04	Black Expansion Joint Caulk	Basement - Floor	Concrete/ Concrete	300 ln ft	No	2.1 mg/Kg	Aroclor-1254
05	Gray Door Frame Caulk	Exterior North Entrance	Masonry/ Metal	-	No	-	-
06	Gray Door Frame Caulk	Exterior Loading Dock – Overhead Door	Metal/ Metal	-	No	-	-
07	Multi-Color Expansion Joint Caulk	Exterior Former Entrance	Masonry/ Metal	-	No	-	-
08	Gray Window Frame Caulk	2 nd Floor – Aluminum Window	Glass/ Metal	-	No	-	-
09	Gray Door Frame Caulk	Exterior Front Entrance	Metal/ Metal	-	No	-	-
10	Gray Door Frame Caulk	Exterior South Entrance	Masonry/ Metal	-	No	-	-
11	Black Window Frame Caulk	Exterior – Front Entrance	Glass/ Metal	-	No	-	-
12	Interior Gray Window Glazing Compound	1st Floor – Showroom	Glass/ Metal	-	Yes	-	-

Notes:

PCB concentrations shown in parts per million (ppm).

ND = Not detected above the indicated laboratory reporting limit.

ACM = Asbestos-Containing Material.

sq ft = Square Feet.

ln ft = Linear Feet.

Bold = PCBs detected in sample.

Shaded = PCBs detected >50 ppm. Material is PCB Bulk Product.

Shaded = PCBs Detected >1 ppm. Material is PCB Excluded Product.

Quantities are not provided for samples that were non-detect or contained PCBs at a concentration of <1 ppm. Table 6 presents ATC's cost estimates for removal and disposal of the identified PCBs.

Table 6: PCB Excluded Bulk Product Cost Estimate
201 Yarmouth Road
Barnstable, Massachusetts

PCB Material Location	Material	Estimated Quantity	Unit Cost	Total Estimated Cost
2 nd Floor – Men's & Women's Restrooms	White Vanity Caulk	25 ln ft	\$ 10.00/ ln ft	\$250.00
Basement, Floor	Expansion Joint Caulk	300 ln ft	\$ 10.00/ ln ft	\$3,000.00
Total Estimated Cost for Removal/Abatement of PCBs:				\$3,250.00

Quality Control/Quality Assurance Review

ATC reviewed the quality assurance/quality control (QA/QC) information presented in the laboratory analytical report (Appendix B) to confirm that the data were of sufficient quality to support the recommendations and conclusions presented in this report. Not all analytical method QA/QC requirements were met for all samples. Specifically, ATC evaluated the QA/QC compliance issues as summarized below:

- A dilution was performed as part of the standard analytical procedure.

The QA/QC compliance variances are not considered to be significant and do not affect the conclusions and recommendations presented in this report.

5.0 PCB, MERCURY AND OTHER HAZARDOUS MATERIALS (OHM) SURVEY

A hazardous materials survey was conducted on July 29, 2020, by Ms. Elizabeth Jane Fuller. The survey consisted of a visual inspection of accessible interior and exterior areas of the building which is scheduled for demolition.

5.1 Objective

The objective of the hazardous materials survey was to evaluate for the presence of PCB-containing ballasts and electrical equipment, mercury-containing electrical components, refrigerant-containing equipment, equipment that could contain chemicals, and other potentially hazardous materials including chemicals or unlabeled containers that may require disposal as part of the demolition of the building.

5.2 Scope of Work

The survey was an analysis of the building based on visual assessment. During the survey, each accessible area was visually inspected for the presence of hazardous materials that will require proper disposal prior to demolition activities. ATC inspected interior and exterior building locations that could be accessed from the ground for potentially hazardous materials. Potentially hazardous materials observed during the survey were visually inspected and the item, condition, quantity, and location are noted. The results of the survey are noted in the following section.

The scope of work for this project did not include inspection of the Site for the presence of underground storage tanks (USTs) or other underground structures that may contain hazardous materials.

5.3 Results

A list of potentially hazardous materials or items suspected to contain hazardous materials, as observed during the survey, is included in the following table:

**Table 7: OHM Summary
201 Yarmouth Road
Barnstable, Massachusetts**

Area					Fire extinguishers	Air Conditioning Handlers
	4-foot long fluorescent bulbs	Fluorescent/HID light fixture ballasts (labeled as "No PCBs")	Potential mercury switches/thermometers	Rechargeable batteries (all types, primarily in emergency lights, exit signs)		
KAM Appliances						
Basement	22	11	2	3	1	0
1st Floor	64	32	0	2	1	0
2nd Floor	64	32	0	2	1	4
Exterior	0	0	0	4	0	0
Estimated Total Units	150	75	2	11	3	4
Estimated Disposal Cost per Unit	\$2	\$5	\$30	\$10	\$10	\$30
Estimated Total Cost	\$300	\$375	\$60	\$110	\$30	\$120
Estimated Subtotal			\$995			
Notes:	10% Contingency		\$100			
Estimated Total Cost			\$1,200			
Estimated Total Cost rounded to nearest \$100 interval.						

Certain electrical components such as resistors, small dry-type transformers, and computer circuit boards do not contain large quantities of hazardous materials but their recycling is encouraged by government agencies. Larger white goods and electrical components should be recycled per applicable local, state, and federal regulations.

A summary of the categories of items containing or suspected to contain hazardous materials is included in the following subsections.

5.3.1 Fluorescent and High Intensity Discharge (HID) Light Ballasts

Fluorescent and High Intensity Discharge (HID) light fixture ballasts manufactured prior to July 1979 may contain small quantities of PCBs. Light ballasts manufactured after July 1979 do not contain PCBs and those manufactured between 1978 and 1998 were required to have "No PCBs" labels. Light ballasts that do not have "No PCBs" labels, unless known to be manufactured since 1998, should be treated as PCB-

containing and handled/disposed of accordingly. Alternatively, for light ballasts that do not have “No PCBs” labels the manufacturer may sometimes be contacted to ascertain the presence of PCBs.

ATC estimates the total number of ballasts in the building to be approximately 75. Room lighting was observed to be similar throughout the areas inspected by ATC.

ATC inspected several fluorescent light ballasts during the survey and they were confirmed to be labeled “No PCBs”.

5.3.2 Fluorescent and HID Light Bulbs

Fluorescent and HID light bulbs may contain small amounts of heavy metals such as mercury, lead, cadmium, and nickel, and therefore must be handled/disposed of properly. An inventory of fluorescent light bulbs in the building was conducted. Approximately 150 fluorescent light bulbs were observed in the building.

5.3.3 Other Potential PCB-Containing Equipment/Materials

In some cases, “wet-type” electrical transformers contain transformer oil (also known as dielectric fluid) that may contain PCBs and therefore must be handled and disposed of properly. “Dry-type” electrical transformers on the other hand, contain no transformer oil. ATC did not observe any “wet-type” or “dry-type” transformers during the inspection.

Note that electrical cabinets containing electrical switches, breakers, and other electrical equipment were located in several of the inspected areas. Due to safety and logistical reasons, the cabinets were not opened during the hazardous material survey. However, there are typically no hazardous materials or components containing hazardous materials located within these types of common small electrical cabinets.

5.3.4 Mercury-Containing Equipment

Thermostats, thermometers, and pressure gauges sometimes contain mercury. In addition, mercury-containing switches were sometimes used on heating boilers and other building equipment. ATC observed 2 potential mercury-containing thermostats/switches/gauges within the building.

4.3.5 Other Hazardous Materials

Equipment including water heaters, boilers and compressors were observed within the Site building. This machinery will need to be drained prior to removal and the lubricating oil will need to be recycled or properly disposed.

All cathode ray tubes (televisions and computer monitors) are banned from solid waste disposal facilities since they are known to contain lead and will need to be recycled or properly disposed. In consideration that the building was occupied at the time of the inspection, ATC assumes all computers and televisions will be removed prior to demolition.

5.4 Conclusions

Various light ballasts, light bulbs, potential PCB-containing equipment, potential mercury-containing equipment and miscellaneous items were observed by ATC within the surveyed areas. Care should be taken when handling the inventoried materials and the materials should be disposed according to applicable local, state, and federal regulations.

The estimated cost to dispose of identified OHM in the building is approximately **\$1,200.00**, which includes a 10% contingency/mobilization fee. This cost estimate was developed with the assumptions noted throughout this report and the following assumptions:

- Only hazardous materials visually observed during the survey are included;
- No significant hidden hazardous materials are discovered at a later time;
- The estimated cost does not include costs for assessment and/or remediation associated with any possible subsurface soil or groundwater contamination, if present, and/or remediation.

The scope of work for this project did not include inspection for the presence of USTs or other underground structures that may contain hazardous materials.

APPENDIX A

ASBESTOS BULK SAMPLE ANALYSIS RESULTS BY PLM

**EMSL Analytical, Inc.**

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>**EMSL Order:** 132005094**Customer ID:** ATCA69**Customer PO:****Project ID:****Attention:** Elizabeth Fuller

ATC Group Services LLC

10 State Street

Suite 100

Woburn, MA 01801

Project: 201 Yarmouth Street; Barnstable, MA**Phone:** (781) 932-9400**Fax:** (781) 932-6211**Received Date:** 07/31/2020 9:40 AM**Analysis Date:** 08/01/2020 - 08/03/2020**Collected Date:** 07/29/2020

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
01A 132005094-0001	Basement; Water Heater Room - Left Front - White Paper TSI	White Fibrous Homogeneous		60% Non-fibrous (Other)	40% Chrysotile
			HA: Basement		
01B 132005094-0002	Basement; Front of Main Space - White Paper TSI				Positive Stop (Not Analyzed)
			HA: Basement		
01C 132005094-0003	Basement; Vertical Run - Front of Main Space - White Paper TSI				Positive Stop (Not Analyzed)
			HA: Basement		
02A 132005094-0004	Basement; Water Heater Room - Left Front - White TSI Wrap	White Fibrous Homogeneous	40% Cellulose	20% Non-fibrous (Other)	40% Chrysotile
			HA: Basement		
02B 132005094-0005	Basement; Front of Main Space - White TSI Wrap				Positive Stop (Not Analyzed)
			HA: Basement		
02C 132005094-0006	Basement; Vertical Run - Front of Main Space - White TSI Wrap				Positive Stop (Not Analyzed)
			HA: Basement		
03A 132005094-0007	Basement; Water Heater Room - Left Front - Fitting TSI - Wrap - White	White Fibrous Homogeneous	70% Cellulose	20% Non-fibrous (Other)	10% Chrysotile
	Sample has inseparable attached TSI Material.				
			HA: Basement		
03B 132005094-0008	Basement; Main Space - Front - Fitting TSI - Wrap - White				Positive Stop (Not Analyzed)
			HA: Basement		
03C 132005094-0009	Basement; Main Space - Vertical Run - Fitting TSI - Wrap - White				Positive Stop (Not Analyzed)
			HA: Basement		
04A 132005094-0010	Basement; Water Heater Room - Left Front - Fitting TSI - White	White Fibrous Homogeneous		50% Non-fibrous (Other)	50% Chrysotile
			HA: Basement		

Initial report from: 08/03/2020 10:22:31



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5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>

EMSL Order: 132005094

Customer ID: ATCA69

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
04B 132005094-0011	Basement; Main Space - Front - Fitting TSI - White		HA: Basement		Positive Stop (Not Analyzed)
04C 132005094-0012	Basement; Main Space - Vertical Run - Fitting TSI - White		HA: Basement		Positive Stop (Not Analyzed)
05A 132005094-0013	Basement; Main Space - 10 Pane Old Window - Window Glaze - Gray	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
			HA: Basement		
05B 132005094-0014	Basement; Main Space - 10 Pane Old Window - Window Glaze - Gray		HA: Basement		Positive Stop (Not Analyzed)
06A 132005094-0015	1st Floor; Elevator Storage Area - Sheetrock - White	Tan/White Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
			HA: 1st Floor		
06B 132005094-0016	1st Floor; Bathroom - Sheetrock - White	Tan/White Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
			HA: 1st Floor		
06C 132005094-0017	2nd Floor; Office Area - Right Side - Sheetrock - White	Tan/White Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
06D 132005094-0018	2nd Floor; Office Area - Right Side - Sheetrock - White	Tan/White Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
06E 132005094-0019	1st Floor; Elevator Storage Area - Sheetrock - White	Tan/White Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
			HA: 1st Floor		
07A 132005094-0020	1st Floor; Elevator Storage Area - Joint Compound		HA: 1st Floor		Insufficient Material
07B 132005094-0021	1st Floor; Bathroom - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 1st Floor		
07C 132005094-0022	2nd Floor; Office Area - Right Side - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
07D 132005094-0023	2nd Floor; Office Area - Right Side - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
07E 132005094-0024	1st Floor; Elevator Storage Area - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 1st Floor		

Initial report from: 08/03/2020 10:22:31

**EMSL Analytical, Inc.**

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>**EMSL Order:** 132005094**Customer ID:** ATCA69**Customer PO:****Project ID:**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos % Type
			% Fibrous	% Non-Fibrous	
08A 132005094-0025	2nd Floor; Rear Storage Area - 12 Pane Old Windows - Window Glaze - Tan	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
08B 132005094-0026	2nd Floor; Rear Storage Area - 12 Pane Old Windows - Window Glaze - Tan	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
09A 132005094-0027	2nd Floor; Rear Storage Area - 12 Pane Old Windows - Interior Window Caulk - White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
09B 132005094-0028	2nd Floor; Rear Storage Area - 12 Pane Old Windows - Interior Window Caulk - White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 2nd Floor		
10A 132005094-0029	Exterior; Ramp - Side Walk - Rear - Expansion Joint Caulk - Gray	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: Exterior		
10B 132005094-0030	Exterior; Rear Concrete Slab above Steps - Expansion Joint Caulk - Gray	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: Exterior		

Analyst(s)

Elizabeth Stutts (2)

Kevin Pine (18)

Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 08/03/2020 10:22:31



EMSL ANALYTICAL, INC.
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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (lab use only):

132005094

Company Name : <u>ATC Associates</u>		EMSL Customer ID:	
Street: <u>10 State Street</u>		City: <u>Woburn</u>	State or Province: <u>MA</u>
Zip/Postal Code:	Country:	Telephone #: <u>774 296 3941</u>	Fax #:
Report To (Name): <u>elizabeth.fuller@atcgs.com</u>		Please Provide Results via: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email	
email Address:		Purchase Order Number:	
Client Project ID: <u>201 Yarmouth Street Barnstable MA</u>		EMSL Project ID (internal use only):	
State or Province Collected: <u>MA</u>		CT only <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt	
EMSL-Bill to: <input type="checkbox"/> Same <input type="checkbox"/> Different - If bill to is different note instructions in comment. Third party billing requires written authorization from third party			
Turnaround Time (TAT) Options Please Check			
<input type="checkbox"/> 3 Hour	<input type="checkbox"/> 6 Hour	<input checked="" type="checkbox"/> 24 Hour	<input type="checkbox"/> 32 Hour* <input type="checkbox"/> 48 Hour <input type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week
* 32 Hour TAT available for select tests only; samples must be submitted by 11:30am. Please call ahead for large projects and/or turnaround times 6 hours or less.			
PLM - Bulk (reporting limit)		TEM - Bulk	
<input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%)		<input type="checkbox"/> TEM EPA NOB - EPA 600/R-93/116 Section 2.5.5.1	
<input type="checkbox"/> PLM EPA NOB (<1%)		<input type="checkbox"/> NY ELAP Method 198.4 non-friable - NY	
Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%)		<input type="checkbox"/> Chatfield Protocol (semi-quantitative)	
Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%)		<input type="checkbox"/> TEM % by Mass - EPA 600/R-93/116 Section 2.5.5.2	
<input type="checkbox"/> NIOSH 9002 (<1%)		<input type="checkbox"/> TEM Qualitative via Filtration Prep Technique	
<input type="checkbox"/> NY ELAP Method 198.1- friable - NY		<input type="checkbox"/> TEM Qualitative via Drop Mount Prep Technique	
<input type="checkbox"/> NY ELAP Method 198.6 NOB- non-friable - NY		Other tests (please specify)	
<input type="checkbox"/> NY ELAP Method 198.8- Vermiculite Surfacing Material		<div style="border: 1px solid black; height: 40px; width: 100%;"></div>	
<input type="checkbox"/> OSHA ID-191 Modified			
<input type="checkbox"/> EMSL Standard Addition Method			
<input checked="" type="checkbox"/> Positive Stop - Clearly Identify Homogenous Areas (HA)		Date Sampled: <u>07-29-2020</u>	
Sampler's Name: <u>E. Jane Fuller</u>		Sampler's Signature: <u>E. Jane Fuller</u>	
Sample #	HA #	Sample Location	Material Description
<u>01A</u>	<u>Basement</u>	<u>Hot Water Heater Room - Left Front</u>	<u>White Paper TSI</u>
<u>01B</u>	<u>Basement</u>	<u>Front of Main Space</u>	└
<u>01C</u>	<u>Basement</u>	<u>Vertical Run - Front of main space</u>	
<u>02A</u>	<u>Basement</u>	<u>Hot Water Heater Room - Left Front</u>	<u>White TSI Wrap</u>
<u>02B</u>	<u>Basement</u>	<u>Front of Main Space</u>	└
<u>02C</u>	<u>Basement</u>	<u>Vertical Run - Front of main space</u>	
Client Sample # (s): <u>01A-10B</u>		Total # of Samples: <u>30</u>	
Relinquished by (Client): <u>E. Jane Fuller</u>		Date: <u>07-30-2020</u>	Time: <u>1300</u>
Received by (Lab):		Date:	Time:
Comments/Special Instructions:			

Controlled Document - COC-01 Asbestos Bulk - R4 - 09/10/2019

EMSL Analytical, Inc.'s (DBA: LA Testing) Laboratory Terms and Conditions are incorporated into this chain of custody by reference in their entirety. Submission of samples to EMSL Analytical Inc. constitutes acceptance and acknowledgment of all terms and conditions.



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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (lab use only):

132005094

Additional **pages** of the Chain of Custody are only necessary if
needed for additional sample information

Sample #	HA #	Sample Location	Material Description
03A	Basement	Hot Water Heater Room - Left Front	Fitting TSI - Wrap - White
03B	Basement	Main Space - Front	
03C	Basement	Main Space - Vertical Run	
04A	Basement	Hot Water Heater Room - Front Left	Fitting TSI - White
04B	Basement	Main Space - Front	
04C	Basement	Main Space - Vertical Run	
05A	Basement	Main Space - 10 pane old window	Window Glaze - Gray
05B	Basement	Main Space - 10 pane old window	
06A	1 st FL	Elevator Storage Area	
06B	1 st FL	Bathroom	
06C	2 nd FL	Office Area - Rt Side	
06D	2 nd FL	Office Area - Rt Side	
06E	1 st FL	Elevator Storage Area	
07A	1 st FL	Elevator Storage Area	Joint Compound
07B	1 st FL	Bathroom	
07C	2 nd FL	Office Area - Rt Side	
07D	2 nd FL	Elevator Office Area - Right Side	
07E	1 st FL	Elevator Storage Area	
08A	2 nd FL	Rear Storage Area - 12 pane - Old windows	Window Glaze - Tan
08B	2 nd FL	Rear Storage Area - 12 pane - Old windows	Window Glaze - Tan
09A	2 nd FL	Rear Storage area - 12 pane - Old windows	Window Caulk - White - Interior
*Comments/Special Instructions:			

REC'D JUL 31 2020
 EMSL-BOSTON

Page 2 of 3 pages

Controlled Document - COC-01 Asbestos Bulk - R4 - 09/10/2019

EMSL Analytical, Inc.'s (DBA: LA Testing) Laboratory Terms and Conditions are incorporated into this chain of custody by reference in their entirety. Submission of samples to EMSL Analytical Inc. constitutes acceptance and acknowledgment of all terms and conditions.



EMSL Order Number (lab use only):

1 3 2 0 0 5 0 9 4

[illegible]

REC'D
EMSL-BOSTON JUL 31 2020

Controlled Document – COC-01 Asbestos Bulk – R4 – 09/10/2019

A00885 - 36

**EMSL Analytical, Inc.**

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>**EMSL Order:** 132005289**Customer ID:** ATCA69**Customer PO:****Project ID:**

Attention: Bryan Thompson
 ATC Group Services LLC
 10 State Street
 Suite 100
 Woburn, MA 01801

Project: 201 Yarmouth Rd, Barnstable, MA**Phone:** (781) 404-1375**Fax:** (781) 932-6211**Received Date:** 08/07/2020 9:30 AM**Analysis Date:** 08/11/2020**Collected Date:** 08/05/2020

**Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized
 Light Microscopy**

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
1A 132005289-0001	Floor 2 Mens Restroom - Sink Vanity Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
1B 132005289-0002	Floor 2 Mens Restroom - Sink Vanity Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2A 132005289-0003	Floor 2 Storage - Steel Window Glazing	Gray/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2B 132005289-0004	Floor 2 Storage - Steel Window Glazing	Gray/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3A 132005289-0005	Exterior Front Entrance - Caulk in Masonry/Steel Joint	Brown/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3B 132005289-0006	Exterior Front Entrance - Caulk in Masonry/Steel Joint	Gray/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
4A 132005289-0007	Basement Floor - Expansion Joint Count	Black Non-Fibrous Homogeneous	2% Synthetic	98% Non-fibrous (Other)	None Detected
4B 132005289-0008	Basement Floor - Expansion Joint Count	Black Fibrous Homogeneous	2% Synthetic	98% Non-fibrous (Other)	None Detected
5A 132005289-0009	Yarmouth Rd N. Entrance - Door Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
5B 132005289-0010	Yarmouth Rd N. Entrance - Door Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
6A 132005289-0011	Exterior Loading Dock Door (Roll-Up) - Steel Frame Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
6B 132005289-0012	Exterior Loading Dock Door (Roll-Up) - Steel Frame Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
7A 132005289-0013	Track Side Exterior Former Entrance - Masonry/Steel Joint Caulk	Brown/Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
7B 132005289-0014	Track Side Exterior Former Entrance - Masonry/Steel Joint Caulk	Brown/Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8A 132005289-0015	Floor 2 Storage - Aluminum Window Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 08/11/2020 09:19:45

**EMSL Analytical, Inc.**

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>**EMSL Order:** 132005289**Customer ID:** ATCA69**Customer PO:****Project ID:**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
8B 132005289-0016	Floor 2 Storage - Aluminum Window Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
9A 132005289-0017	Exterior Front Entrance - Metal Door Caulk (Newer) Aluminum Frame	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
9B 132005289-0018	Exterior Front Entrance - Metal Door Caulk (Newer) Aluminum Frame	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10A 132005289-0019	Yarmouth Rd S. Entrance - Door Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10B 132005289-0020	Yarmouth Rd S. Entrance - Door Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
11A 132005289-0021	Exterior at Front Entrance - Aluminum Window Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
11B 132005289-0022	Exterior at Front Entrance - Aluminum Window Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
12A 132005289-0023	Floor 1 Showroom N. End - Exterior Aluminum Window Glaze	Gray Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
12B 132005289-0024	Floor 1 Showroom N. End - Exterior Aluminum Window Glaze				Positive Stop (Not Analyzed)
13A 132005289-0025	Floor 2 Showroom - Hardwood Flooring Paper Underlay	Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (Other)	None Detected
13B 132005289-0026	Floor 2 Showroom - Hardwood Flooring Paper Underlay	Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (Other)	None Detected
14A 132005289-0027	Floor 1 Showroom S. Section - Ceramic Floor Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
14B 132005289-0028	Floor 1 Showroom S. Section - Ceramic Floor Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15A 132005289-0029	Floor 1 Showroom S. Section - 2x4 Ceiling Tile Non-Directional Fissured	Gray Fibrous Homogeneous	55% Cellulose 10% Min. Wool	35% Non-fibrous (Other)	None Detected
15B 132005289-0030	Floor 1 Showroom S. Section - 2x4 Ceiling Tile Non-Directional Fissured	Gray Fibrous Homogeneous	55% Cellulose 10% Min. Wool	35% Non-fibrous (Other)	None Detected
16A 132005289-0031	Floor 1 Showroom Center Section - 2x4 Ceiling Tile Directional Fissured	Gray/White Fibrous Homogeneous	55% Cellulose 10% Min. Wool	35% Non-fibrous (Other)	None Detected

Initial report from: 08/11/2020 09:19:45

**EMSL Analytical, Inc.**

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>**EMSL Order:** 132005289**Customer ID:** ATCA69**Customer PO:****Project ID:**

**Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized
Light Microscopy**

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
16B <small>132005289-0032</small>	Floor 1 Showroom Center Section - 2x4 Ceiling Tile Directional Fissured	Gray/White Fibrous Homogeneous	55% Cellulose 10% Min. Wool	35% Non-fibrous (Other)	None Detected
17A <small>132005289-0033</small>	Floor 1 Showroom N. End - Carpet Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
17B <small>132005289-0034</small>	Floor 1 Showroom N. End - Carpet Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18A <small>132005289-0035</small>	Floor 1 Showroom S. Section - Sprinkler Pipe Thread Sealant	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18B <small>132005289-0036</small>	Floor 1 Showroom N. Section - Sprinkler Pipe Thread Sealant	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18C <small>132005289-0037</small>	Floor 1 Showroom N. Section - Sprinkler Pipe Thread Sealant	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
19A <small>132005289-0038</small>	Floor 2 Mens Restroom - 4" Covebase Molding	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
19B <small>132005289-0039</small>	Floor 2 Mens Restroom - 4" Covebase Molding	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
20A <small>132005289-0040</small>	Floor 2 Mens Restroom - Covebase Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
20B <small>132005289-0041</small>	Floor 2 Mens Restroom - Covebase Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
21A <small>132005289-0042</small>	Floor 2 Offices - Residual Adhesive on Steel Window Lintel	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
21B <small>132005289-0043</small>	Floor 2 Offices - Residual Adhesive on Steel Window Lintel	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
22A <small>132005289-0044</small>	Floor 2 Mens Restroom - Vinyl Flooring on Plywood	Brown/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
22B <small>132005289-0045</small>	Floor 2 Mens Restroom - Vinyl Flooring on Plywood	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

**EMSL Analytical, Inc.**

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Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com**EMSL Order:** 132005289**Customer ID:** ATCA69**Customer PO:****Project ID:**

Analyst(s)

*Ramon Buenaventura (44)*Steve Grise, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 08/11/2020 09:19:45

EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS/TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (Lab Use Only):

132005289

 EMSL ANALYTICAL, INC.
 200 ROUTE 130 NORTH
 CINNAMINSON, NJ 08077
 PHONE: (800) 220-3675
 FAX: (856) 786-5974

Company: <u>ATC Group Services</u>		EMSL-Bill to: <input type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street:		Third Party Billing requires written authorization from third party	
City: <u>Woburn</u>	State/Province:	Zip/Postal Code:	Country:
Report To (Name): <u>B Thompson, in Puyana</u>		Telephone #:	
Email Address:		Fax #:	Purchase Order:
Project Name/Number: <u>201 YARMOUTH RD</u>		Please Provide Results: <input type="checkbox"/> Fax <input type="checkbox"/> Email	
U.S. State Samples Taken: <u>MAZUSTABLES</u>		Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt	
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour <input type="checkbox"/> 6 Hour <input type="checkbox"/> 24 Hour <input checked="" type="checkbox"/> 48 Hour <input type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week			
*For TEM Air 3 hr through 6 hr, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
PLM - Bulk (reporting limit)		TEM - Bulk	
<input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%)		<input type="checkbox"/> TEM EPA NOB - EPA 600/R-93/116 Section 2.5.5.1	
<input type="checkbox"/> PLM EPA NOB (<1%)		<input type="checkbox"/> NY ELAP Method 198.4 (TEM)	
Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%)		<input type="checkbox"/> Chatfield Protocol (semi-quantitative)	
Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%)		<input type="checkbox"/> TEM % by Mass - EPA 600/R-93/116 Section 2.5.5.2	
<input type="checkbox"/> NIOSH 9002 (<1%)		<input type="checkbox"/> TEM Qualitative via Filtration Prep Technique	
<input type="checkbox"/> NY ELAP Method 198.1 (friable in NY)		<input type="checkbox"/> TEM Qualitative via Drop Mount Prep Technique	
<input type="checkbox"/> NY ELAP Method 198.6 NOB (non-friable-NY)		Other	
<input type="checkbox"/> OSHA ID-191 Modified		<input type="checkbox"/>	
<input type="checkbox"/> Standard Addition Method			
<input checked="" type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group		Date Sampled: <u>8-5-20</u>	
Samplers Name: <u>Mike Puyana</u>		Samplers Signature: <u>[Signature]</u>	
Sample #	HA #	Sample Location	Material Description
1A		FLOOR 2 MEN RESTROOM	SINK VANITY CAULK
1B			
2A		FLOOR 2 STORAGE	STEEL WINDOW GLAZING
2B			
3A		EXTERIOR FRONT ENTRANCE	CAULK IN MASSURY/STEEL JOINT
3B			
4A		BASEMENT FLOOR	EXPANSION JOINT CAULK
4B			
5A		YARMOUTH RD ENTRANCE	DOOR CAULK
5B			
Client Sample # (s):		Total # of Samples:	
Relinquished (Client): <u>[Signature]</u>		Date: <u>8-6-20</u> Time:	
Received (Lab):		Date: Time:	
Comments/Special Instructions: <u>RESULTS TO B Thompson</u>			

 REC'D KHS 0830
 EMSL-BOSTON AUG 07 2020
TRP BY



EMSL ANALYTICAL, INC.
LABORATORY-PRODUCTS-TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (Lab Use Only):

132005289

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	HA #	Sample Location	Material Description
6A		EXTERIOR LOADING DOCK DOOR	STEEL FRAME CAULK
6B		↓ (ROLL UP)	
7A		TRACKSIDE EXTERIOR FORMER ENTRANCE	MASONRY/STEEL JOINT CAULK
7B		↓	↓
8A		FLOOR 2 STORAGE	ALUMINUM WINDOW CAULK
8B		↓	↓
9A		EXTERIOR FRONT ENTRANCE	METAL DOOR CAULK (NEWER)
9B		↓	ALUMINUM FRAME ↓
10A		YARMOUTH RD - S. ENTRANCE	DOOR CAULK
10B		↓	↓
11A		EXTERIOR - AT FRONT ENTRANCE	ALUMINUM WINDOW CAULK
11B		↓	↓
12A		FLOOR 1 SHOW ROOM - N. END	INTERIOR ALUMINUM WINDOW GLASS
12B		↓	↓
13A		FLOOR 2 SHOW ROOM	HARDWOOD FLOORING PAPER UNDERLAY
13B		↓	↓
14A		FLOOR 1 SHOW ROOM - S. SECTION	CERAMIC FLOOR TILE GROUT
14B		↓	↓
15A		FLOOR 1 SHOW ROOM - S. SECTION	2X4 CEILING TILE - NON DIRECTIONAL
15B		↓	FISSED
16A		FLOOR 1 SHOW ROOM - CENTER SECTION	2X4 CEILING TILE - DIRECTIONAL
16B		↓	FISSED
17A		FLOOR 1 SHOW ROOM - N. END	CARPET MASTIC
17B		↓	↓
*Comments/Special Instructions:			



EMSL Order Number (*Lab Use Only*):

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

[illegible]

REC'D RHS 1830
EMSL-BOSTON AUG 07 2020

APPENDIX B

PCB ANALYTICAL RESULTS



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

August 12, 2020

Bryan Thompson
ATC Group Services LLC - Woburn
10 State Street, Suite 100
Woburn, MA 01801

Project Location: Bannstable, MA
Client Job Number:
Project Number: [none]
Laboratory Work Order Number: 20H0323

Enclosed are results of analyses for samples received by the laboratory on August 6, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads 'Michelle Koch'. The signature is written in a cursive, flowing style.

Michelle M. Koch
Project Manager

Table of Contents

Sample Summary	3
Case Narrative	4
Sample Results	5
20H0323-01	5
20H0323-02	6
20H0323-03	7
20H0323-04	8
20H0323-05	9
20H0323-06	10
20H0323-07	11
20H0323-08	12
20H0323-09	13
20H0323-10	14
20H0323-11	15
20H0323-12	16
Sample Preparation Information	17
QC Data	18
Polychlorinated Biphenyls with 3540 Soxhlet Extraction	18
B263854	18
Dual Column RPD Report	19
Flag/Qualifier Summary	21
Certifications	22
Chain of Custody/Sample Receipt	23



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

ATC Group Services LLC - Woburn
10 State Street, Suite 100
Woburn, MA 01801
ATTN: Bryan Thompson

REPORT DATE: 8/12/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 20H0323

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Bannstable, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
1	20H0323-01	Caulk		SW-846 8082A	
2	20H0323-02	Caulk		SW-846 8082A	
3	20H0323-03	Caulk		SW-846 8082A	
4	20H0323-04	Caulk		SW-846 8082A	
5	20H0323-05	Caulk		SW-846 8082A	
6	20H0323-06	Caulk		SW-846 8082A	
7	20H0323-07	Caulk		SW-846 8082A	
8	20H0323-08	Caulk		SW-846 8082A	
9	20H0323-09	Caulk		SW-846 8082A	
10	20H0323-10	Caulk		SW-846 8082A	
11	20H0323-11	Caulk		SW-846 8082A	
12	20H0323-12	Caulk		SW-846 8082A	



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CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

SW-846 8082A

Qualifications:

O-32

A dilution was performed as part of the standard analytical procedure.

Analyte & Samples(s) Qualified:

20H0323-02[2], 20H0323-03[3], 20H0323-05[5], 20H0323-06[6], 20H0323-07[7], 20H0323-08[8], 20H0323-09[9], 20H0323-10[10], 20H0323-11[11], 20H0323-12[12]

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.

I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

A handwritten signature in black ink, appearing to read "Lisa Worthington", is written over a light gray rectangular background.

Lisa A. Worthington
Technical Representative



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 1

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-01

Sample Matrix: Caulk

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1221 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1232 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1242 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1248 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1254 [1]	1.9	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1260 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1262 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Aroclor-1268 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 4:57	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	85.7	30-150						8/12/20 4:57	
Decachlorobiphenyl [2]	92.5	30-150						8/12/20 4:57	
Tetrachloro-m-xylene [1]	91.3	30-150						8/12/20 4:57	
Tetrachloro-m-xylene [2]	95.1	30-150						8/12/20 4:57	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 2

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-02

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1221 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1232 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1242 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1248 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1254 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1260 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1262 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Aroclor-1268 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:15	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	83.3	30-150						8/12/20 5:15	
Decachlorobiphenyl [2]	90.0	30-150						8/12/20 5:15	
Tetrachloro-m-xylene [1]	94.3	30-150						8/12/20 5:15	
Tetrachloro-m-xylene [2]	99.6	30-150						8/12/20 5:15	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 3

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-03

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1221 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1232 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1242 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1248 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1254 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1260 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1262 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Aroclor-1268 [1]	ND	0.72	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:32	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	85.5	30-150						8/12/20 5:32	
Decachlorobiphenyl [2]	92.8	30-150						8/12/20 5:32	
Tetrachloro-m-xylene [1]	89.4	30-150						8/12/20 5:32	
Tetrachloro-m-xylene [2]	94.7	30-150						8/12/20 5:32	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 4

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-04

Sample Matrix: Caulk

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1221 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1232 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1242 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1248 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1254 [2]	2.1	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1260 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1262 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Aroclor-1268 [1]	ND	0.71	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 5:49	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	78.1	30-150						8/12/20 5:49	
Decachlorobiphenyl [2]	84.6	30-150						8/12/20 5:49	
Tetrachloro-m-xylene [1]	99.0	30-150						8/12/20 5:49	
Tetrachloro-m-xylene [2]	105	30-150						8/12/20 5:49	



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Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 5

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-05

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1221 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1232 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1242 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1248 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1254 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1260 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1262 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Aroclor-1268 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:07	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	82.6	30-150						8/12/20 6:07	
Decachlorobiphenyl [2]	89.1	30-150						8/12/20 6:07	
Tetrachloro-m-xylene [1]	96.7	30-150						8/12/20 6:07	
Tetrachloro-m-xylene [2]	102	30-150						8/12/20 6:07	



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Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 6

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-06

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1221 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1232 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1242 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1248 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1254 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1260 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1262 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Aroclor-1268 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:24	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	83.3	30-150						8/12/20 6:24	
Decachlorobiphenyl [2]	90.6	30-150						8/12/20 6:24	
Tetrachloro-m-xylene [1]	94.4	30-150						8/12/20 6:24	
Tetrachloro-m-xylene [2]	100	30-150						8/12/20 6:24	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 7

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-07

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1221 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1232 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1242 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1248 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1254 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1260 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1262 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Aroclor-1268 [1]	ND	0.78	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:41	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	83.0	30-150						8/12/20 6:41	
Decachlorobiphenyl [2]	89.4	30-150						8/12/20 6:41	
Tetrachloro-m-xylene [1]	98.3	30-150						8/12/20 6:41	
Tetrachloro-m-xylene [2]	104	30-150						8/12/20 6:41	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 8

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-08

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1221 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1232 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1242 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1248 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1254 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1260 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1262 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Aroclor-1268 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 6:59	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	77.6	30-150						8/12/20 6:59	
Decachlorobiphenyl [2]	83.3	30-150						8/12/20 6:59	
Tetrachloro-m-xylene [1]	77.5	30-150						8/12/20 6:59	
Tetrachloro-m-xylene [2]	78.4	30-150						8/12/20 6:59	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 9

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-09

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1221 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1232 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1242 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1248 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1254 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1260 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1262 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Aroclor-1268 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:16	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	85.0	30-150						8/12/20 7:16	
Decachlorobiphenyl [2]	91.8	30-150						8/12/20 7:16	
Tetrachloro-m-xylene [1]	98.7	30-150						8/12/20 7:16	
Tetrachloro-m-xylene [2]	100	30-150						8/12/20 7:16	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 10

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-10

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1221 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1232 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1242 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1248 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1254 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1260 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1262 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Aroclor-1268 [1]	ND	0.80	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:33	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	81.3	30-150						8/12/20 7:33	
Decachlorobiphenyl [2]	87.5	30-150						8/12/20 7:33	
Tetrachloro-m-xylene [1]	87.6	30-150						8/12/20 7:33	
Tetrachloro-m-xylene [2]	92.4	30-150						8/12/20 7:33	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 11

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-11

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1221 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1232 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1242 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1248 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1254 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1260 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1262 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Aroclor-1268 [1]	ND	0.77	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 7:51	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	80.8	30-150						8/12/20 7:51	
Decachlorobiphenyl [2]	86.7	30-150						8/12/20 7:51	
Tetrachloro-m-xylene [1]	93.3	30-150						8/12/20 7:51	
Tetrachloro-m-xylene [2]	98.6	30-150						8/12/20 7:51	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Bannstable, MA

Sample Description:

Work Order: 20H0323

Date Received: 8/6/2020

Field Sample #: 12

Sampled: 8/6/2020 00:00

Sample ID: 20H0323-12

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1221 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1232 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1242 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1248 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1254 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1260 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1262 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Aroclor-1268 [1]	ND	0.76	mg/Kg	4		SW-846 8082A	8/9/20	8/12/20 8:08	WAL
Surrogates	% Recovery	Recovery Limits	Flag/Qual						
Decachlorobiphenyl [1]	79.0	30-150						8/12/20 8:08	
Decachlorobiphenyl [2]	84.0	30-150						8/12/20 8:08	
Tetrachloro-m-xylene [1]	83.4	30-150						8/12/20 8:08	
Tetrachloro-m-xylene [2]	87.7	30-150						8/12/20 8:08	



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332**Sample Extraction Data****Prep Method: SW-846 3540C Analytical Method: SW-846 8082A**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20H0323-01 [1]	B263854	0.532	10.0	08/09/20
20H0323-02 [2]	B263854	0.502	10.0	08/09/20
20H0323-03 [3]	B263854	0.553	10.0	08/09/20
20H0323-04 [4]	B263854	0.561	10.0	08/09/20
20H0323-05 [5]	B263854	0.531	10.0	08/09/20
20H0323-06 [6]	B263854	0.525	10.0	08/09/20
20H0323-07 [7]	B263854	0.514	10.0	08/09/20
20H0323-08 [8]	B263854	0.535	10.0	08/09/20
20H0323-09 [9]	B263854	0.531	10.0	08/09/20
20H0323-10 [10]	B263854	0.501	10.0	08/09/20
20H0323-11 [11]	B263854	0.519	10.0	08/09/20
20H0323-12 [12]	B263854	0.529	10.0	08/09/20



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QUALITY CONTROL

Polychlorinated Biphenyls with 3540 Soxhlet Extraction - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B263854 - SW-846 3540C

Blank (B263854-BLK1)

Prepared: 08/09/20 Analyzed: 08/12/20

Aroclor-1016	ND	0.20	mg/Kg							
Aroclor-1016 [2C]	ND	0.20	mg/Kg							
Aroclor-1221	ND	0.20	mg/Kg							
Aroclor-1221 [2C]	ND	0.20	mg/Kg							
Aroclor-1232	ND	0.20	mg/Kg							
Aroclor-1232 [2C]	ND	0.20	mg/Kg							
Aroclor-1242	ND	0.20	mg/Kg							
Aroclor-1242 [2C]	ND	0.20	mg/Kg							
Aroclor-1248	ND	0.20	mg/Kg							
Aroclor-1248 [2C]	ND	0.20	mg/Kg							
Aroclor-1254	ND	0.20	mg/Kg							
Aroclor-1254 [2C]	ND	0.20	mg/Kg							
Aroclor-1260	ND	0.20	mg/Kg							
Aroclor-1260 [2C]	ND	0.20	mg/Kg							
Aroclor-1262	ND	0.20	mg/Kg							
Aroclor-1262 [2C]	ND	0.20	mg/Kg							
Aroclor-1268	ND	0.20	mg/Kg							
Aroclor-1268 [2C]	ND	0.20	mg/Kg							
Surrogate: Decachlorobiphenyl	3.54		mg/Kg	4.00		88.4	30-150			
Surrogate: Decachlorobiphenyl [2C]	3.77		mg/Kg	4.00		94.3	30-150			
Surrogate: Tetrachloro-m-xylene	3.59		mg/Kg	4.00		89.6	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	3.75		mg/Kg	4.00		93.7	30-150			

LCS (B263854-BS1)

Prepared: 08/09/20 Analyzed: 08/12/20

Aroclor-1016	3.7	0.20	mg/Kg	4.00		92.0	40-140			
Aroclor-1016 [2C]	3.9	0.20	mg/Kg	4.00		96.8	40-140			
Aroclor-1260	3.4	0.20	mg/Kg	4.00		85.6	40-140			
Aroclor-1260 [2C]	3.5	0.20	mg/Kg	4.00		86.9	40-140			
Surrogate: Decachlorobiphenyl	3.52		mg/Kg	4.00		88.0	30-150			
Surrogate: Decachlorobiphenyl [2C]	3.74		mg/Kg	4.00		93.6	30-150			
Surrogate: Tetrachloro-m-xylene	3.70		mg/Kg	4.00		92.5	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	3.85		mg/Kg	4.00		96.3	30-150			

LCS Dup (B263854-BSD1)

Prepared: 08/09/20 Analyzed: 08/12/20

Aroclor-1016	3.7	0.20	mg/Kg	4.00		93.3	40-140	1.46	30	
Aroclor-1016 [2C]	4.0	0.20	mg/Kg	4.00		100	40-140	3.69	30	
Aroclor-1260	3.5	0.20	mg/Kg	4.00		87.6	40-140	2.26	30	
Aroclor-1260 [2C]	3.6	0.20	mg/Kg	4.00		89.0	40-140	2.32	30	
Surrogate: Decachlorobiphenyl	3.59		mg/Kg	4.00		89.6	30-150			
Surrogate: Decachlorobiphenyl [2C]	3.82		mg/Kg	4.00		95.5	30-150			
Surrogate: Tetrachloro-m-xylene	3.84		mg/Kg	4.00		96.0	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	3.99		mg/Kg	4.00		99.8	30-150			



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES***SW-846 8082A*

1

Lab Sample ID: 20H0323-01 Date(s) Analyzed: 08/12/2020 08/12/2020

Instrument ID (1): Instrument ID (2):

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	1.9	
	2	0.000	0.000	0.000	1.6	22.2



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**IDENTIFICATION SUMMARY
FOR SINGLE COMPONENT ANALYTES***SW-846 8082A***4**Lab Sample ID: 20H0323-04 Date(s) Analyzed: 08/12/2020 08/12/2020

Instrument ID (1): Instrument ID (2):

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1254	1	0.000	0.000	0.000	1.5	
	2	0.000	0.000	0.000	2.1	33.3



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
O-32	A dilution was performed as part of the standard analytical procedure.



39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CERTIFICATIONS**Certified Analyses included in this Report****Analyte****Certifications****No certified Analyses included in this Report**

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2021
CT	Connecticut Department of Public Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2021
FL	Florida Department of Health	E871027 NELAP	06/30/2021
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2021
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2021
NC-DW	North Carolina Department of Health	25703	07/31/2021
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2021
MI	Dept. of Env, Great Lakes, and Energy	9100	10/1/2020

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20H0323



Phone: 413-525-2332
Fax: 413-525-6405

CHAIN OF CUSTODY RECORD

39 Spruce Street
East Longmeadow, MA 01028

Page ____ of ____

Company Name: Woburn
Address: 201 Yarmouth Rd
Project Location: Barnstable, MA
Project Number:
Project Manager: B Thompson
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By: M Puyana

Requested Turnaround Time
7-Day ☐ 10-Day ☐
Due Date:

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☒

Data Delivery
Format: PDF ☐ EXCEL ☐
Other:
CLP Like Data Pkg Required: ☐
Email To:
Fax To #:

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	Matrix Code	Conc Code
1	#1 SINK CAULK - FLR 2 MINUS REST ROOM				X	SOL	G
2	#2 STEEL WINDOW GLAZING						
3	#3 CAULK IN MASTERY STEEL ENTRY						
4	#4 EXTERIOR FLOOR EXPANSION JOINT CAULK						
5	#5 MASTERY METAL JOINT CAULK YARMOUTH RD OFFICE						

Comments: RESULTS TO B THOMPSON, RUNNES, M. PUYANA

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature) Date/Time: 8-6-20
Received by: (signature) Date/Time: 8-11-2009
Relinquished by: (signature) Date/Time: 8-20-2009
Received by: (signature) Date/Time: 8/20
Relinquished by: (signature) Date/Time: 8/20
Received by: (signature) Date/Time:

Detection Limit Requirements
MA ☐ MA MCP Required
CT ☐ MCP Certification Form Required
Other: ☐ CT RCP Required
MA State DW Required

Special Requirements
MA MCP Required
MCP Certification Form Required
CT RCP Required

Project Entity
Government ☐ Municipality ☐ MW/RA ☐ Other ☐
Federal ☐ 21 J ☐ School ☐
City ☐ Brownfield ☐ MBTA ☐
Chromatogram ☐
AIHA-LAP, LLC ☐

PCB ONLY
☐ Soxhlet
☐ Non Soxhlet



2040323
Phone: 413-525-2332
Fax: 413-525-6405

Email: info@contestlabs.com

Company Name: **ATC Gro Services**

Address: **Woburn**

Phone:

Project Name: **201 Yarmouth Rd,**

Project Location: **BARNSTABLE, MA**

Project Number:

Project Manager: **B THOMPSON**

Con-Test Quote Name/Number:

Invoice Recipient:

Sampled By: **m Puyana**

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	Matrix Code	Conc Code
6	#6 STEEL/STEEL JOINT CAULK				X	SOL	G
7	#7 EXTERIOR LOADING DOCK CASING/STEEL JOINT CAULK						
8	#8 TRACKSIDE FORMER ENTRANCE ALUMINUM WINDOWS CAULK - FLOOR						
9	#9 METAL/STEEL JOINT CAULK						
10	#10 EXTERIOR FRONT ENTRY DOORS CASING/METAL JOINT CAULK						

Comments: **RESULTS TO B THOMPSON, RUVNES, m PUYANA**

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature)	Date/Time: 8-6-20	Detection Limit Requirements	Special Requirements
Received by: (signature)	Date/Time: 8-6-20 9:44	MA	MA MCP Required
Relinquished by: (signature)	Date/Time: 8-6-20 6:20	CT	MCP Certification Form Required
Received by: (signature)	Date/Time:		CT RCP Required
			RCP Certification Form Required
			MA State DW Required
		Other:	PWSID #
Inquired by: (signature)	Date/Time:	Project Entity	
Received by: (signature)	Date/Time:	Government	Municipality
		Federal	21 J
		City	Brownfield
			AWRA
			School
			MBTA
		Other	Chromatogram
			AIHA-LAP, LLC



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CHAIN OF CUSTODY RECORD

39 Spruce Street
East Longmeadow, MA 01028

Page _____ of _____



Phone: 413-525-2332

Fax: 413-525-6405

Email: info@contestlabs.com

Company Name: **ATC GOLF SERVICES**

Address: **Woburn**

Phone:

Project Name: **2017 ARMOUTH RD**

Project Location: **BARSTABLE, MA**

Project Number:

Project Manager: **B Thompson**

Con-Test Quote Name/Number:

Invoice Recipient:

Sampled By: **M PUYANA**

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	Matrix Code	Conc Code
11	#11 METAL/PAVEMENT/GRASS						
12	#12 EXTERIOR GRASS						
	INTERIOR ALUMINUM						
	FLOORING GLASS						
	FRONT ENTRANCE						

Comments:

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Retinquished by: (signature)	Date/Time: 8-6-20	Detection Limit Requirements	Special Requirements
Received by: (signature)	Date/Time: 8-6-20	MA	MA MCP Required
Disinfectant by: (signature)	Date/Time: 8-6-20 6:30	CT	MCP Certification Form Required
Received by: (signature)	Date/Time:	Other:	CT RCP Required
Inquired by: (signature)	Date/Time:		RCP Certification Form Required
Received by: (signature)	Date/Time:		MA State DW Required
		PWSID #	
Project Entity			
Government	Municipality	MWRA	Other
Federal	21 J	School	Chromatogram
City	Brownfield	MBTA	AIHA-LAP, LLC



I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples _____



con-test
ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client A TC Group Services

Received By SA

Date 8/6

Time 1820

How were the samples received?

In Cooler T

No Cooler _____

On Ice T

No Ice _____

Direct from Sampling _____

Ambient _____

Melted Ice _____

Were samples within Temperature? 2-6°C T

By Gun # 1

Actual Temp - 33

By Blank # _____

Actual Temp - _____

Was Custody Seal Intact? NA

Were Samples Tampered with? NA

Was COC Relinquished? T

Does Chain Agree With Samples? T

Are there broken/leaking/loose caps on any samples? F

Is COC in ink/ Legible? T

Were samples received within holding time? T

Did COC include all Client T

Analysis T

Sampler Name T

pertinent Information? Project T

ID's T

Collection Dates/Times T

Are Sample labels filled out and legible? T

Are there Lab to Filters? F

Who was notified? _____

Are there Rushes? T

Who was notified? Ashely

Are there Short Holds? F

Who was notified? _____

Is there enough Volume? T

Is there Headspace where applicable? F

MS/MSD? F

Proper Media/Containers Used? T

Is splitting samples required? F

Were trip blanks received? F

On COC? F

Do all samples have the proper pH?

Acid NA

Base NA

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	
HCL-		500 mL Amb.		500 mL Plastic	
Meoh-		250 mL Amb.		250 mL Plastic	
Bisulfate-		Flashpoint		Col./Bacteria	
DI-		Other Glass		Other Plastic	
Thiosulfate-		SOC Kit		Plastic Bag	
Sulfuric-		Perchlorate		Ziplock	

Frozen:

Unused Media

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	
HCL-		500 mL Amb.		500 mL Plastic	
Meoh-		250 mL Amb.		250 mL Plastic	
Bisulfate-		Col./Bacteria		Flashpoint	
DI-		Other Plastic		Other Glass	
Thiosulfate-		SOC Kit		Plastic Bag	
Sulfuric-		Perchlorate		Ziplock	

Frozen:

Comments:

APPENDIX A
HYANNIS WATER SPECIFICATIONS

SECTION

- 01300 – SUBMITTALS
- 01301 – CONSTRUCTION RECORD SUBMITTALS
- 02070 – SELECTIVE DEMOLITION, CORING AND PATCHING
- 02221 – TRENCHING, BACKFILLING, COMPACTION, RESTORATION
- 02616 – DUCTILE IRON PIPE AND FITTINGS
- 02617 – CONNECTING TO THE SYSTEM AND ABANDONING PIPES
- 02641 – VALVES, HYDRANTS & SERVICE CONNECTIONS
- 02700 – ASBESTOS CEMENT PIPE REMOVAL, DISPOSAL, ABANDONMENT

SECTION 01300

SUBMITTALS

PART 1- GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Product Data, Samples, site photographs and videotaping, Construction Schedules, Change Orders and Payment Requisitions, and records. Detailed submittal requirements are specified in the technical Sections.
- B. Submittals shall be clear and legible and of sufficient size for presentation of data.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

- 1. Shop drawings as specified in individual Sections include, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.
- 2. All shop drawings submitted by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time.
- 3. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

B. Product Data

- 1. Submit product data as specified in individual Sections.

1.03 CONTRACTOR'S RESPONSIBILITIES REGARDING SHOP DRAWINGS

- A. Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - 4. Conformance with related Sections

- B. Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package.
- C. Notify the Hyannis Water System in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
- D. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished, which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Hyannis Water System will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- E. Project work, materials, fabrication, and installation shall be in conformance with approved shop drawings, applicable samples, and product data.
- F. Number of submittals required: tree (3) copies.
- G. Submittals shall contain, as necessary:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number/ Contractor identification.
 - 3. Contractor's stamp.
 - 4. The names of Contractor, Supplier, Manufacturer.
 - 5. Identification of the product, with the section number, page and paragraph(s).
 - 6. Field dimensions, clearly identified as such.
 - 7. Relation to adjacent or critical features of the work or materials.
 - 8. Applicable standards, such as ASTM or Federal Standards numbers.
 - 9. Identification of deviations from Contract Documents.
 - 10. Identification of revisions on resubmittals.
 - 11. An 8-in by 3-in blank space for approval Engineer stamp.
 - 12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

1.04 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

- A. The review of shop drawings, data and samples will be for general conformance with the design concept, Contract Documents and Hyannis Water System specifications. They shall not be construed:

1. as permitting any departure from the Contract requirements;
 2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
 3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.
- B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. Submittals will be returned to the Contractor under one of the following codes.
- Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
- Code 2 - "APPROVED AS NOTED." This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
- Code 3 - "RESUBMIT." This code is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Hyannis Water System within 15 calendar days of the date of the Hyannis Water System's transmittal requiring the resubmittal.
- D. Re-submittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the Hyannis Water System on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Hyannis Water System on previous submissions.
- E. Partial submittals may not be reviewed. Submittals not complete will be returned to the Contractor and will be considered "Not Approved" until resubmitted. The Hyannis Water System may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- F. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Hyannis Water System at least 7 working days prior to release for manufacture.
- G. When the shop drawings have been completed to the satisfaction of the Hyannis Water System, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Hyannis Water System.

1.05 SCHEDULES

- A. Provide all schedules required by the General Conditions.

1.06 CHANGE ORDERS

- A. Submit preliminary Change Order estimate before actual work is performed.
- B. No work under Change Order shall be performed until the Change Order is approved.
- C. Payment of all change orders shall be in accordance with the relevant provisions of MGL Chapter 30, Section 39G for non-building construction and Section 39K for building construction. Payment of change orders shall be made:
 - 1. In accordance with prices as set forth in the contract;
 - 2. Agreed upon lump sum or unit prices;
 - 3. Time and materials.
- D. The Change Order application shall include:
 - 1. Change Order number;
 - 2. Project/Contract number;
 - 3. Date of Change order;
 - 4. Contract Amount (as Bid);
 - 5. Net Change of Contract Price (this change order);
 - 6. Extended Completion date (is applicable).

1.07 APPLICATION FOR PAYMENT

- A. The Request for payment shall be submitted in form of AIA Document G702 format.
- B. The Application and Certificate for Payment shall be signed and notarized.
- C. Submit at least three (3) original copies of Application and Certificate for Payment. One copy will be returned back to the Contractor and two will remain in the Hyannis Water System file.
- D. The Application shall be accompanied with monthly payroll report forms, in accordance with Massachusetts General Law.
- E. The Contractor shall submit all forms and information required by DEP for SRF program as applicable.

1.08 CONSTRUCTION RECORDS

- A. The Contractor shall provide help to a Hyannis Water System Representative in taking all necessary measurements for preparation of record drawings and tie cards.

- B. If by any reason the Resident Engineer/Inspector and/or Hyannis Water System Representative are not on site, the contractor shall take necessary measurements and submit them to Hyannis Water System Representative in form of tie cards. The tie cards shall be clear and legible to allow photocopying and/or scanning.
- C. All valves, bends, tees, sleeves, reducers, and other fittings, all corporation and curb stops shall have as a minimum two ties. Valves and fittings shall be tied to building corners, utility poles and/or catch basins/manholes (to center of). The curb stops shall be tied to two corners of the building the service belongs to.
- D. Record Drawings and tie cards shall be prepared and submitted in accordance to Specification Section 01301.

END OF SECTION

SECTION 01301

CONSTRUCTION RECORDS SUBMITTALS

PART 1- GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies the general methods and requirements of submission construction records, including record drawings, tie cards and other applicable information pertinent to construction supervision, resident inspection and construction administration.
- B. The Contractor and the Hyannis Water System Representative shall maintain separate sets of records.
- C. The Contractor shall submit to the Owner the set of tie cards for each valve and service installed or modified during the construction.

1.02 RECORD DRAWINGS

- A. For any project involving installation of new water main or relocation of a portion of water main, regardless of length or size of pipe, or cleaning and lining watermain, the record drawing shall be submitted to the Hyannis Water System (HWS) office no later than one month after completion of installation. Paving, cleanup and other construction activities associated with the project, but not directly related to the water main installation are not to be included in the timeline of submittal.
- B. The Record Drawings shall be submitted by the HWS Representative providing resident inspection/construction administration to the construction project. Unless otherwise agreed, the Record drawings shall be submitted as follows:
 - 1. One hard copy, stamped and signed by the Engineer
 - 2. One digital copy (on CD) in PDF format
 - 3. One digital copy (on CD) in AutoCAD format.
- C. The hard copy record drawings shall be to 1 inch = 40 feet scale, printed on 24x36 size paper. If the design was accepted to 1 inch = 20 feet scale, the record drawing would be accepted to the same scale. The drawing shall bear a RECORD DRAWING label clearly visible in the right lower corner of the sheet.
- D. The record drawings shall contain at least the following:
 - 1. The date of submission
 - 2. The Project title and number/ Contract identification.
 - 3. The name of Engineer/Consultant preparing the Record Drawings;
 - 4. Engineer's stamp;
 - 5. North Arrow on every sheet

6. Diameter, material, location and depth of new, cleaned and lined and/or abandoned water main(s)
7. Diameter, type, location of valves, bends, sleeves, tees, caps and any other fittings. Valves and fittings shall be tied to building corners, utility poles and/or catch basins/manholes (to center of) with a minimum two (2) ties each. The distances are to be measured and recorded to one-inch accuracy.
8. Street name(s), houses shown on plans with their numbers, all permanent markers and other useful topographical information, like stone walls, fences, wetland delineation, water bodies etc.
9. All underground structures and utilities accounted/exposed during construction and located in close proximity of water mains;
10. Utility poles used for ties shall bear full pole identification

1.03 SERVICE TIE CARDS

- A. Any project involving installation of new water service or relocation or abandonment of one, regardless of length or size of pipe shall be recorded and the tie card shall be submitted to the Hyannis Water System office no later than one month after completion of installation.
- B. The tie card(s) shall be submitted by the HWS Representative, providing resident inspection/construction administration to the construction project or by the Resident Inspector directly. Tie card shall be legible, clear, accurate, drawn approximately to scale, and all text printed. One set of tie cards shall be submitted to the office of Hyannis Water System.

The tie card shall be prepared on white 8x11 inch page, portrait layout with the building on top. The top 2 inches of the page shall remain blank for office use. Below this blank space the street address of the service shall be printed, following by the tie card diagram.

- D. The tie card shall contain at least the following
 1. Water Main and service pipe location, materials, diameters and approximate depth;
 2. Street name(s) and house number;
 3. Two ties from corners of the building to the curb stop. In case if the building is located 100 feet from the property line or more, ties may be provided to utility poles, catch basins/manholes (to center of), visible permanent markers, hydrants.
 5. Distance from curb stop to the water main (corporation stop)
 6. Saddle, if used
 7. Ties or a distance to abandoned corporation stop;
 8. Edge of pavement, retaining walls, property line, if known
 9. Hydrants and valves in vicinity of the service.
 10. Meter pit shall have 2 ties and the distance from the curb stop to the center of the pit.

1.04 VALVE TIE CARDS

Any project involving installation of new valve(s) shall be recorded and the tie card shall be submitted to the Hyannis Water System office no later than one month after completion of installation.

- B. The tie card(s) shall be submitted by the Contractor separately and by the HWS Representative providing resident inspection/construction administration or by the Hyannis Water System Representative directly.

- C. The tie card shall be prepared for any valve or cluster of valves on 8x11 inch page, portrait layout. Each tie card shall be submitted on the separate sheet of paper.
- D. The tie card shall contain at least the following:
 - 1. Water Main(s) location, materials, diameters and approximate depth, diameter, type, location of valves, bends, sleeves, tees, caps and any other fittings.
 - 2. Street name(s) and house(s) number;
 - 3. North Arrow;
 - 4. Two ties for every valve to utility poles, manholes/catch basins, hydrants, corners of the building. The distance to be measured and recorded to one-inch accuracy
 - 5. Ties to abandoned valves;
 - 6. Edge of pavement, retaining walls, property line, if known
 - 7. Diameter, type, location of valves, bends, sleeves, tees, caps and any other fittings.

1.05 CONSTRUCTION RECORDS BY CONTRACTOR

- A. The Contractor shall provide help to a Hyannis Water System Representative in taking all necessary measurements for preparation of record drawings and tie cards.
- B. If by any reason the Resident Engineer/Inspector and/or Hyannis Water System Representative is not on site, the contractor shall take necessary measurements and submit them to the HWS Representative in form of tie cards. The tie cards shall be clear and legible to allow photocopying and/or scanning.
- C. The contractor shall maintain a separate set of records. In case the records maintained by the Hyannis Water System Representative are found deficient, the Owner may request the Contractor records for verification.
- D. Upon completion of the project, and prior to final payment, the CONTRACTOR shall provide the Town Surveyor with an as-built survey prepared in conformance with 250 CMR, Sections 6.01 and 6.02, from update Nov. 22, 2013. The completed survey is to be presented on a black line print(s) and stamped and signed by a Professional Surveyor registered in the State of Massachusetts. A digital copy of the survey in AutoCad is to accompany the print(s).

The as-built is to include ALL changes made to the site or roadway, etc. during construction and should be based upon NAVD '88 and NAD '83, unless prior provisions have been made. The survey shall include elevations at centerline, face of curb, top of curb, back of sidewalk and any off-site areas of work. An appropriate number of benchmarks are to be set in the job vicinity. Manholes shall be shown with rim elevations, inverts, pipe types and sizes and all pertinent information to determine flow rates. Water lines shall be shown with the size and type of pipe, services and valves well as depth beneath finished grades. All utilities, whenever possible after discussion with the Town Surveyor, shall be shown on the as-built. All pole relocations, light poles, etc. shall be depicted. Pavement striping, color and character. If building construction was included, an accurate location with dimensions to the boundary line(s) shall be shown. Floor elevations of each floor as well as building height, outside lighting and all parking and striping.

Accurately record the details of all completed works.

Survey monuments are to be protected during the course of construction and any property corners, roadway bounds or geodetic control markers destroyed during construction are to be replaced and reported as such on this as-built.

The Town Surveyor will review this as-built upon submittal, and upon approval, forward said approval to the project manager.

END OF SECTION

SECTION 02070

SELECTIVE DEMOLITION, CORING AND PATCHING

PART 1.00 - GENERAL

1.01 WORK INCLUDED:

- A. Demolition of existing structures, mechanical and electrical equipment, utilities, and building elements as indicated on the drawings and all demolition as necessary to complete the work as required by the plans and specifications.
- B. Coring, patching and associated repairs.

1.02 RELATED SECTIONS:

- 1. Division 1 – General Requirements
- 2. Division 15 - Mechanical
- 3. Division 16 - Electrical

1.03 DEFINITIONS

- A. Remove: Remove and legally dispose of items indicated.
- B. Remove and Replace: Remove and legally dispose of items indicated to be removed and replaced. Install new items in the same locations or in locations indicated.
- C. Remove and Relocate: Remove items indicated; install the items in the locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Engineer, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.05 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Schedule of selective demolition activities indicating the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
5. Coordination of Owner's continuing occupancy of portions of existing structures and utilities and of Owner's partial occupancy of completed Work.

C. Inventory of items to be removed and salvaged.

D. Inventory of items to be removed by Owner.

E. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations. Photographs shall be in digital format.

F. Record drawings at Project closeout according to Division 1 Section 01700 "Contract Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

G. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

H. Surficial soil sample analyses.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing local, state, and federal notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.07 PROJECT CONDITIONS

A. Owner may occupy portions of the site immediately adjacent to selective demolition area. Conduct selective demolition so that Owner's operations will not be disrupted. Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.

B. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Hazardous Materials:

1. The Contractor shall anticipate presence of lead in paint systems of existing equipment and structures to be removed or rehabilitated. The Contractor shall conduct necessary investigation, prepare the Health and Safety Plan and submit to the Engineer for review.
2. The Contractor shall anticipate presence of asbestos in existing structures to be demolished. The Contractor shall conduct necessary investigation, prepare the Health and Safety Plan and submit to the Engineer for review
3. All work associated with testing, removal, containment, and disposal of these materials shall be in accordance with the Rhode Island Department of Environmental Management Remediation Regulations and all applicable local, State, and Federal regulations.

D. Storage or sale of removed items or materials on-site will not be permitted.

1.08 SCHEDULING

- A. Arrange selective demolition schedule so as not to interfere with Owner's on-site operations.

PART 2.00 - PRODUCTS (Not Applicable)

PART 3.00 - EXECUTION

3.01 EXAMINATION

- A. The by-pass piping and pumping station shall be installed, connected, tested and fully operational before any demolition work is initiated.
- B. The Contractor must receive written authorization from the Engineer and/or Owner to begin any work under this Section.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. Investigate presence of the hazardous materials, prepare and submit Health and Safety Plan.
- D. Verify that utilities have been disconnected and capped.
- E. Inventory and record the condition of items to be removed and reinstalled or salvaged.
- F. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Engineer.
- G. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- H. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Contractor shall arrange to shut off indicated utilities with applicable utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.
- C. Utility Requirements: Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
 - 4. Cover and protect equipment and structures that have not been removed.

- D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished. Strengthen or add new supports when required during progress of selective demolition.

3.04 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in manner that will prevent spillage on adjacent surfaces.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 8. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 - 10. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- C. Break up and remove concrete slabs on grade, unless otherwise shown to remain.

3.06 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Salvage: All materials and equipment designated to remain under Owner's jurisdiction shall be stored and delivered to the Owner's yard per Owner's request at no cost to the Owner.
- D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.08 CLEANING

- A. Clean adjacent existing structures and restore to original condition on completion of selective demolition operation.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING, COMPACTION, RESTORATION

PART 1. GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to perform all trenching for pipelines and appurtenances, including saw-cutting and removal of pavement, drainage and dewatering, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.
- B. Excavation shall extend to the width and depth shown on the Drawings or as specified and shall provide suitable room for installing pipe, structures and appurtenances. All excavation, trenching, and related sheeting, bracing, etc shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- C. The contractor shall coordinate with the owners of all existing underground facilities prior to excavating. The size, material and location of existing utilities are based on information obtained from the private utilities and Hyannis Water System records during design and may be not accurate. The Contractor is responsible for accurate location and protection of the existing utilities.
- D. The contractor shall remove any rock encountered in the trench. The rock excavation shall be paid under appropriate bid item when the rock size exceeds 1 cubic yard.
- E. The contractor shall re-set all disturbed curb stones and replace all curb stones damaged during construction with the stones of the same material and quality. The concrete backing shall be provided to all curb stones re-set or replaced by the contractor.
- F. Refer to Standard Details No. 1 and 2 in Appendix B of Specifications.

PART 2. PRODUCTS:

2.01 IMPORTED FILL

- A. All imported backfill materials shall meet requirements of the Massachusetts Department of Transportation Specifications.
 - 1. Common fill shall consist of inert material that includes stone less than 6 inches, gravel and coarse sand free from frost, frozen lumps, loam and clay, organic material, concrete, asphalt and other surface coatings and deleterious materials.
 - 2. Select fill shall consist of common fill that is free of rock and fragments of ledge.

3. Gravel borrow (structural fill, common fill, or backfill) shall consist of inert material that is hard, durable stone and coarse sand free from frost, frozen lumps, loam and clay, surface coatings, and deleterious materials.

Graduation requirements for gravel shall be determined by AASHTO-T11 and T27 and shall conform to the following:

<u>Sieve Designation</u>	<u>Percent Passing</u>
1/2 in.	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

Maximum size of stone in gravel shall be 6 inches largest dimension

4. Processed gravel. Processed gravel shall be obtained from approved natural deposits and unprocessed except for the removal of deleterious materials and stones larger than the maximum size permitted.

Processed gravel shall be unfrozen and substantially free from vegetation, roots, loam and other organic matter, clay, snow, frozen particles and other fine or harmful substances.

Processed Gravel: Inorganic granular material meeting the following gradation:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
3 in.	100
1-1/2 in.	70 – 100
3/4 in.	50 – 85
No. 4	30 – 60
No. 200	0 – 10

5. Bank-run gravel. Bank run gravel shall be obtained from approved natural deposits and unprocessed except for the removal of deleterious materials and stones larger than the maximum size permitted.

Bank-run gravel shall be unfrozen and substantially free from vegetation, roots, loam and other organic matter, clay, snow, frozen particles and other fine or harmful substances.

Bank-run gravel: Inorganic granular material meeting the following gradation:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
6 in.	100
2 in.	80 - 100
No. 4	20 - 65
No. 200	0 – 12

6. Crushed stone. Crushed stone shall consist of sound, durable stone, free of any foreign material, angular in shape, free from structural defects and comparatively free of chemical

decay. The stone shall be maximum size of 1-1/2-in and a minimum size of 1/2-in. Crushed stone shall be used as ordered by the Engineer.

7. Topsoil: Friable loam, typical of fertile local topsoil; free from pure clay, weeds, noxious weed seeds, sod, clods and stones larger than 1 inch, toxic substances, litter, or other deleterious material; having a mildly alkaline to medium acid pH between 6.0 and 7.5. Soluble salts shall not exceed 4 millimhos per centimeter.

Soil Texture: 20 to 40% fines (silt and clay fraction passing the 200 sieve) and 60 to 80% Sand and gravel. The maximum particle size shall be 1-inch.

Organic Content: 5 to 10%

Additives: As required by soil analysis of Topsoil for, lawn areas.

8. Controlled Density Fill (CDF) or "Flowable Fill": Controlled density fill shall consist of a flowable, self-consolidating, rigid setting, low density mixture meeting performance standards as specified in Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, Type 1E. CDF is to be batched at a ready mix plant and is to be used at a high or very high slump of approximately 10 to 12 inches. It shall be flowable, require no vibration and after it has been placed can be excavatable by hand tool and/or small machines. The ingredients shall comply with the following:

Portland Cement – AASHTO M 85

Fly Ash – AASHTO M 295 Class F

Sand – M4.02.02 (Massachusetts Highway Specification)

2.02 PAVEMENT

- A. Pavement materials for all municipal, county or private roads shall be in compliance with Town of Barnstable Highway Dept. regulations.
- B. Pavement materials for any road under jurisdiction of Massachusetts DOT shall be in compliance with Massachusetts Department of Transportation Specifications.

PART 3. EXECUTION

3.01 TRENCH EXCAVATION

- A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating and removed to avoid mixing with soil.
- B. Strip and stockpile topsoil from grassed areas crossed by trenches. At the Contractor's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.
- C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.

3.02 DISPOSAL OF MATERIALS

- A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.
- B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the Hyannis Water representative. When removal of surplus materials has been approved by the Hyannis Water System, dispose of such surplus material in approved areas provided by the Contractor. No temporary staging areas will be provided at the Hyannis Water System facilities.
- C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor.

3.03 SHEETING AND BRACING

- A. Furnish, put in place and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures
- B. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, prevent movement of the pipe. When installing pipe, trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least 1 foot above the top of the pipe.

3.04 TEST PITS

- A. Excavation of test pits may be required for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.
- B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.05 ROCK EXCAVATION

- A. Excavation of rock shall be by mechanical means only. No blasting is allowed

3.06 EXCAVATION BELOW GRADE AND REFILL

- A. Whatever the unstable material or groundwater encountered, trench drainage shall be employed.
- B. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, the work of excavating below grade and furnishing and placing the refill shall be performed at Contractor's own expense.
- C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse

sand, or a mixture graded from coarse sand to the fine peastone, as approved by the Hyannis Water representative, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Hyannis Water representative prior to placement. Screened gravel shall then be placed in 6-in layers thoroughly compacted up to the normal grade of the pipe. If directed by the Hyannis Water representative, bank-run gravel shall be used for refill of excavation below grade.

3.07 BACKFILLING

- A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be expeditiously completed. The material for backfill shall be free of include large rocks, any asphalt, frozen soil, plastic or trash.
- B. Selected fill (common fill free of rock, fragments of ledge, or organic matter) or gravel, shall be placed up to 1 foot over the pipe and manually compacted around the pipe.
- D. Where the pipes are laid cross country, the remainder of the trench shall be filled with common fill material in layers not to exceed 18 inches and mounded 6 inches above the existing grade or as directed. Where a loam or gravel surface exists prior to cross country excavations, it shall be removed, conserved and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition.
- E. Where the pipes are laid in streets, driveways, or parking areas, the remainder of the trench up to a depth of 18 inches below the bottom of the specified permanent paving shall be backfilled with common fill material in layers not to exceed one (1) foot and thoroughly compacted to meet 95% of maximum dry density as determined by AASHTO T-99. Existing material can be used if approved by the Engineer. The Contractor shall arrange and pay for one sample per 1000 feet of trench in locations indicated by the Engineer. If any test reveals insufficient compaction, the Contractor shall re-excavate, re-compact and re-test the area with insufficient compaction at no additional cost to the Owner.
- F. The sub-base layer shall be 6 inches of dense graded material consisting of processed stone or gravel over a 12 inch layer of bank run gravel. Existing material may be substituted for the 12 inch imported gravel layer if approved by the Engineer.
- G. Where the pipes are laid in the State Highway Traveled Way or under major drain lines as designated on the Drawings, Controlled Density Fill (CDF) shall be used to backfill trench after the specified gravel or selected fill has been placed to a level 1 foot above top of pipe. Trench will be filled to the level of the bottom final pavement. Existing utilities within trench shall be braced to prevent floating.
- H. Where pipes are laid under gas lines or electrical cables, sand shall be used to backfill around gas pipe. Sand shall be placed 6 inches above and below gas line.
- I. Backfill shall be brought up evenly on all sides. Top layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 92 percent compaction. Water jetting or puddling shall not be used, unless specifically permitted by the Hyannis Water representative.

- J. Small rocks and fragments of ledge smaller than 6 inches may be used in trench backfill providing that rock fragments shall not be placed until the pipe has at least 2 feet of cover. Bituminous paving shall not be placed in backfilling. Frozen material shall not be used under any circumstances. No junk/garbage/refuse is allowed in trench.

3.08 RESTORING TRENCH SURFACE

- A. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, the Contractor shall maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.
- B. In and adjacent to streets, driveways, or parking areas the top 12-in layer of trench backfill shall consist of compacted gravel. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor, at his/her own expense, have samples of the material tested by an independent testing laboratory, in order to establish its compliance with the specifications. Only material which has been tested and approved by the Hyannis Water representative shall be allowed to be incorporated into the work.
- C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored to a condition at least equal to that existing before work began.
- D. Temporary pavement shall be installed every week on all public and private roads. Permanent pavement shall be installed not earlier than 90 days after installation of temporary pavement. Temporary pavement shall be maintained by contractor until replaced with permanent paving. All paving procedures and materials shall be in compliance with Town of Barnstable Specifications.

3.09 GRANITE AND CONCRETE CURBING

- A. The contractor shall re-set all disturbed curb stones and replace all curb stones damaged during construction with the stones of the same material and quality. The line of the curbing shall be straight and true for the full depth and shall be flush with adjacent curbing or sidewalk.
- B. Granite curb shall be set on 8-inch minimum depth of compacted gravel base and backed with concrete on the front side of the curb. The concrete backing shall be provided to all curb stones re-set or replaced by the contractor. Refer to Section 033001 FIELD CONCRETE for concrete and mortar requirements.
- C. The joint of the curbing shall be pointed with mortar for the full depth of the curbing. Excess mortar shall be satisfactory cleaned from the curb.

3.10 LOAM AND SEED

- A. Cross country areas shall be loamed and seeded as follows:

Lawn Area Seed Mix	% Weight
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“Rebel II” Tall Fescue	70%
“Baron” Kentucky Bluegrass	10%
“Palmer” Perennial Ryegrass	20%

Natural Area Seed Mix	% Weight
Kentucky 31 Fescue	40%
Palmer Perennial Ryegrass	30%
Birds Foot Trefoil (Empire Variety)	15%
Red Clover	5%
White Clover	5%
Redtop (Streaker Variety)	5%

SECTION 02616

DUCTILE IRON PIPE AND FITTINGS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to furnish, install and test ductile iron pipe and fittings, buried and exposed, as shown on the Drawings and as specified herein.
- B. Piping shall be located substantially as shown on the Drawings. The Hyannis Water System reserves the right to make modifications in locations as may be found desirable. Contractor shall receive approval for any considerable deviation of pipe location from one indicated on drawings from the Hyannis Water System. Pipe fitting notation is for the Contractor's convenience and does not relieve him/her from installing and jointing different or additional items where required to achieve a complete piping system.
- C. Where the word "pipe" is used, it shall refer to pipe, fittings, or appurtenances unless otherwise noted.

1.02 RELATED WORK

- A. Section 02221 – Trenching, Backfilling, Compaction, Restoration
- B. Section 02641 - Valves, Hydrants and Service Connections
- C. Section 03301 - Field Concrete

1.03 SUBMITTALS

- A. Shop drawings - per Section 01300
- B. Record drawings – per Section 01301

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - ASTM A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
- B. American Water Works Association (AWWA)
 - AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-In through 48-In (75mm through 1200mm) for Water and Other Liquids.
 - AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 - AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
 - AWWA C153 - Ductile-Iron Compact Fittings, 3-In through 16-In (76 mm Through 610 mm), for Water and Other Liquids.
 - AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - AWWA C651 - Disinfecting Water Mains.

- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein. Pipe rejected after delivery shall be marked for identification and shall be removed from the job.
- B. All pipe and fittings shall be permanently marked with the following information:
 - 1. Manufacturer, date.
 - 2. Size, type, class, or wall thickness.
 - 3. Standard produced to (AWWA, ASTM, etc).

1.06 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe. Under no circumstances shall the pipe be dropped or skidded against each other.
- B. Stacking shall conform to manufacturer's recommendations.
- C. Gaskets for mechanical and push-on joints to be stored shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All products as specified herein shall be new, unused, and purchased specifically for this contract.
- B. All pipe and fittings shall be manufactured in the USA.

2.02 MATERIALS

- A. Pipe
 - 1. Buried ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, Class 52, double cement lined. Pipe shall be supplied in standard lengths. .
 - 2. Pipe for internal installation shall be flanged ductile iron pipe minimum Class 53, in accordance with ANSI/AWWA C115/A21.15.
 - 3. Ductile iron pipe shall be by U.S. Pipe and Foundry Company, Inc., American Cast Iron Pipe Company, Griffin Pipe or approved by Hyannis Water System equal.
 - 4. Restrained joint push-on pipe shall be TR- Flex, Anchor Gaskets, Field-O-Lock or similar.
 - 5. Socket joint pipe shall be Flex-Lok, Ball & Socket, Snap-Lok, Usiflex class 56, or similar.
- B. Joints
 - 1. Buried ductile iron pipe shall have rubber-gasket push-on joint, restrained rubber-gasket push-on joint, rubber-gasket mechanical joint, or socket joint, as specified.
 - a. Gasket shall be of SBR (vulcanized styrene butadiene) rubber conforming ANSI/AWWA C111.

- b. Restrained joints shall be suitable for a working pressure of 250 psi and fabricated of heavy section ductile iron casting. Restrained joint shall be Meg-A-Lug Thrust Restraint Wedge as manufactured by EBAA Iron Inc., 1400 Series by Ford or approved equal.
 - c. Bolts and nuts shall conform ASTM A307, Grade B.
- 2. Flanged pipe shall have flanges in accordance with ANSI/AWWA C115/A21.15.
 - a. Faced and drilled to American 125 Standard.
 - b. Long hubs
 - c. Gaskets shall be 1/8 thick, made from SBR rubber shall meet ANSI/AWWA C111/A21.11.
 - d. Bolts, studs and nuts shall be heavy hex conforming ASTM A307, Grade B.
 - e. Filler flanges shall be furnished faced on both sides and drilled, completed with extra length bolts.

C. Fittings

- 1. Ductile iron pipe fittings shall be shall meet the requirements of ANSI/AWWA C110 and C153 as applicable. Fittings shall have the minimum pressure rating of the pipe.
- 2. Flanged fittings shall be rated 250 psi, unless otherwise specified. Base bends shall have machined and drilled bases

D. Exterior Coating and Interior Lining

- 1. Buried ductile iron pipe and fittings shall have a bituminous outside coating in accordance with ANSI/AWWA C151 and C153, respectively.
- 2. Exposed ductile iron pipe and fittings shall be factory primed with red primer. The final coating is specified in Section 09900.
- 3. Ductile iron pipe and fittings shall have a double thickness cement mortar lining and asphaltic seal coat in accordance with ANSI/AWWA C104/A21.14.

E. Couplings

- 1. Connection to existing pipe shall be made with solid sleeves 12-inch-long as a minimum. Solid sleeves shall be restrained in accordance with Section 2.02.B.
- 2. Where solid sleeve is not applicable, minimum 12-inch-long flexible couplings for buried application shall be FC Series by Ford, Style 38 or 162 as applicable by Dresser, or approved equal. Couplings shall be furnished with pipe stop removed. Ductile Iron components shall be epoxy coated conforming to AWWA C500.
- 3. Contractor is responsible to verify dimensions of piping necessary to ensure proper installation of couplings. The pipe shall be prepared for coupling in accordance with manufacturer recommendations.

PART 3 - EXECUTION

3.01 GENERAL

- A. All pipe and fittings shall be examined before laying and no piece shall be installed which is found to be defective. Damage to the pipe coatings shall be repaired per manufacturer's recommendations. Pipe and fittings shall be thoroughly cleaned before laying. Any defective pipe discovered after it has been laid shall be removed and replaced with a sound pipe
- B. Pipe joints shall be assembled in strict accordance with the manufacturer's instructions and AWWA C600.

- C. When the water main is installed above the sewer or drain pipe, a minimum 18 inches of vertical separation is required between pipes. In case the 18-inch separation is not achievable, the water main shall be polyethylene encased in sock or wrap for a length to reach 10 feet of horizontal separation between the sewer/drain pipe and the end of encasement. In no case shall the vertical separation be less than 6 inches.
- D. When the water main is installed below the sewer or drain pipe, a minimum 12 inches of vertical separation is required between pipes and the water main shall be polyethylene encased in sock or wrap for a length to achieve 10 feet of horizontal separation between the sewer/drain pipe and the end of encasement. In no case shall be vertical separation less than 12 inches.
- E. A minimum 10-foot horizontal separation is required between water main and sewer lines going parallel. If the 10-foot separation is not achieved, water main shall be polyethylene encased. In no case shall be horizontal separation less than 3 feet between a water main and any other utility (electrical conduit, sewer, water, gas pipe, etc.)
- F. Polyethylene Encasement for ductile iron pipe shall meet ANSI/AWWA C105/A21.5 (American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems).
- G. Refer to Standard Details No. 1 and 2 in Appendix B.

3.02 UNDERGROUND INSTALLATION OF DUCTILE IRON PIPE AND FITTINGS

- A. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding (if necessary) shall be placed, manually compacted and graded to provide firm, uniform and continuous support for the pipe. Blocking will not be permitted.
- B. When laying is not in progress, open ends of the pipe shall be closed by a plug or other approved means. The deflection at joints shall not exceed 75 percent of allowable deflection recommended by manufacturer.
- C. All ductile iron pipe laid underground shall have normally 5 feet (a minimum of 4 1/2-ft) of cover unless otherwise shown on the Drawings or as specified herein.
- D. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut, at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged. Cutting of restrained joint pipe is not allowed.
- G. Jointing Ductile-Iron Pipe
 - 1. Generally pipe shall be laid with bell ends looking ahead. The joint surfaces shall be cleaned and lubricated and the plain end of the pipe shall be aligned with the bell of the pipe to which it is to be joined and pushed home. A rubber gasket shall be inserted in the groove of the bell end of the pipe immediately before the joint is made.
 - 2. Bolts of mechanical or restrained joints shall be tightened to the manufacturer-specified torques.
 - 3. The pipe shall be mechanically restrained at all bends, tees and other fittings, valves, dead end caps etc. Additionally the pipe shall be restrained (using snap gaskets) for a minimum of 40 feet of length in each direction from the fitting, unless otherwise specified.

3.03 TESTING

- A. After installation, water pipe shall be tested in accordance with Standard hydrostatic test in accordance with AWWA 600 requirements.
- B. Any segment of pipe 40 feet or longer shall be pressure tested.

- C. The Contractor shall provide all pumps, pipe, connections, gages, measuring devices, and all other apparatus necessary for the test. Backflow prevention device shall be pressure reducing type approved by the Hyannis Water System. Double-check-valve backflow prevention device is not allowed. The Hyannis Water System will supply water to the contractor for testing purposes at no expense to the Contractor.
1. Testing will be performed prior to connecting new pipeline sections to any existing potable water system piping. No physical connections (temporary or permanent) between new pipe and existing pipe will be allowed during the test without the use of an approved backflow prevention device.
 2. Test Pressure - the required minimum test pressure shall be 1-1/2 times the working pressure measured at the point of lowest elevation of the pipeline and corrected to elevation of test gage. Test pressures shall not vary by more than plus or minus 5 psi for duration of test.
 3. Duration of Test - two (2) hours minimum.
 4. Air Removal - prior to performance of the test, the pipeline shall be completely filled with water for a period of 72 hours. Expel air by means blow-offs, hydrants or other means as required. After the tests are completed, plug all temporary taps.
 5. Allowable Leakage:
 - a. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valve section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not be measured by pressure drop in test section over a period of time.
 - b. No pipe installation will be accepted if the leakage is greater than that determined by the formula $L = SD\sqrt{P/133,200}$, in which "L" is the leakage in gallons per hour; "S" is the length of pipe tested in feet; and "P" is the average test pressure during the leakage test in pounds per square inch; and "D" as the nominal diameter of the pipe in inches.

Pipe Size-in	6	8	10	12	16	20
Leakage-gph	0.5	0.66	0.83	0.99	1.32	1.66

6. Repair of Leaks: If the test discloses leakage greater than the allowable leakage, the Contractor shall, at his own expense, locate and repair the defective joints until leakage is within the specified allowable. The Contractor shall repair any specific leaks regardless of the test results if, in the opinion of the Hyannis Water System representative, they are serious enough to endanger the future serviceability of the pipeline.

3.04 DISINFECTION OF POTABLE WATER LINES

A. General:

1. Flushing and disinfection of potable waterlines shall be done in accordance with AWWA C651 – Disinfecting Water Mains, latest edition, and shall be witnessed by the Hyannis Water System representative, unless otherwise approved. The Contractor shall provide all temporary blow-offs, pumps, chlorination equipment, chlorine and all other necessary apparatus required. The Hyannis Water System will supply water to the contractor for disinfection purposes at no expense to the Contractor.
2. Any segment of pipe 40 feet or longer shall be chlorinated and tested.
3. All valves on the new main shall be operated during the disinfection procedure in order to ensure complete disinfection.

4. Contractor shall not make physical connection to the existing water main prior to satisfactory results of chlorination.

B. Pipe Cleaning:

1. If the pipe contains dirt or heavy encrusted matter that, in the opinion of the Hyannis Water System representative, will not be removed during the flushing operation, the Contractor shall clean and swab the interior of the pipe with a 12.5 percent hypochlorite disinfecting solution.
2. The pipeline shall be flushed prior to disinfection.

C. Chlorine Application:

1. In general, chlorine shall be applied using the continuous feed method per AWWA C651.
2. Water shall have not less than 25 mg/L free chlorine. Maintain the chlorinated water in the pipeline for a minimum of 24 hours, after which period, the treated water shall have a free chlorine residual of not less than 10 mg/L.

D. Final Flushing:

1. Flush chlorinated water from the main until the chlorine concentration is below 1 mg/L. The Contractor shall be responsible for legal disposal of chlorinated water at no additional expense to the Owner.
2. If the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to be wasted, to neutralize the chlorine residual remaining in the water.
3. Refer to the Standard Detail No. 14 for a dechlorination facility layout.

E. Bacteriologic Tests:

1. After completion of the final flushing and prior to placing the pipeline in service, collect samples from the end of the line for testing for total coliform and e-coli. Two samples taken on consecutive days will be required for each isolated section of pipe tested. The results shall be submitted to the Hyannis Water System for review and approval prior to placing the pipeline into service. The two consecutive samples should state total coliform and e-coli absent (0, including background reading) in both samples.
2. If the original disinfection fails to produce satisfactory bacteriological samples, repeat the disinfection and testing procedure until two consecutive samples present satisfactory results at no additional expense to the Owner.

3.07 CLEANING

At the conclusion of the work, Hyannis Water System reserves the right to request cleaning the entire pipe by flushing with water to remove all dirt, stones, pieces of wood, or other material that may have entered during the construction period. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.

END OF SECTION

SECTION 02617

CONNECTING TO THE SYSTEM AND ABANDONNING PIPES

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to furnish, install and test new connection to the system, or disconnect and abandon pipes, buried and exposed, as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02221 – Trenching, Backfilling, Compaction, Restoration
- B. Section 02616 – Ductile Iron Pipe
- C. Section 02641 - Valves, Hydrants and Service Connection
- D. Section 03301 - Field Concrete

1.03 SUBMITTALS

- A. Tie cards shall be prepared to indicate location of all ends of disconnected or abandoned pipes and valves.
- B. Tie cards shall be prepared to indicate location and size of abandoned corporation stops.
- C. All record submittals shall be per Section 01301

PART 2 - PRODUCTS

2.01 GENERAL

- A. All products as specified herein shall be new, unused, and purchased specifically for this contract.
- B. All pipe and fittings shall be manufactured in the USA.

2.02 MATERIALS

- A. Pipe and Fittings
 - 1. Pipe and fittings shall be in accordance with Section 02616 Ductile Iron Pipe.
 - 2. Tapping Sleeves and Valves shall be in accordance with Section 02641.
- B. Couplings
 - 1. Connection to existing Cast Iron pipe, if outside diameter of pipe permits shall be made with solid sleeves 12-inch-long as a minimum. Solid sleeves shall be restrained in accordance with Section 02616.

2. Where solid sleeve is not applicable, flexible couplings for buried application shall be FC Series by Ford, Style 38 or 162 as applicable by Dresser, or approved equal. Couplings shall be furnished with pipe stop removed. Ductile Iron components shall be epoxy coated conforming to AWWA C500.
3. The pipe shall be prepared for coupling in accordance with manufacturer recommendations.

C. Back Flow Prevention Devices

1. Back flow prevention device (BFPD) shall be pressure reducing type. No double check valve BFPD is allowed.

D. Caps and Plugs

1. All caps and plugs on pressurized pipes shall be mechanical joint.

PART 3 - EXECUTION

3.01 GENERAL

- A. Connections and disconnections shall be located substantially as shown on the Drawings. The Hyannis Water System reserves the right to make modifications in locations as may be found desirable. Contractor shall receive approval for any considerable deviation of pipe location from one indicated on drawings from the Hyannis Water System. Pipe fitting notation is for the Contractor's convenience and does not relieve him/her from installing and jointing different or additional items where required to achieve a complete connection.

3.02 ABANDONED PIPE CONNECTIONS

- A. Abandoned pipe shall be physically disconnected from operational system: i.e. a portion of pipe shall be removed to create a gap between operational and abandoned pipes. Both pipes at the ends of the gap shall be capped or plugged.
 1. Cap or plug on pressure ductile iron, cast iron and PVC pipe shall be mechanical joint and backed by thrust block.
 2. Cap or plug on pressure asbestos-cement pipe shall be installed by adding a spool piece of ductile iron pipe with flexible coupling and then following the paragraph above.
 3. Cap or plug on abandoned pipe shall be installed regardless of pipe material. The end of pipe shall be cut and the cap or plug installed to prevent soil entering the pipe.
 4. Asbestos-cement pipe shall be abandoned for future use in accordance with DEP requirements. No broken pipe shall be left in trench.
 5. A slug of concrete may be used to substitute for a cap. The length of concrete slug shall be as a minimum equal to the diameter of the pipe.

3.02 ABANDONED VALVES

- A. Valves shall be abandoned in closed position unless otherwise indicated on drawings or requested by Hyannis Water System representative.

- B. Valve boxes and stems shall be pulled out and resulting void shall be filled with sand and paved over.

3.03 ABANDONED SERVICE (HOUSE) CONNECTIONS

- A. The house connection to be abandoned at the corporation stop.
- B. The curb box shall be removed
- C. Service pipe shall be capped at the property line.

3.04 CONNECTION TO THE OPERATIONAL SYSTEM

- A. Connecting to the operational system shall be made in accordance with AWWA C651-05 Standard, unless otherwise approved by the Owner for some special circumstances.
- B. To make a temporary connection to operational hydrant in order to fill new pipe with water for testing, flushing or for temporary service, a back flow prevention device (BFPD) must be used.
- C. The BFPD shall be furnished and installed by the contractor. The installation of BFPD shall be inspected by the Hyannis Water System representative before use and the hydrant shall be opened by Hyannis Water System personnel only.
- D. To make a permanent connection to the operational system, the Contractor shall notify the Hyannis Water System representative at least 48 hours in-advance. If connection to the operational system requires temporary shutdown of distribution water main in service, a 2-week notifications, following by 48-hour notification to the customers is required.
- E. All necessary satisfactory test results and Certificates of Analyses shall be submitted and approved by the Hyannis Water System representative before any arrangements are made to open valves.
- F. The Hyannis Water System personnel are not available on Mondays to operate valves or hydrants. Any assistance outside normal working hours is a subject of charge in accordance with Hyannis Water System Service Fees chart.

END OF SECTION

SECTION 02641

VALVES, HYDRANTS & SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The work under this Section includes the furnishing, installation and testing of all buried gate and butterfly valves, hydrants, tapping sleeves, house connections, and appurtenances as indicated on the plans or as may be required by the Hyannis Water System.

1.02 RELATED WORK

Section 02221 – Trenching
 Section 03301 – Field Concrete
 Section 02616 – Ductile Iron Pipe and Fittings

1.03 SUBMITTALS

- A. Shop drawings – per Section 01300
- B. Record drawings, tie cards – per Section 01301

1.04 REFERENCE STANDARDS

- A. American Water Works Association (AWWA)
 - AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - AWWA C502 - Dry-Barrel Fire Hydrants
 - AWWA C504 - Rubber-Seated Butterfly Valves
 - AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service
- B. American National Standards Institute (ANSI)
 - ANSI B16.1 - Cast-Iron Pipe Flanges and Flanged Fittings.
- C. American Society for Testing and Materials (ASTM)
 - ASTM A48 - Standard Specification for Gray Iron Castings
 - ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
 - ASTM A276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
 - ASTM A536 - Standard Specification for Ductile Iron Castings
- D. Steel Structures Painting Council (SSPC)
 - SSPC SP-6 - Surface Preparation Specification No. 6 Commercial Blast Cleaning.
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- F. The applicable Hyannis Water Standard Details are included in Appendix B.

1.05 QUALITY ASSURANCE

- A. All valves, hydrants, and appurtenances shall be new and in perfect working condition. In no case will used or damaged hydrants or valves be acceptable. The selection of equipment to meet the specified design conditions is the responsibility of the Contractor.
- B. Valves shall be shop tested in accordance with the following:
 - a. Gate valves: AWWA C500.
 - b. Rubber-seated butterfly valves: AWWA C504.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.
- B. Furnish covers for all openings.
 - 1. All valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.
 - 2. All valves smaller than 3-in shall be shipped and stored as above except that heavy card board covers may be furnished instead of wood.
- C. Store equipment to permit easy access for inspection and identification. Any corrosion in evidence at the time of Hyannis Water System acceptance shall be removed, or the valve shall be removed from the job.

PART 2 - PRODUCTS

2.01 GATE VALVES

- A. Unless otherwise specified, all valves 4" through 12" shall be gate valves. Gate valves shall be resilient seated gate valves and shall meet AWWA C-509. This valve shall be iron-body, bronze mounted, non-rising stem, rated for 200 psi pressure. All valves to be mechanical joint conforming to ANSI C111.
- B. For standardization purpose the gate valves shall **be model A2360 by Mueller**, or equal.
- C. All valves shall be open **LEFT (counterclockwise)**.
- D. All valves shall be manufactured in the USA
- E. The interior and exterior cast/ductile iron surfaces of the valve shall be bond-fusion epoxy coated. The factory coating shall not be damaged. Field-touch-up will not be allowed.
- F. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
- G. Stem shall be bronze, sealed by at least two O-rings; all stem seals shall be replaceable with valve wide open and while subjected to full rated pressure.

- H. Bonnet and gland bolts and washers shall be manufactured from stainless steel. The hot dip process (ASTM A153) is not acceptable.
- I. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure of sealing.

2.02 TAPPING SLEEVES AND VALVES

- A. All tapping sleeves shall meet AWWA Standard C-110.
- B. Tapping sleeve and tapping valve shall be of the same manufacturer.
- C. Tapping valves shall comply with Section 2.01 Gate Valves except one end shall be flanged and the other mechanical type joint.
- D. The sleeve and bolts shall be made of stainless steel Type 304.
- E. The tapping sleeve shall be a mechanical type joint to provide pressure – tight installation and be suitable for use with the existing pressurized pipe material. Outlet flange shall be Class 125C, ANSI B16.1. Tapping sleeves shall have totally confined end gaskets and be designed to withstand a minimum of 200 psi working pressure.
- F. Tapping valves shall be provided with an oversized opening to allow the use of full size cutters.

2.03 VALVE BOXES

- A. Cast iron valve boxes shall be two-piece adjustable style, slip type, no flange, as manufactured by Ford, Clow, Mueller, or approved by Hyannis Water System equal. Barrel inside diameter shall be 4½ inches with 26-inch top section and 48-inch bottom section lengths adjusted to finish grade.
- B. Covers shall be cast iron, 5¼ inch, with the word "WATER" and a direction to open arrow imprinted thereon. The boxes and covers shall be compatible with the valves to which they attach.
- C. Valve boxes shall be manufactured in the North America.

2.04 SERVICE CONNECTIONS

- A. Service connections shall be minimum 1" (2" minimum for commercial services) PE 200 psi black CTS SDR-9 tubing with 14 gauge wire. No union fittings shall be installed between corporation and curb stop. For new services no union shall be installed between curb stop and the house, unless the service is longer than 100 feet, in which case the meter pit is required.
- B. Corporation stop shall be no lead bronze ball valve (NL cast on the valve body is required). For the standardization reason the following models are accepted: **Mueller B25008NL** or equal. Direct tapping of 1-inch service into 12-inch ductile iron pipe or larger is allowed, in all other cases tapping saddle is required. The saddle shall be stainless steel double-strap as manufactured by Mueller, Ford or Smith-Blair.

- C. Curb stop and box shall be installed at the property line, unless otherwise directed by Hyannis Water System representative. Curb stop shall be no lead bronze ball valve, (NL cast on the valve body is required), compression x compression, non-drainable. For the standardization reason the curb stop shall be **Mueller B25209NL**, or equal.
- D. Curb box shall be “Erie” style with its rod ending 10-14 inches below the surface. Curb boxes shall be manufactured in North America.
- E. Meter pit shall be Plastic Pit Setter by Ford or EZ-Setter Meter Box for 1” service and EZ-Vault for larger service by Mueller or equal. The meter pit shall be designed to accommodate necessary meter size and pit location. The pit within driveways shall have H20 load roof.

2.05 HYDRANTS

- A. Hydrants must be model **A423 CENTURION by Mueller, open LEFT (counterclockwise)**, or equal, with the following features:
 - a) one 4 ½ inch steamer nozzle and two 2 ½ inch hose nozzles, NST,
 - b) arrow and word “open” indicating direction to turn stem,
 - c) cap chains for all nozzle caps,
 - d) brass number tag 2 ½” x1”
 - e) base connection: 6” MJ
 - f) color: red, with white **factory** painted cover cap
 - g) 5 ½ -foot bury, unless otherwise required to achieve specified clearance beneath flange.

PART 3 - EXECUTION

3.01 INSTALLATION OF TAPPING SLEEVES AND VALVES

- A. All tapping sleeves, valves and accessories shall be inspected by the contractor for defects before installation and all defective, unsound or damaged materials shall be rejected. The Hyannis Water System personnel may make additional inspections if deemed necessary and the Contractor shall furnish all necessary assistance for such inspection.
- B. The interior of tapping sleeves, valves, and couplings shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operation. Any damaged exterior epoxy coating must be repaired using Mueller touchup kit.
- C. Valves shall be laid to the line and grade in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.
- F. At times when work is not in progress, open ends of sleeves, valves and fittings shall be securely closed by a plug, so that no trench water, earth or other substances will enter.
- G. Any tapping sleeve, valves or fittings that have been disturbed after laying shall be taken up and reinstalled. Installed valves may be inspected by the Hyannis Water System representative before backfill.
- H. No shims or mounds of earth shall be used to raise the equipment to grade.

- I. Tapping sleeves shall be installed where indicated or as directed by the Hyannis Water System personnel. The tapping machine shall be provided by the contractor. The pressure testing shall be performed with water, no pressure testing by air is allowed.
- J. Refer to the Standard Detail No. 7 in Appendix B.

3.02 SETTING VALVES AND VALVE BOXES

- A. Valves shall be set plum. Blocking or supports of a permanent nature shall be placed under each valve to ensure against settlement. No wood material is acceptable.
- B. Refer to the Standard Detail No. 6 in Appendix B.
- C. Each valve shall be tightly closed before being placed in the line and shall remain so until the joints on each side are completely tightened.
- D. Valve boxes shall be set for all valves. They shall be fitted together and to the valve and securely held during backfilling. They shall be centered over the valve operating nut. The bedding material around them shall be thoroughly tamped in place and the box cover set to the finished grade.

3.03 SETTING HYDRANTS

- A. Hydrants shall be set plum. Flat stone or concrete support block shall be placed under the hydrant to ensure against settlement. No wood material is acceptable.
- B. The hydrant connection shall be 6" restrained pipe with gate valve. The hydrant gate valve shall be installed at the main (with anchor tee) or three (3) feet in-front of the hydrant. Installation shall be in accordance with standard detail available at Hyannis Water System and shall include a ¾" crushed or pea stone pack for drain at the base of the hydrant.
- C. The hydrant flange shall be about 4 to 6 inches above the ground surface. In case the furnished hydrant is short to provide such a clearance, the contractor shall furnish and install appropriate riser or replace the hydrant with longer one at no additional expense to the Hyannis Water System.
- D. Refer to Standard Details No. 3 and 4 in Appendix B for hydrant installation layout. The hydrant shall have three (3) feet diameter free space around it. No structures, trees, bushes, fences or other obstacles are allowed. The steamer shall be at least 18 inches away from the sidewalk edge. Refer to Detail No. 5 for installation of bollards, where required.
- E. The Contractor shall repair any damaged hydrant paint using Mueller paint touchup kit.

3.04 INSTALLATION OF SERVICE CONNECTIONS

- A. All existing iron pipe services between corporation and curb stop shall be replaced with PE 200 psi tubing if disturbed or leaking, unless specifically directed otherwise by Hyannis Water System representative. All existing curb stops shall be replaced with the new 1" curb stop (minimum 2" for commercial service) if any work is done on the service.

- B. Service pipe shall be installed at the depth of 5 feet (4½ feet minimum). If the service pipe is installed under sewer or drain pipe using open trench, it shall be installed in the PVC sleeve for the length to reach two feet of horizontal separation between sewer/drain pipe and the end of the sleeve, In no case shall be vertical separation less than 12 inches.
- C. The curb stops shall be installed at the property line. If location of the property line is not evident, contact Hyannis Water System personnel for determination at least 5 working days in advance. Installation of curb stops within town right-of-way, on sidewalks or shoulders may be allowed only by Hyannis Water System manager. The permission shall be made in-writing.
- D. The direct tapping of main to connect service is allowed for 1” service only for a ductile or cast iron water main 12-inch diameter or larger. In all other cases a saddle shall be installed.
- E. Refer to Standard Detail No. 8 in Appendix B.

3.05 TESTING AND DISINFECTION

- A. All installations longer than 40 feet shall be flushed, disinfected and tested in conformance with requirements of Section 02616 DUCTILE IRON PIPE AND FITTINGS

3.06 HYDRANT REMOVAL

- A. All Mueller hydrants to be replaced shall be carefully removed and delivered to the Hyannis Water System yard. Hydrant to be removed in its entirety to avoid any damage to the foot valve and connecting flange.

END OF SECTION

SECTION 02700

ASBESTOS CEMENT PIPE REMOVAL, DISPOSAL, ABANDONMENT

PART I - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all materials, equipment, labor and incidentals; provide for the removal and disposal or abandonment of asbestos cement water main pipe, as indicated and specified.
- B. All asbestos cement pipe that is shown on the drawings or discovered during excavation and which is removed during construction is the responsibility of the Contractor, for removal, transportation and proper disposal.

1.2 RELATED WORK N/A

1.3 GENERAL APPLICABILITY OF CODES, REGULATIONS AND STANDARDS:

All applicable federal, state and municipal codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. All regulations by governing agencies in their most recent version are applicable. Provisions contained in this specification that are more stringent than applicable codes, regulations and standards shall govern for this project.

1.4 REFERENCE STANDARDS

Massachusetts Division of Occupational Safety (Mas5DOS)

- 1. 453 CMR 6.00 - The Removal, Containment, or Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (Mas5DEP)

- 2. 310 CMR 7.00 - Asbestos Regulations
- 3. 310 CMR 19.061 - Asbestos Disposal Regulations
- 4. 310 CMR 40.0000 - Massachusetts Contingency Plan waste site cleanup regulations
- 5. 310 CMR 4.00 - Timely Action and Fee Provisions
- 6. 310 CMR 5.00 - Administrative Penalties Regulations

1.5 SUBMITTALS

- A. Contractor is required to submit a Health and Safety Plan specific to Asbestos Cement removal and disposal. The plan shall detail the contractor's removal methods and asbestos handling, management, containment, and transportation procedures necessary to comply with the referenced standards.
- B. Submit Massachusetts DEP Asbestos Notification Form (ANF-001).
- C. Contractor shall submit to the Hyannis Water Representative the original copy of the "Waste Shipment Record" acknowledging disposal of all associated waste material from the Contract showing delivery date, quantity, and appropriate signature of Contractor, transporter, and landfill's authorized representative. No final payment will be made before

this submittal is accepted.

1.6 STORAGE

- A. Asbestos cement pipe that has been properly wet, sealed, and labeled, is permitted to be stored for up to 30 days at the site with prior approval from MassDEP.

PART 2-PRODUCTS

- 2.1 Polyethylene Sheet: Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 6.0 mils thick as required, frosted or black as indicated.
- 2.2 Duct Tape: Provide duct tape in 2-inch or 3-inch widths as indicated, with an adhesive, which is formulated to aggressively stick to sheet polyethylene, is waterproof, and will adhere to other materials.
- 2.3 Spray Cement: Provide spray adhesive in aerosol cans that is specifically formulated to stick tenaciously to sheet polyethylene.
- 2.4 Waste Containers: Provide 6 mil thick leak-tight polyethylene bags labeled as follows:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

If the waste material contains sharp edges or may otherwise puncture polyethylene bags, provide properly labeled drums or other closed containers for storage, transportation, and disposal.

- 2.5 Warning Signs and Labels: Shall comply with 29 CFR 1926.59(k), and all other federal, state, or local codes and regulations.
- 2.6 Brushes: All brushes shall have nylon bristles. Wire brushes are excluded from use due to their potential to shred asbestos fibers into small fibers. Wire brushes may be used on pipe joint applications upon prior written notice to the Engineer.
- 2.7 Amended water shall be water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate asbestos lined materials.

PART 3 - EXECUTION

3.1 GENERAL

- A. Nonfriable asbestos cement pipe shall be handled, transported, and disposed of in a way that prevents it from becoming friable and releasing asbestos fibers. AC pipe cannot be shattered, crumbled, pulverized, sanded, chipped, or ground.

- B. AC pipe may not be removed from the excavation if it is not necessary to disturb it during the installation of the new pipeline.
- C. AC pipe shall never be handled unless it is wet. Dry pipe shall be wet down with a suitable wetting material prior to handling it.
- D. The Contractor shall take care not to damage pipe by impact, bending, compression, or abrasion during uncovering, handling, and removal.

3.2 REMOVAL

- A. If pipe is intact and not broken, place 6 mil polyethylene sheeting under the asbestos cement pipe to prevent soil contamination.
- B. Pipe shall be wrapped in two (2) layers of 6 mil polyethylene sheeting and sealed with duct tape. Containers shall be labeled appropriately.
- C. If the pipe is damaged or saw cutting is necessary, place 6 mil polyethylene sheeting under the asbestos cement pipe to prevent soil contamination. Saw cutting requires containment unless using HEPA exhausted and shrouded cutting equipment.
- D. Pipe shall be sealed in leak-tight Containers. After the pipe has been properly sealed and labeled as described above, place pipe in lined roll-off containers. Container shall be enclosed and locked, having proper labels and DOT placards as required. If using an open top roll-off containers, all containers must be properly sealed, labeled, and secured inside a locked fence area to prevent tampering from unauthorized personnel.

3.3 AC PIPE LEFT IN PLACE

- A. Ends of AC pipe to be left in the excavation shall be encapsulated. AC pipe is not to be crushed and left in place. Any crushed pieces must be removed and properly disposed of.

3.4 STORAGE, TRANSPORT AND DISPOSAL

- A. Package, transport, and dispose of asbestos containing waste material in accordance with local, state, and federal regulations. All shipments must have complete waste shipment records.
- B. Dispose of all material at a landfill permitted to accept asbestos-containing waste material.
- C. Waste Labeling:
 - 1. Warning labels, having waterproof print and permanent adhesive in compliance with OSHA, EPA and Department of Transportation requirements shall be affixed to or printed on the sides of all waste bags or transfer containers. Warning labels shall be conspicuous and legible.

2. In compliance with NESHAPS, 40 CFR, Part 61.150, all waste containers or bags shall be labeled with the following generator information:
 - a. Name of waste generator.
 - b. Location where waste was generated.
- D. Dispose of all material at a landfill permitted to accept asbestos-containing waste material.

END OF SECTION 02700

APPENDIX B

EVERSOURCE STANDARD DOCUMENTS

DESIGN STANDARDS

- D3820 – CONSTRUCTION, MATERIAL, AND WORK SPECIFICATIONS FOR NEW 15/25kV PRIMARY UNDERGROUND DISTRIBUTION SYSTEMS UP TO 200 AMPS

CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION

- C1100 – DISTRIBUTION DUCTBANK CONSTRUCTION AND MATERIALS
- C2021 – PRIMARY URD RISER CONSTRUCTION
- C2022 – POWER CABLE RISERS FOR 25 KV AND BELOW
- C3801 – INSTALLATION OF PRECAST PAD FOUNDATIONS FOR 4KV, 15 KV, & 25KV PAD MOUNTED, THREE-PHASE DISTRIBUTION TRANSFORMERS
- C3802 – RECOMMENDED MINIMUM CLEARANCES FROM THREE-PHASE DISTRIBUTION TRANSFORMER FOUNDATION TO BUILDINGS, BUILDING OPENINGS, LANDSCAPING, OR TRAVELED WAY
- C3813 – INSTALLATION OF PRECAST CONCRETE MANHOLES
- C3814 – INSTALLATION OF HANDHOLES & BOXPADS
- C5000 – GROUNDING AND BONDING POLE-MOUNTED EQUIPMENT

MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION

- M1204 – PRECAST CONCRETE MANHOLE 6'-0"W x 10'-0"L x 8'-0"H INSIDE DIMENSIONS
- M1216 – PRECAST CONCRETE – PRIMARY PULL BOX FOUNDATION 5'-0" x 5'-0" x 5'-0" H INSIDE DIMENSIONS
- M1300 – NSTAR No. 1 Solid Cover
- M1303 – NSTAR No. 1 Manhole Frame
- M1307 – NSTAR No. 00 Manhole Frame
- M1308 – NSTAR Adapter for No. 00 Manhole Frame
- M3801 – PRECAST CONCRETE TRANSFORMER FOUNDATIONS UP TO 2500 kVA
- M3902 – SINGLE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS

MANUFACTURERS LISTS

- C1100 APPENDIX – DISTRIBUTION CONDUIT, FITTINGS, AND ACCESSORY MATERIAL MANUFACTURERS AND PART NUMBERS
- C3813 – PRECAST CONCRETE MANHOLES, COVERS AND ACCESSORY MATERIAL SUPPLIER PART NUMBERS
- D3820 APPENDIX – 200 AMP UNDERGROUND ELECTRIC DISTRIBUTION MATERIAL MANUFACTURERS AND PART NUMBERS

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 1 of 34
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**CONSTRUCTION, MATERIAL, AND WORK
SPECIFICATIONS FOR NEW
15/25kV PRIMARY UNDERGROUND DISTRIBUTION
SYSTEMS UP TO 200 AMPS**

These Specifications supersede all related URD specifications from former Boston Edison including W2.10-10.3, 2.10-10.5, and Comm. Electric 4-0385.

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 2 of 34
---------------------	--	------------------------------------

Table of Contents

	PAGE#
<u>I Scope</u>	4
<u>II Definitions</u>	4
<u>III Prerequisite</u>	4
<u>IV Supporting Standards – to be adhered to as elements of this standard</u>	6
A. Construction Standards	
B. Material Standards	
C. Work Standards and other Applicable NSTAR Documents	
<u>V Bill of Common Materials</u>	
A. 15 kV Materials.....	7
B. 25 kV Materials.....	8
C. Secondary Cable and Connectors.....	9
D. Miscellaneous Accessories.....	9
E. Conduits, Riser Stand Pipes, and Manholes.....	9
F. Equipment Box Pads and Hand holes.....	10
<u>VI Ownership And Responsibility For Installation</u>	
A. Primary and Secondary System.....	11
B. Services and Meters.....	12
<u>VII Construction Issues</u>	
A. Cable and Conduit System	13
B. Conduit Design and Layout.....	14
C. Trenching and Backfilling.....	15
D. Installation of Box Pads, Foundations, Manholes and Hand holes.....	16
E. Grounding.....	16
F. Street and Area Lighting.....	16
<u>VIII Cable Installation And Terminations</u>	17
<u>IX Inspections and Acceptance Testing</u>	17

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: center;">D3820 Rev 0</p> <p style="text-align: right;">Page 3 of 34</p>
---------------------	--	---

X Physical Drawings

FIG-1	Example UD System Layout.....	18
FIG-2	Typical Grounding Ring.....	19
FIG-3	UD - Typical Trench Sections Cable In Duct.....	20
FIG-4	Typical Trench / Excavation - Public Way Road Crossings.....	21
FIG-5	Typical Trench/Excavation In The Public Way Sidewalk Crossings.....	22
FIG-6	Typical Plan of Transformer Pad, Vault, Handhole and Conduit.....	23
FIG-7	Typical Primary Road Crossing To Transfromer Box Pad.....	24
FIG-8	Typical Secondary And Primary Road Crossing.....	25
FIG-9A	Primary Riser Pole.....	26
FIG-9B	Secondary Riser Pole.....	27
FIG-10A	Single Phase Private UD Supplied from Existing Manhole.....	28
FIG-10B	Single Phase Private UD Supplied from New Manhole.....	29
FIG-11	Single Phase Private UD Supplied from Company Riser Pole.....	30
FIG-12	Single Phase Dead-Front Pad Mounted Transformer Picture.....	31
FIG-13A	Single Phase Cable Switching Station/Enclosure.....	32
FIG-13B	Three Phase Cable Switching Station/Enclosure.....	33

XI – Approvals.....

34

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 4 of 34
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I Scope

These specifications are for new construction of underground residential distribution systems. Additional requirements for commercial distribution will supplement this standard and are outlined separately. These specifications are not intended to apply to existing developments where the Company maintains an underground distribution system.

The information contained within is not intended to be a substitute nor supersede the Company's "Terms and Conditions for Electric Service" as filed with the Massachusetts DPU or the "Information and Requirements for Electric Service" booklet (see latest edition).

NSTAR reserves the right to make final interpretations of this specification and its appendices, and may make amendments as necessary to ensure proper construction.

II Definitions

Hereafter, where referred to in these specifications, "Company" shall refer to the NSTAR Electric & Gas Company. "Developer" shall refer to the land developing company, their sub-contractor, or individual residential property-owner where underground service is being planned for installation. "UDS" or "URD" shall mean Underground Residential Distribution System. "MEC" is the Massachusetts Electrical code, the state version of the National Electrical Code. "NESC" is the National Electrical Safety Code, which applies to all electrical construction in the public way or accessible to the public. "Company CSE" refers to NSTAR Company Customer Service Engineering, the normal point of contact for originating and advancing new requests for service. "Company Inspector/Supervisor" is the established NSTAR representative that shall perform on site inspections and approvals at different stages of construction.

III Prerequisites

The Company will agree to the installation of the UDS upon compliance by the Developer of the following requirements:

- A. If required by the Company, the Developer may need to execute an Electric Line Extension Agreement for Overhead and Underground Systems.
- B. That the Inspector of Wires of the municipality in which the subdivision is to be located, approve of the specific features of the proposed "UDS" installation which falls within his/her jurisdiction. The Developer is responsible for compliance with all Municipal requirements and permits.
- C. That the Developer grants to the Company the following permanent easements including perpetual right of access to each easement as defined in the Company's

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: right;">D3820 Rev 0</p> <p style="text-align: right;">Page 5 of 34</p>
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easement form. Except as specifically prohibited below, planting trees and shrubs within easements shall be at the discretion of the Company.

1. A blanket easement within the street layout for installation of primary power and secondary cables and all supporting infrastructure including conduit, manholes, splice boxes, pedestals, pads, pad mounted equipment, and riser poles.
 2. As required, a fifteen foot wide easement along sidelines and/or across lots, on private property, for power and communication cables, ducts, pads, and enclosures.
- D. That the Developer shall be responsible for the location of all foreign objects such as water, gas, telephone, CATV, sewage, drainage and ledge along the proposed route of the UD system before excavation begins. Such facilities must be completed prior to the installation of the electric system.
1. In general, the Company specifies an arrangement whereby other utilities share the opposite side of the road layout reserving the side proposed on the UDS construction plan for power and communication facilities. The UDS construction plans are an integral part of the electric system. The system shall be installed as detailed on the construction plans and any changes must be approved by the Company prior to the installation. The Company reserves the right to revise the construction plans.
 2. That the Company be given all pertinent data necessary for petitions on state and town road crossings forty-five days prior to construction. Commonwealth of Massachusetts law requires anyone planning to excavate in a public way to give notice to all public utilities. Please review the latest Massachusetts Dig Safe Law & Rules online at: http://www.digsafe.com/laws_statelaws.htm and call **888-DIG-SAFE (344-7233)**.
 3. That the Company receive town/city approved final plans scaled no less than 1 in. = 100 ft. prior to engineering. In addition to approved prints, UDS construction plans shall be provided as AutoCAD (version 2005 or earlier) files with layers showing all utilities, property lines; formatted as detailed in Construction Standard C1100. After construction, final as-built plans are also to be provided to NSTAR in the same format.
 4. A legend of all utilities and infrastructure shall be consistent with the Company's Operations Records Department.
 5. That in addition to meeting these specifications, the Developer agrees to meet any other specific requirements as identified by the Company in the planning stages of the system. The Developer agrees that the Company shall make the final decision as to the electrical and mechanical requirements of the system in accordance with these specifications. The Company's interpretation of these specifications shall be binding on the Developer.

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 6 of 34
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IV Supporting Standards

These are separate electronic documents, but have information and requirements that are integral to this standard. See latest revisions available on NSTAR.com.

A. Construction Standards:

- C1100 - Distribution Duct Bank Construction and Materials
- C2010 - Cold Shrink Termination for 15/25kV Jacketed Cable
- C2012 - Installation of 200 Amp Loadbreak Elbows on 15/25kV Pad Mount Equipment
- C2021 - Primary URD Risers for 15/25kV and Below
- C2022 - Power Cable Risers for 15/25kV and Below
- C2026 - Installation of Premolded Joints on 15/25kV Cable
- C3800 - Installation of S&C PME-9, Fused, Padmounted, Switch 15&25kV, 600 Amps
- C3801 - Installation of Pre-Cast Foundation for Pad Mounted Three-Phase Transformer
- C3802 - Clearance Requirements from Equipment to Buildings, Landscaping, or Traveled Way
- C3813 - Installation of Precast Concrete Manholes
- C3814 - Installation of Fiberglass/Composite Handholes, Box Pads & Switch Enclosures
- C5000 - Grounding and Bonding distribution Pole-Mounted Equipment

B. Material Standards:

- M1202 - 4'x6'x6' Inside Precast Concrete Manhole
- M1204 - 6'x10'x8' Precast Concrete Manhole
- M1208 - 4'x4'x4' Precast Concrete Secondary Pull Box
- M1216 - 5'x5'x5' Precast Concrete Manhole
- M1300 - NSTAR No. 1 Solid Cover
- M1303 - NSTAR No. 1 Manhole Frame
- M1600 - 600V EP Rubber Insulated Cable Material Standard
- M1601 - 15-35kV Concentric Neutral Cable Material Standard
- M3800 - Dead Front Primary Switching/Junction Enclosure
- M3801 - Three Phase Transformer Precast Transformer Pad
- M3803 - Precast Retaining Wall
- M3902 - Single Phase Padmount Transformer Material Standard
- M3904 - Three Phase Padmount Transformer Material Standard

C. Work Standards and other Applicable NSTAR Documents:

- W1604 - Cable Pulling Operations
- NSTAR Safety Manual, Latest Revision
- NSTAR Information & Requirements Book, Latest Revision
- NSTAR Terms and Conditions Line Extension Policy for New Service

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 7 of 34
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V Bill of Common Materials

The key materials required for construction are listed in this section.

The “Compatible Unit” is an internal NSTAR designer reference. The “Catalog ID” is an internal NSTAR warehouse stock number. Each catalog ID has an approved list of equivalent Manufacturers and Part numbers. No substitutions are allowed. The material cross-reference list is available on nstar.com.

A. 15kV Primary Cable and Accessories

DESCRIPTION	COMPATIBLE UNIT	CATALOG ID
PRIMARY CABLE		
15KV #1 SOL AL, 1/C SINGLE, EPR CABLE	UCANM-#1AL-1	92
15KV #1 SOL AL, 3x1/C TRIPLEX, EPR CABLE	UCANM-#1AL-3T-WD	93
15KV 4/0 AL, 3x1/C TRIPLEX, EPR CABLE	UCANM-4/0AL-3T	16332
JOINTS AND TERMINATIONS		
JOINT, 15KV PREMOLDED KIT, #2 STR / #1 SOL	UJMP-2-1S	1454
JOINT, 15KV PREMOLDED KIT, 4/0	UJMP-4/0	16334
TERMINATION, 15/25KV 1PH, COLD SHRINK, 1/0 AL, #1 SOL or #2 STR	UTC-1/0/1/2	9937
TERMINATION 15KV HEAT SHRINK, 4/0 AL,	UTM-SH-4/0	1423
200 AMP ACCESSORIES		
FEEDTHROUGH BUSHING, 15KV	U2MBWF	516
BUSHING WELL INSERT, 15KV	U2MBWS	515
INSULATING CAP, 15KV	U2MCAP	1119
ELBOW, 15 kV LOADBREAK, 4/0 STR	U2ME-4/0	16333
ELBOW, 15 kV LOADBREAK, #1 SOL AL, #2 STR CU	U2ME-1SOL	517
INSULATED STANDOFF BUSHING, 15 kV	U2MISB	515
MULTI-TAP, 15KV, 3 WAY	U2MJN-3W	806
MULTI-TAP, 15KV, 4 WAY	U2MJN-4W	1486
1 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE (TURTLE), 15KV, 4 POSITION	U2MJCAB-1PH	9533
3 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE(TURTLE), 15KV, 3 x 4 POSITION	U2MJCAB-3PH	2590

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: right;">D3820 Rev 0</p> <p style="text-align: right;">Page 8 of 34</p>
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B. 25kV Primary Cable and Accessories

DESCRIPTION	COMPATIBLE UNIT	CATALOG ID
PRIMARY CABLE		
25KV 1/0 SOL AL, 1/C SINGLE, EPR CABLE	UCANH-1/0AL-1	8714
25KV 1/0 SOL AL, 3x1/C TRIPLEX, EPR CABLE	UCANH-1/0AL-3T	8716
JOINTS AND TERMINATIONS		
JOINT, 25KV PREMOLDED KIT, 1/0 SOL AL	UJHP-1/0S	9864
JOINT, 25KV PREMOLDED KIT, TRANSITION, 1/0 SOL TO #2 STR	UJHP-1/0S-2	9865
TERMINATION, 15/25KV 1PH, COLD SHRINK, 1/0 SOL AL, #1 SOL or #2 STR	UTC-1/0/1/2	9937
200 AMP ACCESSORIES		
FEEDTHROUGH BUSHING, 25KV	U2HBWF	9540
BUSHING WELL INSERT, 25KV	U2HBWS	9756
INSULATING CAP, 25KV	U2HCAP	9457
ELBOW, 25 kV LOADBREAK, 1/0 SOL AL	U2HE-1/0SOL	9754
MULTI-TAP, 25KV, 4 WAY	U2HJN-4W	9772
1 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE (TURTLE), 25KV, 4 POSITION	U2HJCAB-1PH	9534
3 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE (TURTLE), 25KV, 3x4 POSITION	U2HJCAB-3PH	9536

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 9 of 34
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C. Secondary Cable and Connectors

DESCRIPTION	COMPATIBLE UNIT	CATALOG ID
600 VOLT CABLE		
600V 4/0 AL, 3x1/C TRIPLEX, XLPE INSUL CABLE	UCAS-4/0AL-3T YS-4/0AL-TPX	87
600V 4/0 CU, 3x1/C TRIPLEX, EPR/HYP CABLE	UCAS-4/0CU-3T YS-4/0CU-TPX	8746
600V 500 CU, 3x1/C TRIPLEX, EPR/HYP CABLE	UCAS-500CU-3T YS-500CU-TPX	16016
HANDHOLE CONNECTORS, 600 Volt Insulated		
MOLE BUS, 4 POS, 1 WAY, #12 - 350 KCMIL	UCN-M4P1W-350	9761
MOLE BUS, 4 POS, 1 WAY, #2 - 750 KCMIL	UCN-M4P1W-750	9764
MOLE BUS, 6 POS, 1 WAY, #10 - 500 KCMIL	UCN-M6P1W-500	9763
MOLE BUS, 6 POS, 1 WAY, #2 - 750 KCMIL	UCN-M6P1W-750	9762
MOLE BUS, 8 POS, 2 WAY, #2 - 750 KCMIL	UCN-M8P2W-750	15981

D. Miscellaneous Accessories

DESCRIPTION	COMPATIBLE UNIT	CATALOG ID
FAULT INDICATORS		
FCI, 25kV or 15kV Cable, autorange trip, current reset	U2FI	9660
FCI, 15 kV Elbow Test Point Mount, 800 Amp trip, voltage reset	U2FI-TP-VR	692
GROUNDING MATERIALS		
5/8" Dia. Ground Rod With Connector	UGN4x4	9229
1/0 Copper Ground Wire, bare tinned, 7 strand	UGN4X4, UWB-1/0CU-1	115
Ground Wire Connector 1/0-1/0 Cu Wire	UGN4x4	608
Ground Rod Connector to 1/0 Cu Wire	UGN4x4	9009

E. Conduit, Riser Stand Pipes, and Manholes

DESCRIPTION	COMPATIBLE UNIT	CATALOG ID
See C1100 Standard for all conduit, fittings, risers, accessories, and installation details.		
See C3813 Standard for all common manholes, frames and covers, accessories, and installation details.		

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: center;">D3820 Rev 0</p> <p style="text-align: right;">Page 10 of 34</p>
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F. Equipment Box Pads and Handholes

DESCRIPTION	COMPATIBLE UNIT	CATALOG ID
(Dimension included are top surface x height)		
Handholes		
Fiberglass handhole: 15"x10"x12" –lighting only	NHHPS	840
Fiberglass handhole: 23"x14"x15" -single residence	NHHPM	9571
Fiberglass handhole: 30"x17"x18" – <u>standard use</u>	NHHP	841
Composite handhole: 30"x17"x18", H20 rated	NHHC	9572
Box Pads – Transformers and Splices		
Fiberglass box pad/splice box: 43"x37.5"x32" For NSTAR North Transformers (single phase) or splice box (top opening = 26"w x 32"d)	NPDX-FN	1622
Fiberglass box pad/splice box (ledge areas only): 43"x37.5"x15" For NSTAR North Transformers (single phase) – shallow depth or splice box (top opening = 26"w x 32"d)	NPDX-FNS	7747
Fiberglass Cover (Use with Cat. IDs 1622, 7747, 16955)	NPDX-F1PCOV	1349
Fiberglass box pad/splice box: 43"x37"x32" For NSTAR South Transformers (single phase; top opening = 26"w x 26"d)	NPDX-FSO	16955
Large Box Pads – Switchgear		
Fiberglass box pad for 15kV PME-9 Switches (and 3 phase primary splice box) 75"x72"x36"	NPDS-F75x72	14024
Fiberglass cover for use with Cat. ID 14024	NFDS-F75x72COV	14078
Fiberglass box pad for use with 25kV PME-9 Switchgear: 86"x84"x36"	NFDS-F86-84	14556
Fiberglass base cover for use with Cat. ID 14556	NFDS-F86x84COV	14557

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 11 of 34
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VI Ownership and Responsibility are as follows:

A. Primary and Secondary System

1. The Primary and Secondary Electrical Distribution System located in the public way, future public way, or easement areas shall be designed by the Company. All Electrical Materials shall be furnished by the Company, or by the Developer/Company Approved Contractor (except for transformers and meters) as defined by the NSTAR Terms and Conditions Line Extension Policy for New Service. Materials to be provided may include cable, transformers, loadbreak elbows, terminations, high voltage splices, connectors and switching enclosures. Installation of cable and accessories may be completed by the Company or by Company approved electrical sub-contractors to the Developer at the Company's option and at the Developer's expense per NSTAR terms and conditions. After passing final inspection and electrical acceptance testing, system shall then be transferred and owned and maintained by the Company.
2. The necessary supporting non-electric infrastructure located in the public way, future public way, or easement areas shall be designed by the Company. All Materials shall be furnished by the Developer, or otherwise by the Company as defined by the approved Company Terms and Conditions Line Extension Policy for new service. All material installation costs including all excavations, backfilling and resurfacing shall be paid for by the Developer. Materials include conduit, fittings, fiberglass/poly pads, foundation pads, manholes, splice boxes, riser pipes, and all grounding provisions. The Developer shall provide for concrete encasement of conduit as required by the Company. At a minimum, primary use conduit street crossings shall be encased in concrete. Specific details noted in NSTAR standards shall be strictly adhered to unless approved in writing by the Company. All electrical supporting infrastructure located in the public or future public way and easement areas, will be owned and maintained by the Company after all Company inspections and conveyances of ownership are completed.
3. Precast retaining walls shall be furnished and installed by Developer where there is a possibility of a transformer or any other equipment being undermined due to a sharp drop off behind the unit or covered over from being installed into the side of an embankment. A simple retaining wall is available per NSTAR Materials Standard M3803, but more complex designs shall be installed as needed to preserve the final grades. Railroad ties and landscape timbers are not acceptable to shore around electrical equipment.
4. Installation of electrical conduits and cables on private property and common driveways with long setbacks: Per Company Terms and Conditions, the Developer shall either provide materials or acquire it from NSTAR at the customer's expense. The Company shall make final connections that energize the cables at the transformer, service hand hole, or riser as required. The cables and conduit along private ways shall be owned and maintained by the owner of record. For risers the Developer shall install the first ten feet of rigid galvanized

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	<p style="text-align: right;">D3820 Rev 0</p> <p style="text-align: right;">Page 12 of 34</p>
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steel conduit, steel sweep, grounding and duct in accordance with Figure 9A. The Company will designate the quarter on the pole where the riser is to be located and will install the remainder of the riser materials not shown in the drawing.

B. Services and Metering

1. Except for meters, all service cable, connectors, enclosures and other material and equipment associated with services, shall be supplied and installed by Developer or others. Meters shall be supplied and installed by the Company.
2. The Developer or his agent is responsible for obtaining all required local permits to receive service.
3. Service conductors must be installed at a depth according to the latest edition of the Massachusetts Electrical Code (MEC), and is subject to inspection by the local Wire Inspector. This minimum depth is thirty inches. Services may be either direct buried or in duct as required by the MEC. For maximum reliability, the Company recommends that service cables be installed in a schedule 40 PVC conduit sized per the MEC.
4. If three phase service is required, Developer must contact the Company Customer Service Engineer for additional equipment and cable requirements.
5. The Company or an agent of the company shall make the final service connection at the transformer or secondary hand hole (at the property line).
6. All service cables on private property shall be owned and maintained by the owner of record. The Company will, at the request and expense of the owner of record, perform any needed maintenance or repair on service cables and conduit.
7. Connecting an underground secondary extension or new service to existing energized underground secondaries (also see I&R Book):
 - a. The Developer subcontractor must excavate to the edge of the service hand hole or pad mount transformer position. The Developer shall not open or push service conductors into the hand hole or box pad.
 - b. The Developer subcontractor shall leave a coil of cable within the excavation long enough for the Company to make final connections: minimum of three feet of cable for hand holes, and eight feet for transformer pads. Approx 3 feet of trench next to the hand hole or pad mount, will not be backfilled, and shall be covered and made safe w/ steel plate or ¾" plywood to allow for NSTAR connection.

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	<p style="text-align: right;">D3820 Rev 0</p> <p style="text-align: right;">Page 13 of 34</p>
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VII Construction Standards & Issues

A. Cable & Conduit System

1. The primary operating voltage of the subdivision shall be single or three phase as determined by the Company, but may range from 4,160 V grounded-wye up to 22,860 V grounded-wye. Company personnel shall follow NSTAR Optimal Design Guidelines when designing new systems or line extensions.
2. The primary cable supply system shall typically be of a loop design installed in conduit. The number of primary ducts is determined by the number of primary cables needed to supply load, complete circuit loops, or allow for future expansion if possible. Multiple phases in separate ducts may be necessary in order to balance loads on the system.
3. For developments with 10 or more lots/services, Company may require two separate risers installed on two separate poles to feed into the subdivision. Cable shall be installed to complete a loop terminating at two risers or via use of cable switching stations supplied from a different source. For developments with 9 or fewer lots/services, 2 parallel conduits may be installed to one pole with sufficient cable to complete the loop circuit.
4. All underground conduit to be used with the primary or secondary cables listed in this standard (see section V Bill of Materials) shall be minimum 4 inch, schedule 40 PVC. Primary duct sweeps shall be 4" sched. 40 galvanized steel; 36" radius for risers, and 48" min. radius for any horizontal sweeps. Primary riser stand pipes and shall be 4" sched. 40 rigid galvanized steel.
 - a. Duct shall be installed as detailed in C1100.
 - b. No more than three cables can be installed per duct.
 - c. Primary and secondary cables cannot be installed in the same duct.
5. Primary cable splices shall be avoided as much as possible, and if required shall be installed inside an enclosure suitable to the location. Typically, concrete or composite pull boxes are required if accessible to vehicle traffic. Fiberglass splice boxes shall be utilized only for grassy/nonpaved areas with no vehicle access. Bollards may be accepted by the Company for protection of some locations with limited vehicle access.
6. Secondary Mains - The secondary cable system shall typically be a single phase, three wire 240/120 volt system consisting of two phase cables and one neutral. The three conductors shall be of the size and insulation type specified by the Company. Potential three phase requirements shall be communicated to Company CSE for investigation.
7. Services and Meters - Residential services shall be single phase, three wire, 240/120 volts. If three phase power is required, Company CSE must be contacted in advance to verify availability and added cost. The local Inspector

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 14 of 34
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of Wires shall be consulted for requirements pertaining to size of service entrance cable, depth of installation, joint trenching with other utilities and road and driveway crossings. Meter pedestals, where utilized, shall be located not closer than five feet from the back or sides of transformer pads or hand holes.

8. Service Entrance Installations - Service cables shall typically originate in hand hole unless designed by the Company to enter a transformer. Multiple or large sized service cables may be required to terminate in a handhole in order to minimize transformer cable congestion.
 - a. Service entrance cables shall be installed up to the hand hole such that the Company can install and make up connections without delay.
 - b. All services will be permanently marked in hand holes and manholes, with the correct house address (if available) or lot number.
 - c. Developer shall not push new cables into energized equipment or box pads unless Company representatives are on site to provide assistance.

B. Conduit Design Layout Requirements

1. It is critical that maximum cable pulling tensions are not violated when cable is installed. Duct line design, including the number of and types of sweeps and the section length greatly affects pulling tensions. Single phase primary cable tension is limited to 600 pounds. Triplex primary or secondary URD cable used in these designs is limited to 1,000 pounds total. See standard W1604, or use other industry accepted guidelines such as Okonite bulletin EHB regarding pulling tensions and cable layout.
2. Road Crossings - All roadway crossings shall be perpendicular to the side of the road. This includes Company approved horizontally drilled crossings. State road crossings shall be concrete encased. Company may require encasement for certain installations or when in close proximity to other utilities. Primary use conduit road crossings are typically encased, secondary only use need not be encased. Driveway crossings shall be parallel to the side of the road.
3. Location of sweeps in the conduit run: The distance from the radius bend of the conduit to the nearest cable terminator and/or splice/pull box location shall be no more than 25% of the total section length. This way the cable may be fed in at the end nearest the radius bend to minimize pulling tensions and sidewall bearing pressures.
4. Conduit Run: The conduit layout between cable terminations and/or splice/pull box locations shall be as straight as practical and contain no more than one (1) 90° sweep with a minimum 48" radius, exclusive of quarter bends that may be present at pads or risers. Radius bends in the conduit shall be gradual and not less than twenty-five feet (25'). All conduits should enter under the fiberglass pad so that the pad can be replaced if necessary without disturbing the primary cables.

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: right;">D3820 Rev 0</p> <p style="text-align: right;">Page 15 of 34</p>
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5. Pulling Length Limitations: The maximum allowable distance between cable pulling entrance and exit points is 600 feet, with a typical distance of approx 400 feet.
6. Typical conduit layouts are illustrated by Figures 6, 7 & 8. If a particular location requires longer section lengths or nonstandard arrangements that are not served by the design, Company CSE shall be contacted. All conduits must include a pull tape with footage markings, and must be capped as detailed in C1100.
7. Riser Poles: Details for primary riser poles are shown in Figure 9A, and secondary poles are shown in Figure 9B. All riser conduits must include a pull tape with footage markings, and must be capped.
8. A minimum separation of 18" in any direction between electric and natural gas facilities is to be maintained. If electric conduit is encased, separation may be reduced to 12". A minimum separation of 12" in any direction between electric and communications facilities is to be maintained.

C. Trenching and Backfilling

1. All excavation and roadway work shall adhere to OSHA, DOT, and NSTAR safety requirements without exception.
2. All trench lines, regardless of method of installation within the road taking shall be not less than three feet from paved surface of the road and shall not deviate more than one foot, six inches either side of this line in accordance with FIG-3. Final grades must be established, the surface roughly leveled, easement boundaries, street, lot and trench lines staked by the Developer before any trenching is started. The Company shall not be responsible for stakes incorrectly placed and will hold the Developer responsible for costs of construction changes resulting from such placement. The trench route must be clear of trees, bushes, stumps, ledge, large rocks and other impediments. The Developer shall adhere to specified depths and locations for trenches with any deviation from specified depths and locations being subject to the approval of the Company Inspector/Supervisor. Construction changes resulting from improperly established grades, settling, etc., shall be the responsibility of the Developer. The trenches shall be excavated in accordance with specific job plans and the general requirements of the Figures in this standard and C1100.
3. The entire conduit run, including splice boxes and equipment pad entries shall be inspected by the Company Inspector/Supervisor before any backfilling is begun. Backfill shall be the best of excavated material and shall not contain stones greater than three inches in any dimension and shall not contain ashes, cinders, shells, any organic matter or frozen material. Backfill shall be mechanically compacted. See C1100 for details. The trench shall be backfilled immediately following inspection and approval by the Company Inspector/Supervisor.

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 16 of 34
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D. Installation of Box Pads, Equip. Pads, Manholes and Hand Holes

1. Box Pads, Manholes, And Hand Holes shall be installed and properly grounded in accordance with the following standards:
 - a. C3801 - Installation of Pre-Cast Foundation for Pad Mounted Three-Phase Transformer
 - b. C3813 - Installation of Precast Concrete Manholes
 - c. C3814 - Installation of Fiberglass/Composite Handholes, Box Pads & Switch Enclosures
2. Splice/pull boxes, manholes and transformer box pads shall not be located at low points in the final grade, drainage areas or on abrupt slopes. In areas which have poor drainage, provisions must be made to keep foundations, utility vaults, pull boxes, etc., from filling with water.
3. All conduit openings into pull boxes, box pads and manholes shall be capped after installation to prevent entrance of dirt and debris. 2500 lb. strength pulling tape with footage markings shall be installed in all ducts per C1100.
4. All Manholes, castings, and covers shall be rated for H20 loading as detailed in NSTAR Material standards (Manholes M1201-1299 & Covers and Frames 1300-1399). Pull boxes or hand holes vulnerable to vehicle traffic or parking shall be polymer concrete composite designs (not plastic or fiberglass) rated for H20 loads. Manholes and pull boxes also shall not be installed at driveway entrances or where they are likely to be obstructed or made inaccessible by a vehicle.
5. Necessary building and roadway clearances for transformers and other equipment are outlined in Construction Standard C3802. When padmount equipment is installed in paved areas or otherwise subject to damage from vehicular moving or parking traffic, protective concrete filled steel posts or bollards must be furnished and installed by the Developer. A clear area surrounding all padmount transformers or equipment (4' on sides and 3' from the rear and 10' in front) must be maintained. See C3802 for details.

E. Grounding

Properly installed grounding is important for public and worker safety. Company standards show grounding details, but contact Company CSE with any questions.

F. Street and Area Lighting

1. Street or area lighting design shall be consistent with Company lighting standards. This includes fixture styles, light sources (HPS or MH), operating voltages and wattages. Company CSE can provide details on options.
2. Nonstandard lighting systems in the public way will not be accepted for future maintenance by the Company in communities where the Company maintains town lighting systems.

ISSUED 31-Aug-09	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	<p style="text-align: right;">D3820 Rev 0</p> <p style="text-align: right;">Page 17 of 34</p>
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VIII Cable Installation and Terminations

The following standards shall be adhered to for proper construction.

- A. C2012 -Installation of 15/25kV Loadbreak Elbows
- B. C2021 - Primary URD Risers for 15/25kV an Below
- C. C2026 - Installation of Premolded Joints on 15/25kV Cable
- D. C5000 - Grounding and Bonding distribution Pole–Mounted Equipment
- E. W1604 – Cable Pulling Operations

IX Inspections and Acceptance Testing

- A. Company Inspector/Supervisors shall be contacted at predefined inspection points during the construction process. Failure to comply with properly scheduling inspections may result in work being “undone/ unexcavated” at the expense of the Developer in order to demonstrate full compliance with standards.
- B. If Company has evidence of concern or has recorded previous violations of Company standards by a Developer or its contractor, Company Inspector/Supervisors may require disassembly of some work completed by the Developer’s contractor, at the Developer’s expense, as a way to ensure quality of construction. Installers may require recertification by company to complete specific tasks such as cable splicing and terminating.
- C. Electrical acceptance testing of completed cable installation work is to be completed by Developer or Company approved sub-contractor .
 - 1. All primary cable, terminations, elbows or splices shall be high voltage tested by a qualified tester at the expense of the Developer. Test voltages and leakage currents shall be stabilized for 5 minutes minimum at the following voltages:
 - a. 15kV Cable System – 40 kV DC
 - b. 25kV Cable System– 60 kV DC
 - 2. Certified high voltage cable test results are to be provided to the Company Inspector/Supervisor prior to the system being energized. This applies to future Company or private system installations, additions, or repairs.
 - 3. Secondary cable that the Company authorizes be installed by Developer in the public way may require testing to 1000 Volts after installation.
- D. Failure to comply with standard requirements, inspections, and acceptance testing protocols may lead to contractor removal from approved contractor list.

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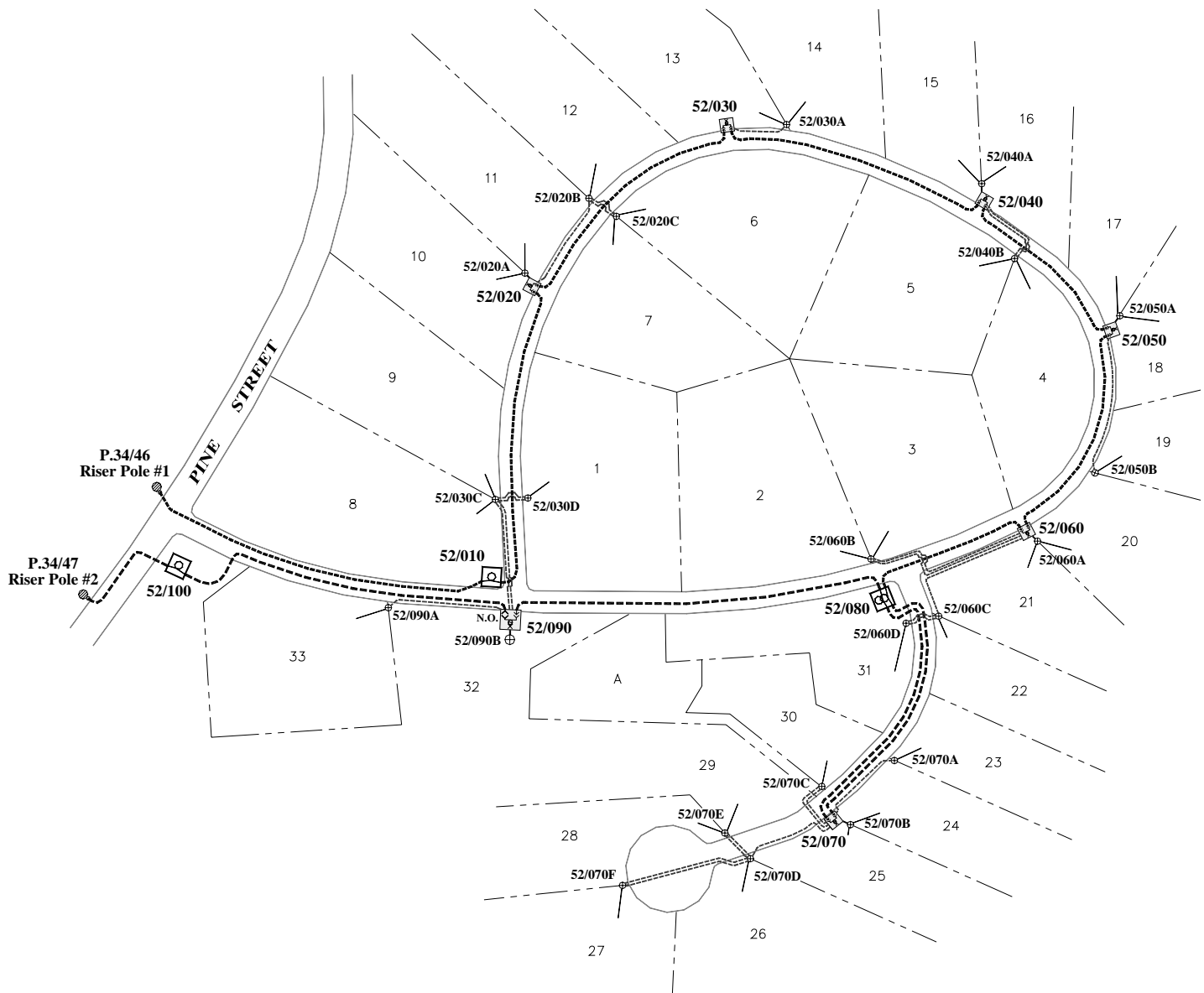
D3820
Rev 0

Page 18 of 34

EXAMPLE RESIDENTIAL UD SYSTEM LAYOUT

FIG-1

(Illustrative Purposes Only)



Notes:

1. URD Systems will be designed for each project by Company personnel using NSTAR Optimal Design Guidelines.
2. Numbering system shown is an example only and is not common to all areas.

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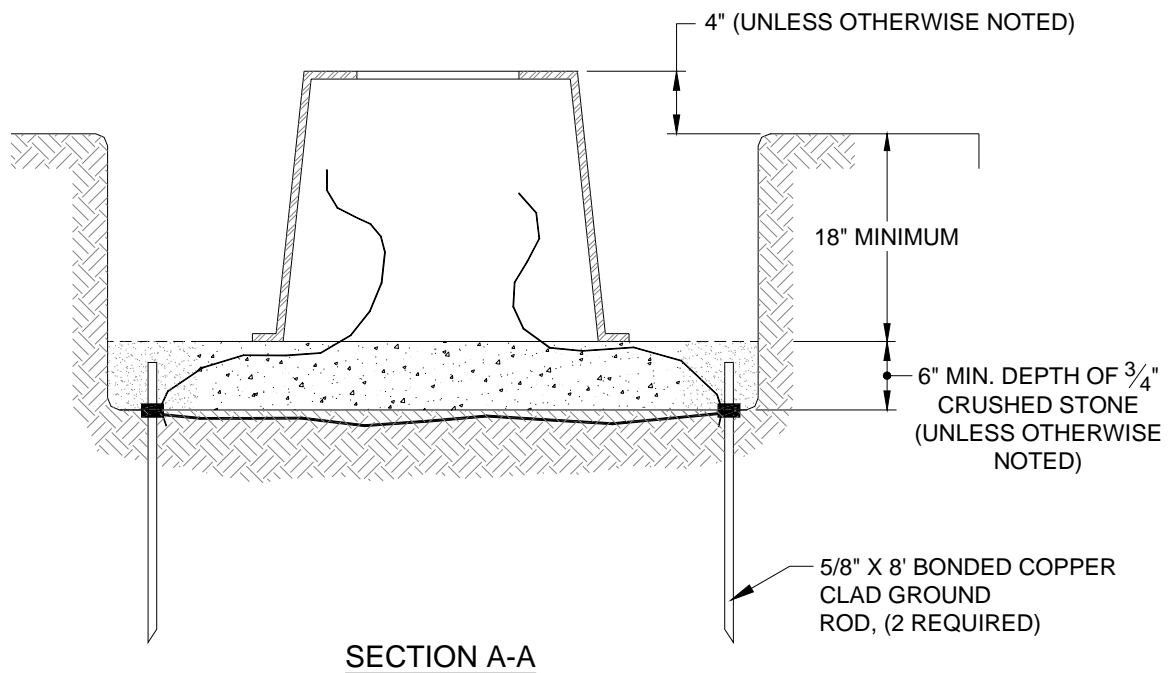
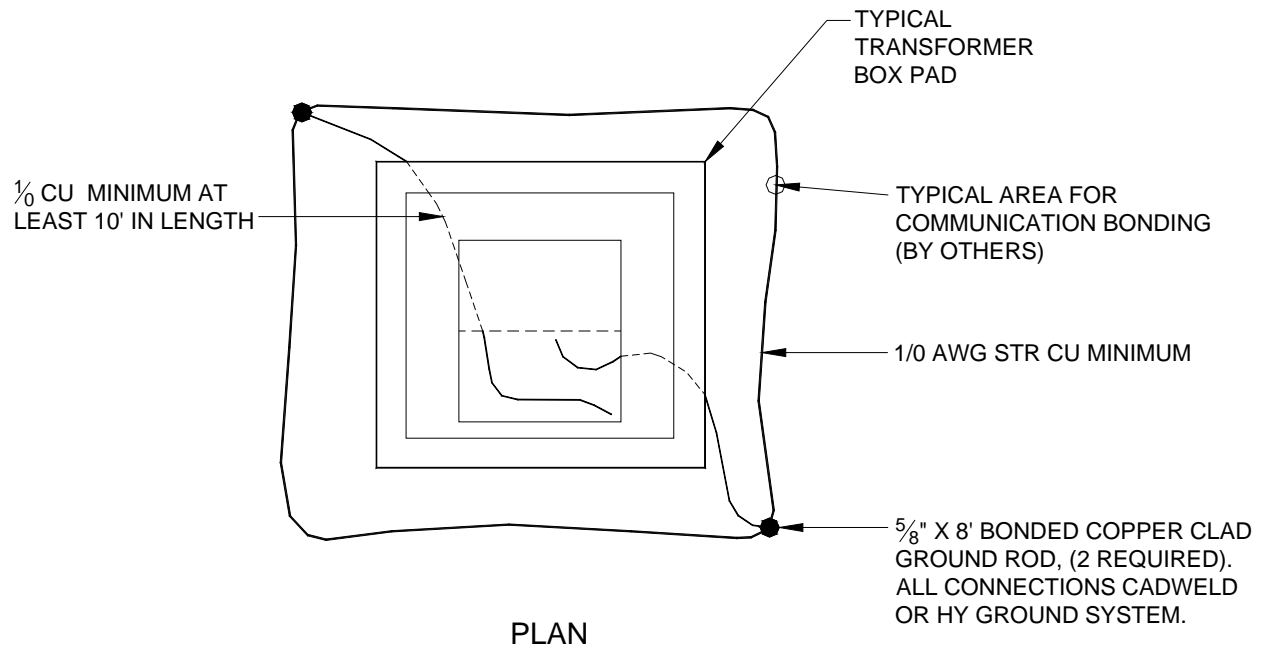


D3820
Rev 0

Page 19 of 34

GROUNDING RING (Refer to C3801, C3814)

FIG-2

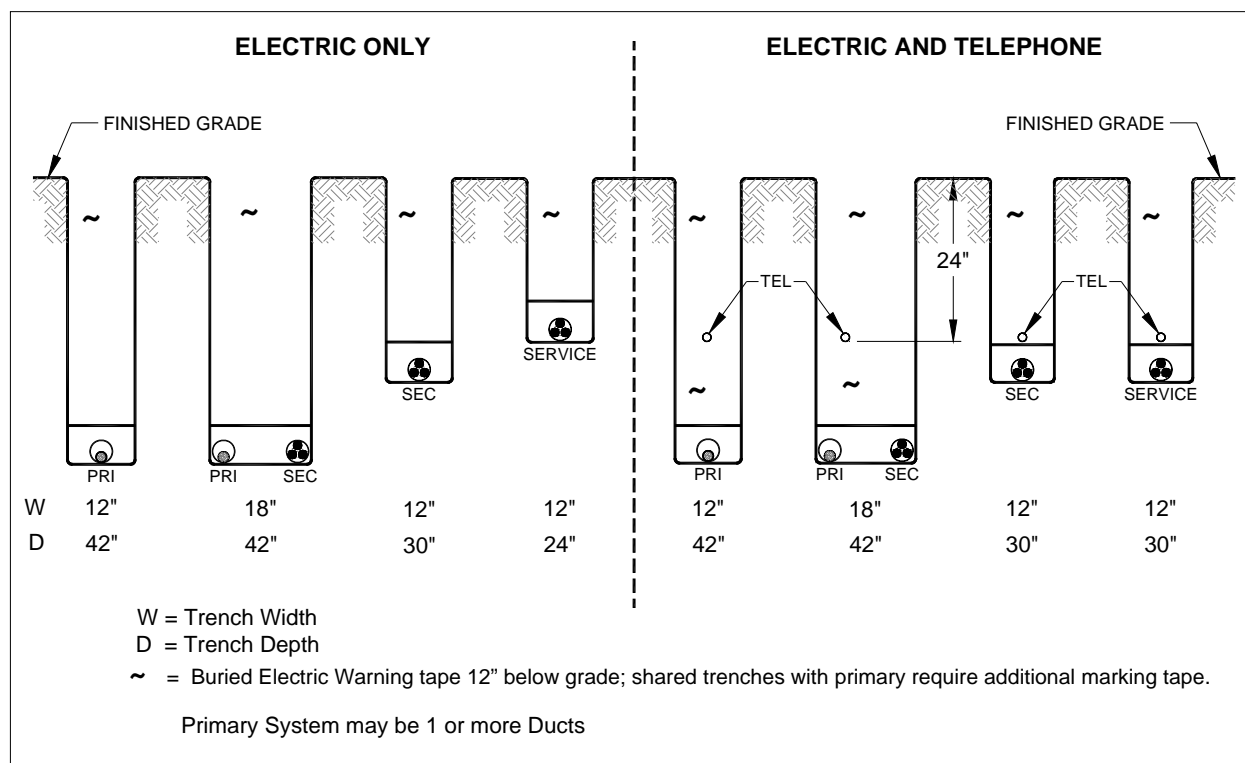


Notes:

1. The 5/8" ground rods shown in Fig 2 are a min. diameter and length; 3/4" x 10' is acceptable.

UD - TYPICAL TRENCH SECTIONS CABLE IN DUCT

FIG-3



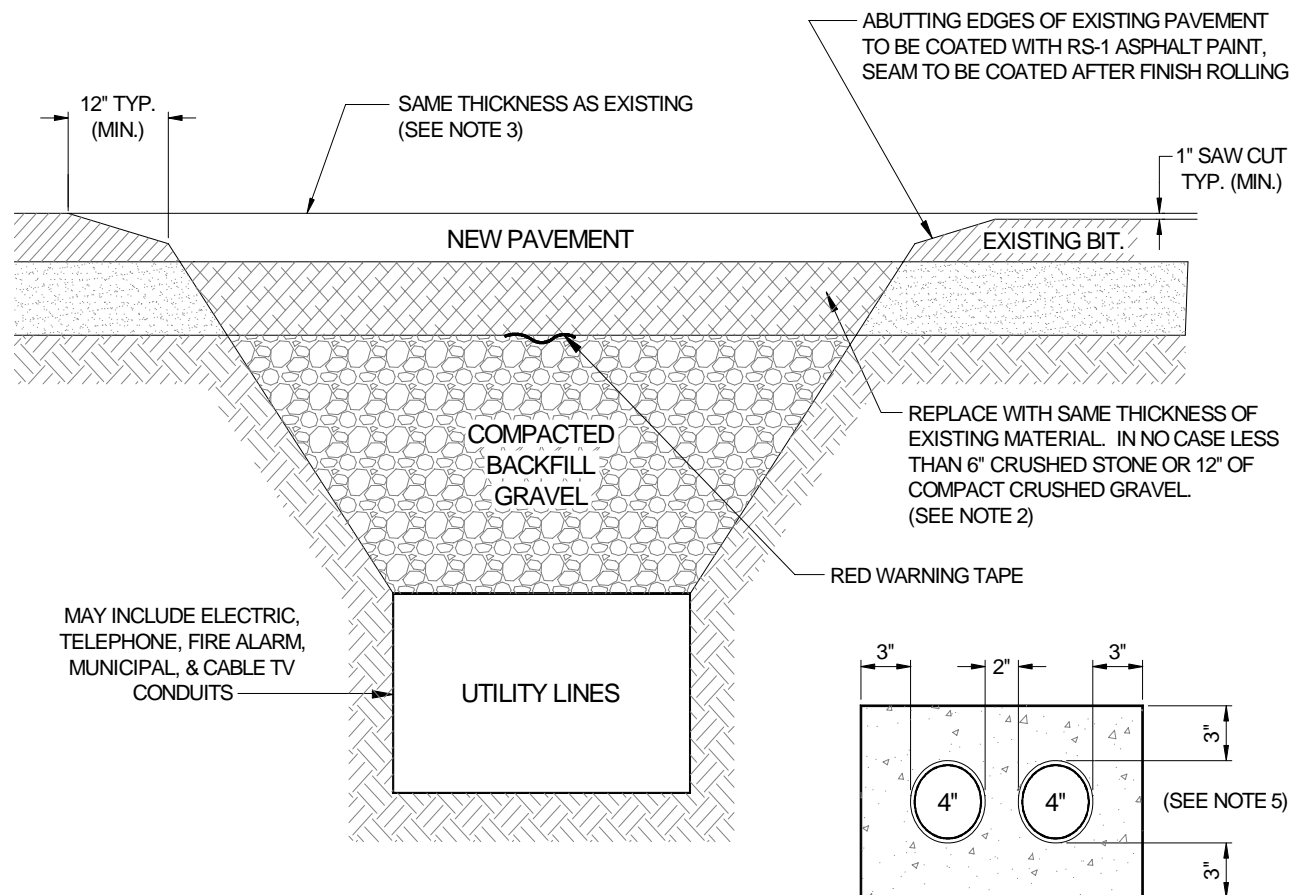
Notes:

1. All public way conduit and backfill shall be installed in accordance with Construction Standard C1100 as required by the Company, or wiring inspector for private property.
2. All public roadway crossings with primary use conduit are to be encased in concrete. Additional locations may require concrete encasement as determined by the Company.
3. Minimum separation in any direction between electric and communications shall not be less than 12" under any circumstances.
4. Minimum separation in any direction between electric and gas lines and equipment shall not be less than 18". If electric conduit is concrete encased, minimum separation may be reduced to 12".

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TYPICAL TRENCH / EXCAVATION - PUBLIC WAY ROAD CROSSINGS

FIG-4



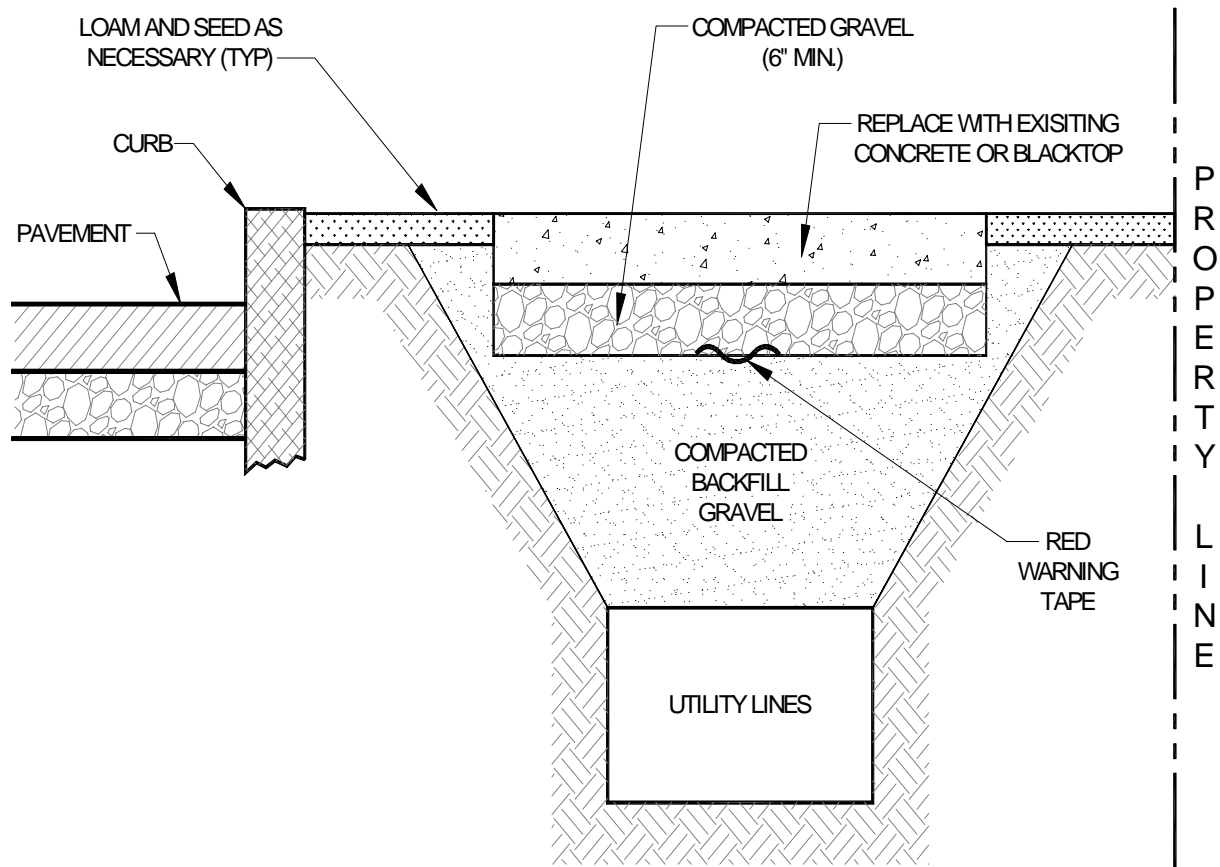
MINIMUM ELECTRIC REQUIREMENTS
FOR STATE ROADS

Notes

1. Developer shall be responsible for the requirements of specific local and/or state permits
2. Base material must be 4" of bituminous concrete base Type I-1, for state roads
3. Finish material must be 3" of bituminous concrete top Type I-1 laid in two courses each with a 1 ½" thickness.
4. State roads require that infrared method be performed in conjunction with permanent patch to create a smooth driving surface consistent with existing roadway. This mix must be machine laid. The district office must be notified two days prior to starting work on state roads so that an inspector may be assigned.
5. Concrete encasement as required per D3820 Section VII and standard C1100 for all state roads. Typical conduit bank road crossings shall be encased.

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TYPICAL TRENCH/EXCAVATION IN THE PUBLIC WAY SIDEWALK CROSSINGS
FIG-5



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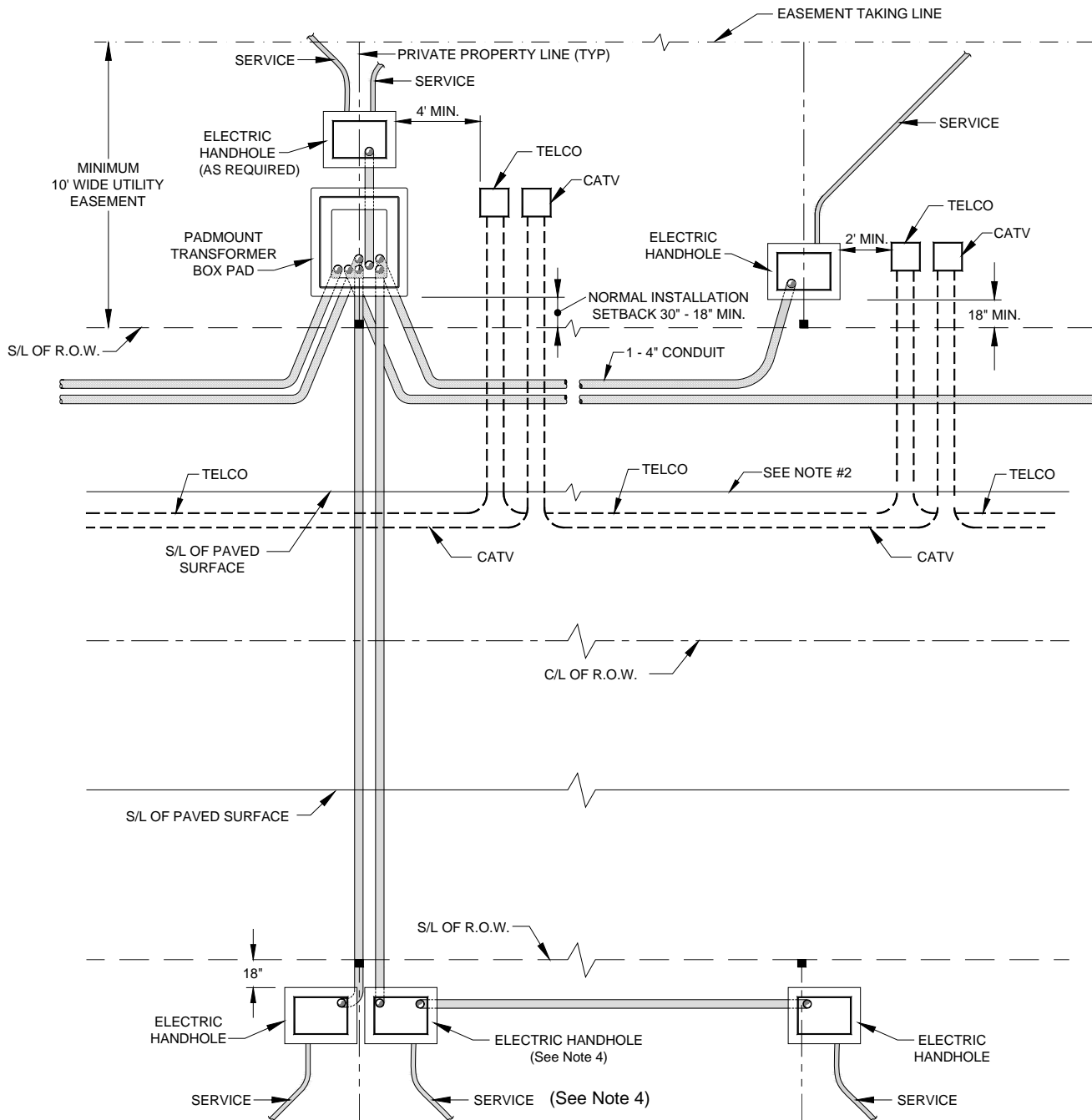


D3820
Rev 0

Page 23 of 34

PLAN VIEW OF TYPICAL TRANSFORMER BOX PAD, PULL BOX, HANDHOLE,
AND CONDUIT LOCATIONS

FIG-6



Notes:

1. See FIGS. 7 and 8 for typical primary secondary road crossing elevations. Duct lines crossing street shall typically be perpendicular to the edge of the street.
2. Minimum of 3' from S/L of hard surface to C/L of trench.
3. Refer to FIG-2 for pad grounding details.
4. If only one lot is to be served across the street, the 2nd hand hole may not be needed.

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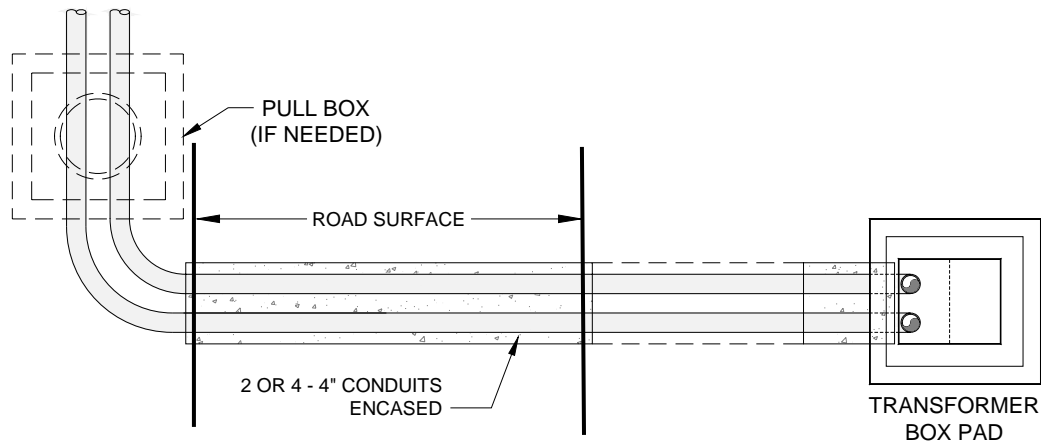


D3820
Rev 0

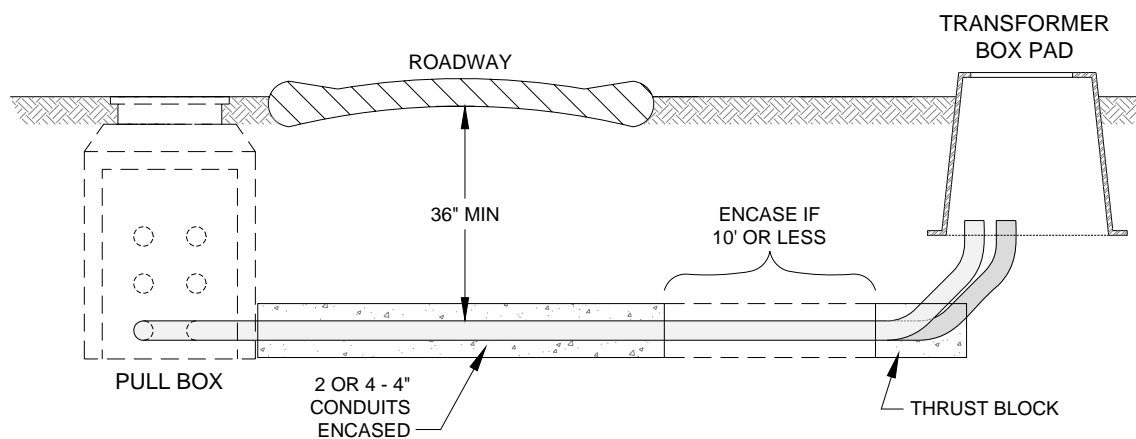
Page 24 of 34

TYPICAL PRIMARY ROAD CROSSING TO TRANSFORMER BOX PAD

FIG-7



PLAN VIEW



SIDE VIEW

Notes:

1. All primary use ducts for main line and box pad taps shall enter into opposite ends of the pull box only (not on sides). Bell ends and pull lines shall be installed per C1100.
2. Pull box or manhole outlined above may be required for future use or installations that have excessive sweeps and/or pull lengths. See Section VII-B.

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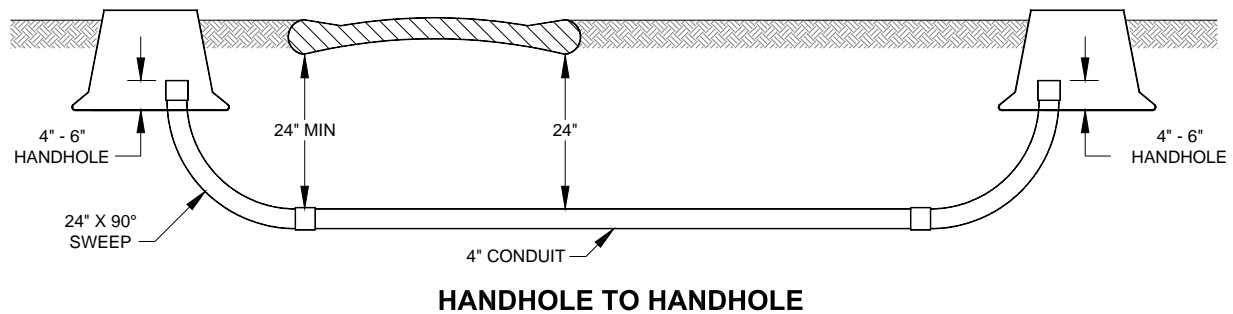
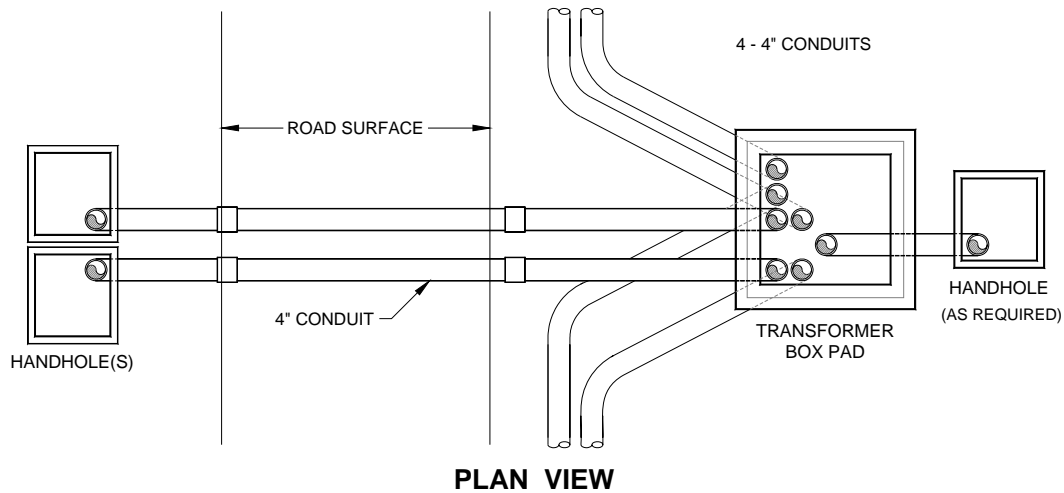
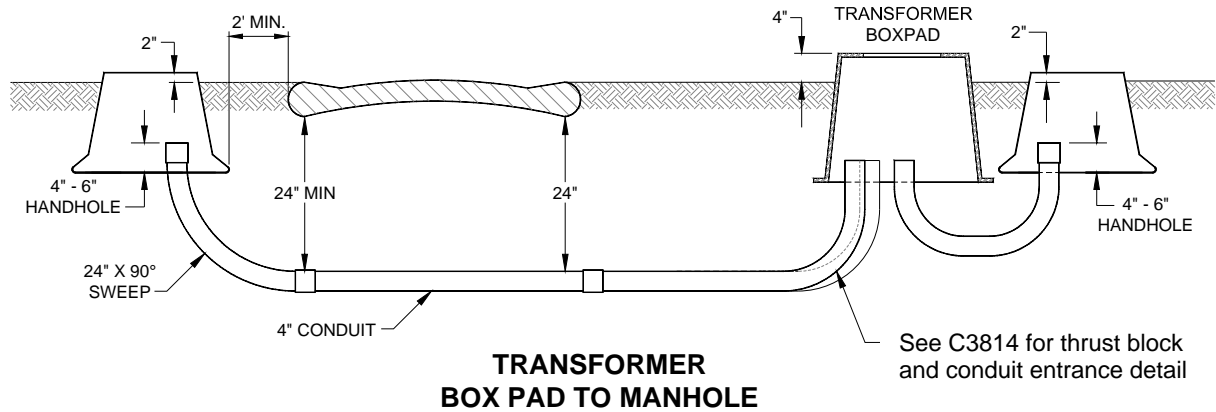


D3820
Rev 0

Page 25 of 34

TYPICAL SECONDARY ROAD CROSSING

FIG-8



Notes:

1. Conduit, bell ends, and pull lines shall be installed per C1100.
2. Handhole and Box Pad installation details shall conform to C3814.

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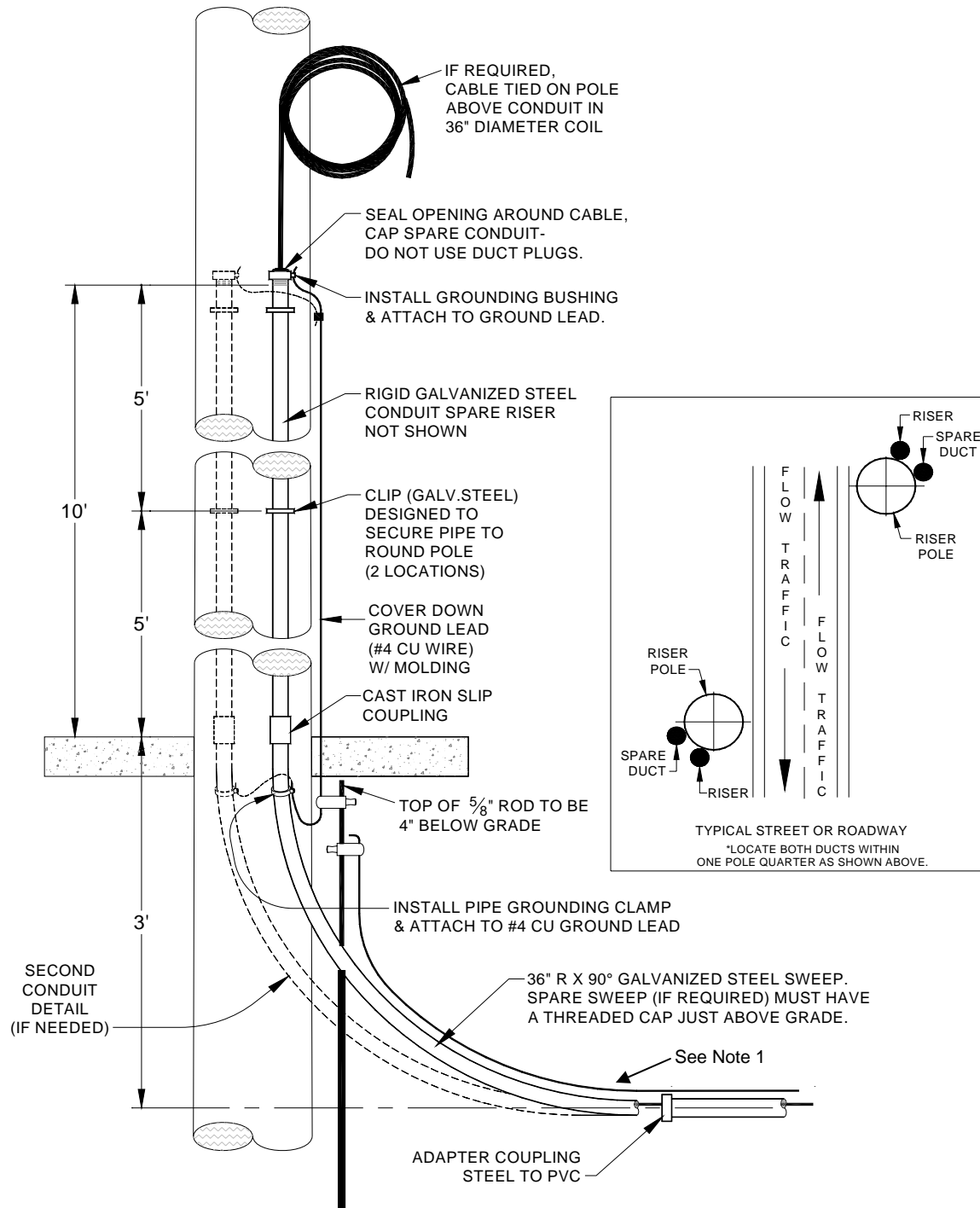


D3820
Rev 0

Page 26 of 34

PRIMARY RISER POLE (See C1100)

FIG-9A



Notes:

1. NSTAR south areas only - #2 bare copper wire (direct buried counterpoise) shall connect riser pole ground to the first pad/switch/manhole grounding ring.
2. Exothermic connections (Cadweld) are acceptable for buried connections.

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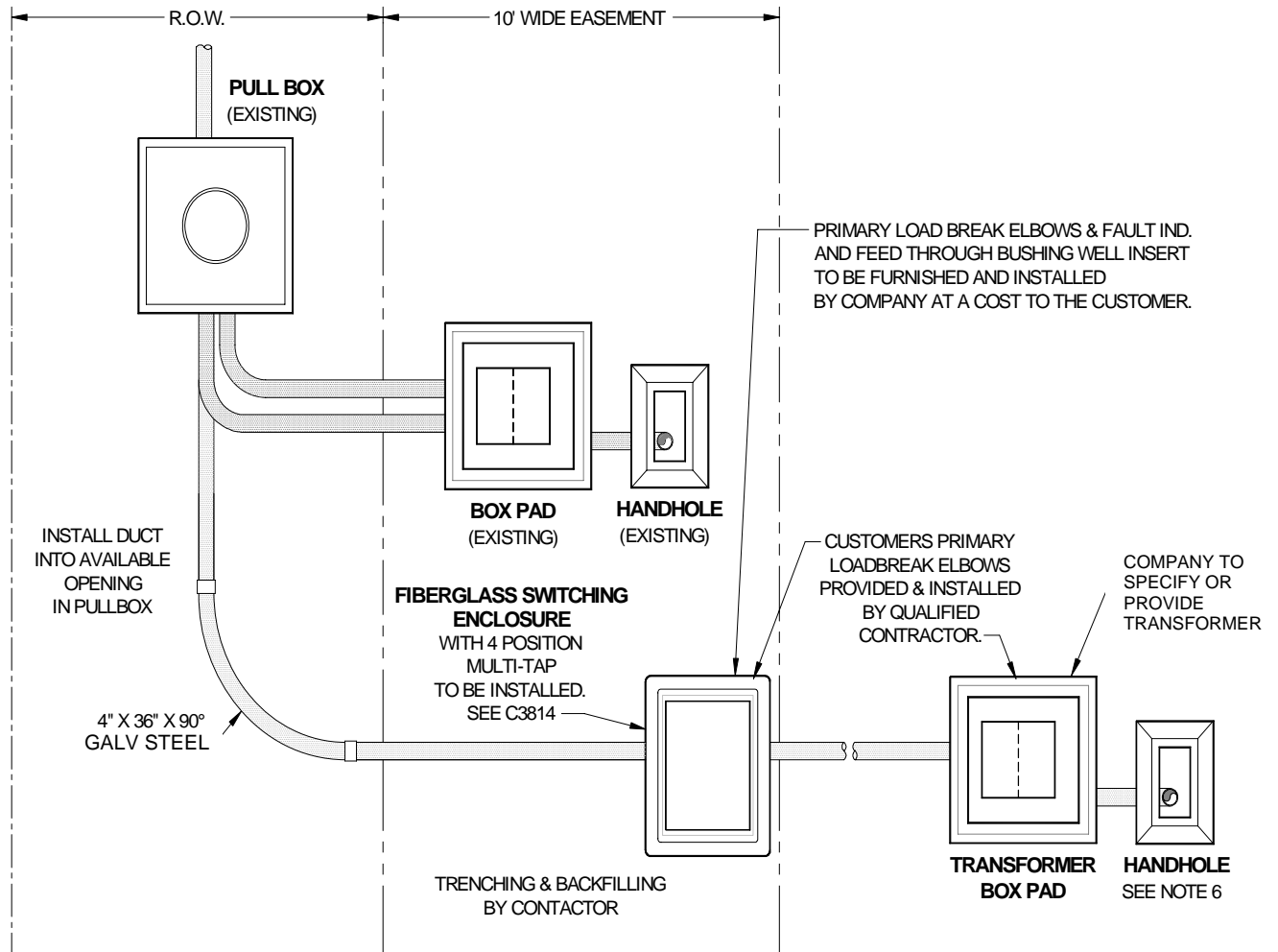


D3820
Rev 0

Page 28 of 34

**SINGLE PHASE PRIVATELY OWNED UD SYSTEM SUPPLIED FROM
EXISTING MANHOLE/PULL BOX FOR SECONDARY METERING**

FIG-10A



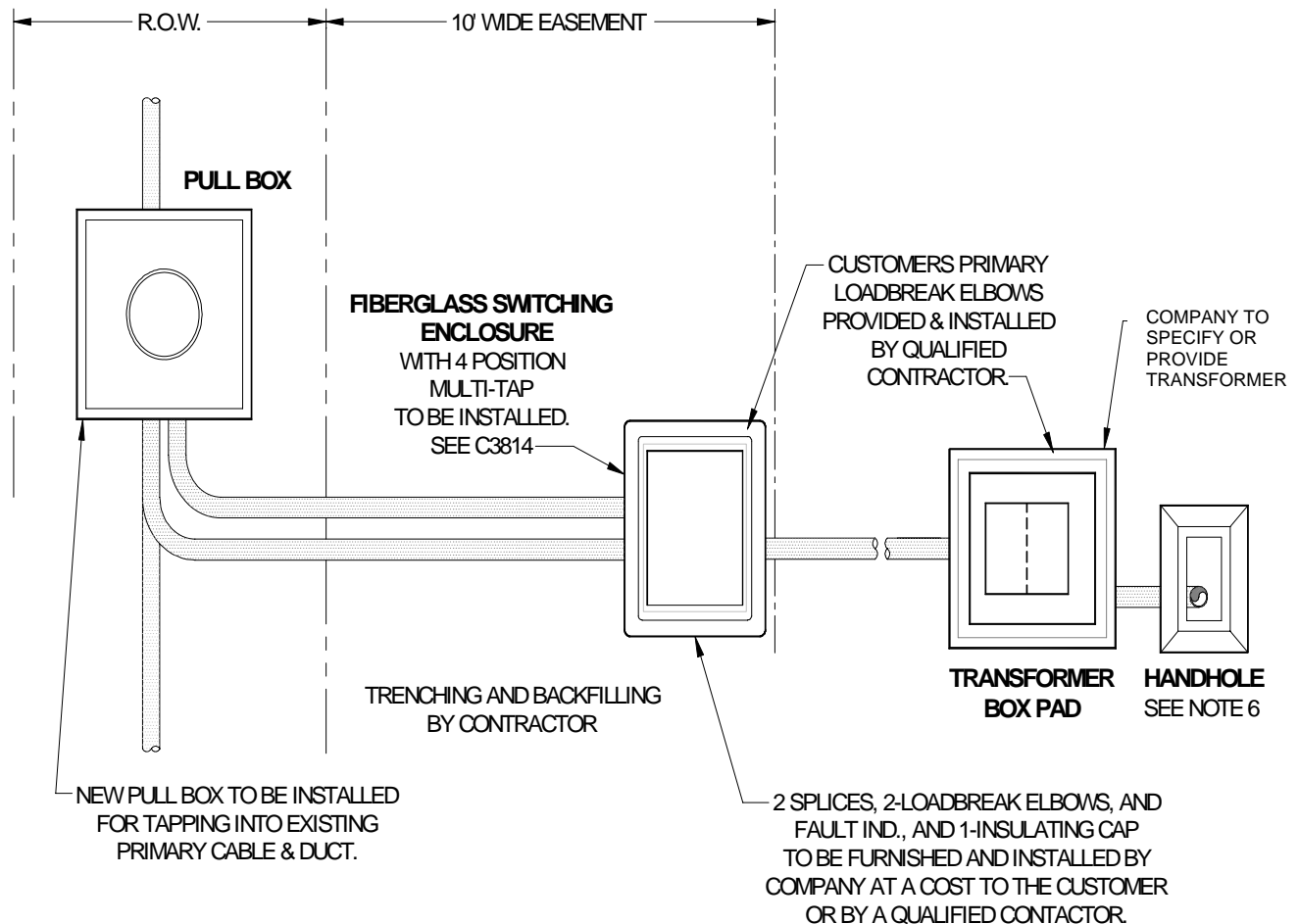
Notes:

1. This standard will apply when it is determined by the Company that existing facilities are suitable to provide new primary service.
2. Pad location must be accessible to trucks for maintenance purposes, therefore location must be agreeable to Company. (Maximum 10' – 12' off traveled way. (See C3802)
3. Customer to provide easement prepared by the Company for placement of Company owned transformer on private property.
4. The installation of the primary cable as provided and installed by the Contractor must meet all Company specifications. All installations shall be inspected and approved prior to backfilling.
5. A high-voltage acceptance test is needed on all primary cable and accessories - see section IX.
6. Hand hole may be required behind transformer pad for service connections.
7. Refer to Dwg. FIG-2 for grounding detail. (Enclosure and transformer pad).
8. Fusible loadbreak elbow may be required by the Company at customer expense.

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**SINGLE PHASE PRIVATELY OWNED UD SYSTEM SUPPLIED FROM
NEW MANHOLE/PULL BOX FOR SECONDARY METERING**

FIG-10B



Notes:

1. This standard will apply when there are no existing facilities suitable to provide new primary service. Note: Multi-Tap enables the customer's service to be isolated as required.
2. Pad location just be accessible to trucks for maintenance purposes, therefore location must be agreeable to Company. (Maximum 10'-12' off traveled way. See C3802)
3. Customer to provide easement prepared by the Company for placement of Company owned transformer on private property.
4. The installation of the primary cable as provided and installed by the Contractor must meet all Company specifications. All installation shall be inspected and approved prior to backfilling.
5. A high-voltage acceptance test is needed on all primary cable and accessories - see Section IX.
6. Hand hole may be required behind transformer pad for service connections.
7. Refer to Dwg. FIG-2 for grounding detail. (for enclosure and transformer pad).
8. Fusible loadbreak elbow may be required by the Company at customer expense.

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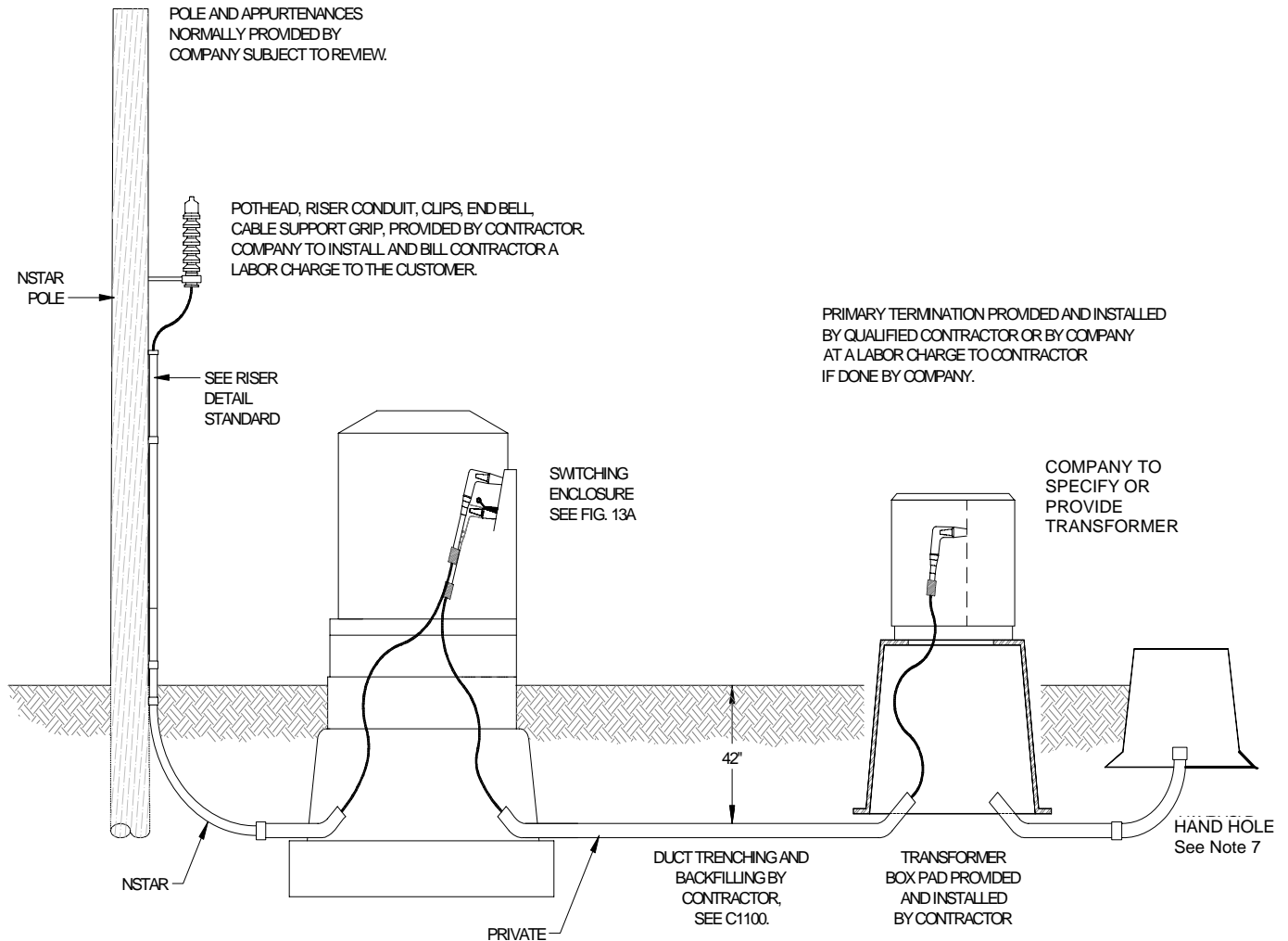


D3820
Rev 0

Page 30 of 34

**SINGLE PHASE PRIVATELY OWNED UD SYSTEM SUPPLIED
FROM OVERHEAD DISTRIBUTION COMPANY POLE**

FIG-11



Notes:

1. Pad location must be accessible to trucks for maintenance purposes, therefore location must be agreeable to Company.
2. Customer to provide easement prepared by the Company for placement of Company owned transformer on private property.
3. The installation of the primary cable as provided and installed by the contractor must meet all Company specifications. All installations shall be inspected and approved prior to backfilling.
4. A high-voltage acceptance test is needed on all primary cable and accessories- see Section IX.
5. Refer to Dwg. FIG-2 for grounding detail. (Enclosure and transformer pad)
6. Refer to Dwg. FIG-9 for riser pole detail.
7. Hand hole may be required behind transformer and for service connections.
8. Fusible loadbreak elbow may be required by the Company at customer expense.

ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 31 of 34
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SINGLE PHASE DEAD-FRONT PAD MOUNTED TRANSFORMER (M3902) FIG-12

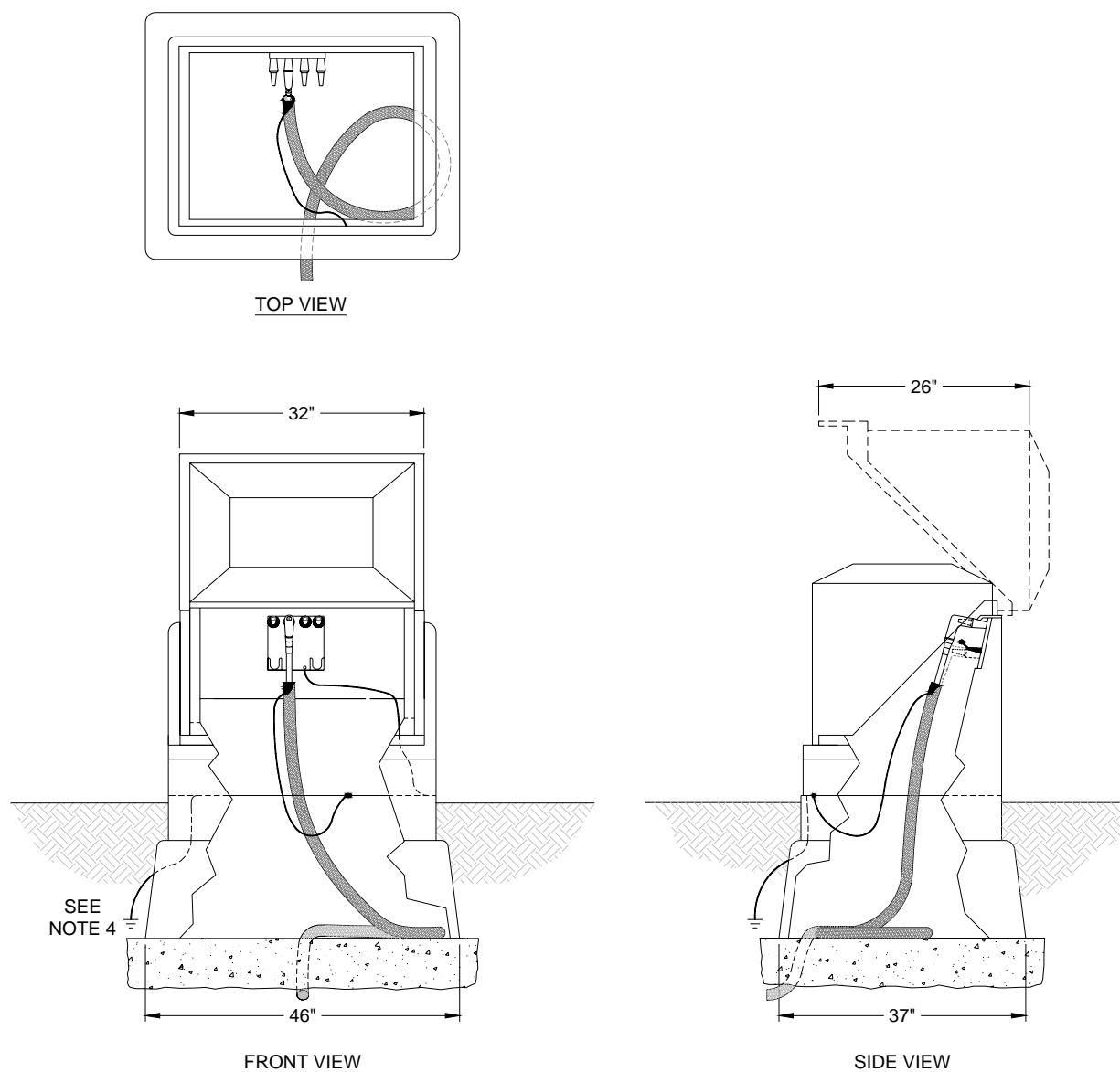


NOTES:

1. Interconnect all grounds; concentric neutral, transformer tank, and ground lead. Refer to FIG-2 for grounding detail
2. Primary bushing must have either an elbow connector or an insulated cap. The plastic cover provided is only a dust cap, not an insulated cap.
3. The primary concentric neutrals must be connected together. A tap from this connection will be made to both of the transformer tank grounding studs.
4. All cables must be clearly marked as to where they go TO (Manhole, Pad or Riser pole number) using slide on black on yellow 1" plastic tags equivalent to Tech Products Type ELVY.
5. For single-phase transformer pad details see NSTAR Construction Standard C3814.

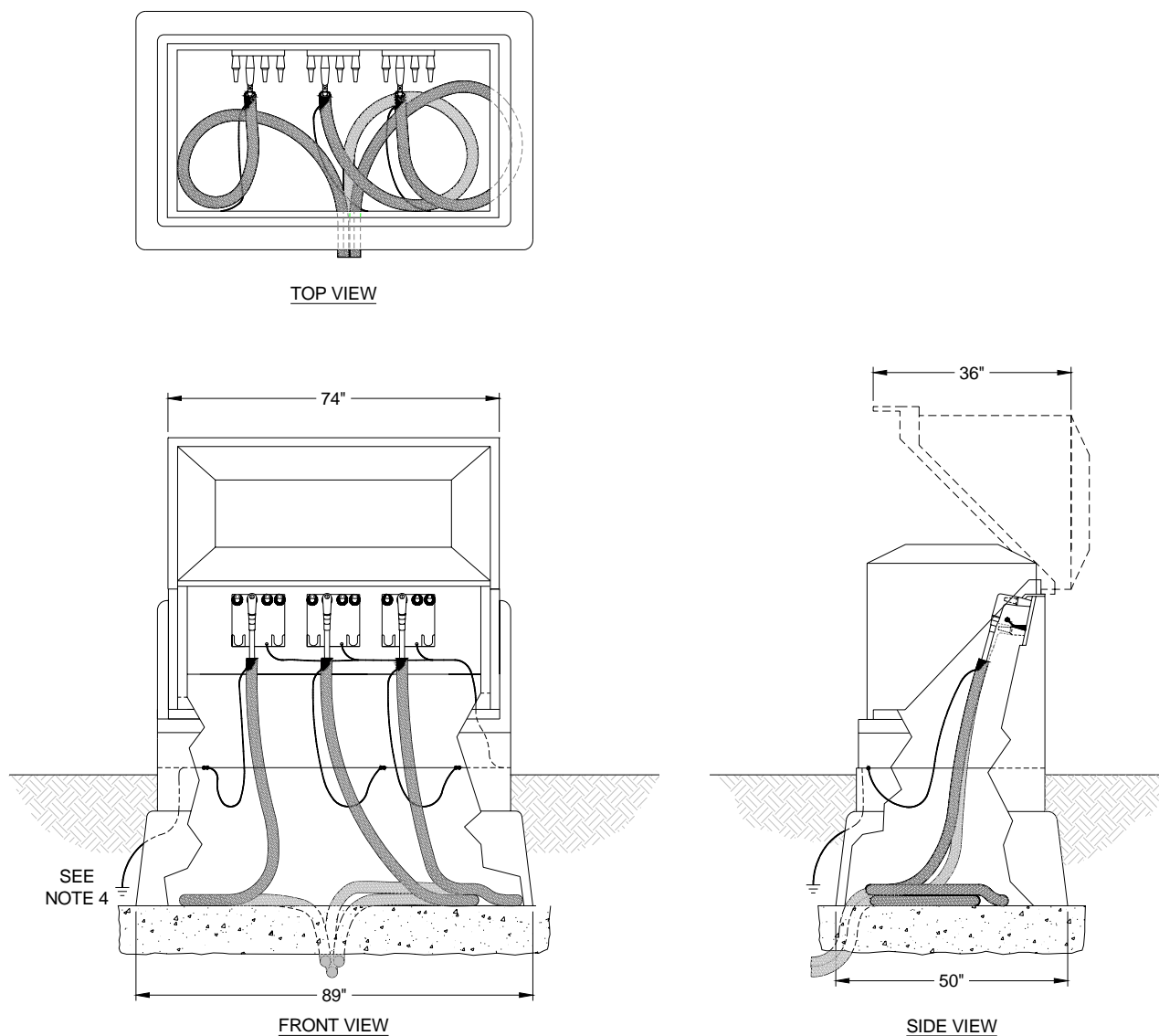
ISSUED 31-Aug-09	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 Rev 0 Page 32 of 34
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SINGLE PHASE CABLE SWITCHING ENCLOSURE, 15 & 25kV

FIG-13A

Note:

1. Enclosure installed per C3814; dimensions shown here are approximate.
2. Install 4" conduits with bell ends unless otherwise required by design.
3. Cables terminated w/elbows per C2012. Fusible elbows may be required by the Company.
4. Grounding in accordance with Dwg. FIG-2 and then connected to the ground ring bus.

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THREE PHASE CABLE SWITCHING ENCLOSURE, 15 & 25kV**FIG-13B****Notes:**

1. Enclosure installed per C3814; dimensions shown here are approximate.
2. Install 4" conduits with bell ends unless otherwise required by Company design.
3. Cables terminated w/elbows per C2012. Fusible elbows may be required by the Company.
4. Grounding in accordance with Dwg. FIG-2 and then connected to the ground ring bus.

<p>ISSUED 31-Aug-09</p>	<p>DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	<p>D3820 Rev 0</p> <p>Page 34 of 34</p>
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XI Approval Signature

Approved by: Amin Jessa
Director, Distribution Engineering

<p>ISSUED 24-Apr-08</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p></p>	<p>C1100</p> <p>Revision 0 Page 1 of 25</p>
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****This Standard Supersedes BECo 2.10-2.1, COM/Elec NEFA****

DISTRIBUTION DUCTBANK CONSTRUCTION AND MATERIALS

Table of Contents

	page
1) <u>Scope</u>	2
2) <u>General</u>	2
3) <u>Conduit & Fittings Specifications</u>	2
4) <u>Conduit Plan and Records/Data Requirements</u>	2
5) <u>Application</u>	3
6) <u>Excavation, Backfill and Street Restoration</u>	3 - 4
7) <u>Installation</u>	4 - 5
8) <u>Breaking into existing Manholes</u>	6
9) <u>Compatible Unit Format for Conduit & Fittings</u>	6 - 7
10) <u>Ductbank Compatible Units</u>	7
11) <u>Bill of Materials/Compatible Units – Conduit, Fittings & Access</u>	8 - 11
12) <u>Typical Construction Plans</u> (Figures A – G).....	12 - 18
13) <u>Duct Bank Cross Sections</u> (Figures 1 – 23).....	19 - 24
14) <u>Conduit Bank Concrete Requirements and Weights/linear Ft.</u>	25
15) <u>Reference Standards</u>	25
16) <u>Signature Approval</u>	25

ISSUED 24-Apr-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 Revision 0 Page 2 of 25
---------------------	--	---

1.0 **Scope**

The purpose of this standard is to provide ductbank construction details, installation requirements and material lists for concrete-encased and direct buried conduit systems.

2.0 **General**

- 2.1 All excavation, backfill and paving shall be done In accordance with this standard and all applicable local and state regulations. When conflicts exist between local/state regulations and this standard the more stringent requirement shall be adhered to unless otherwise directed by NSTAR.
- 2.2 Before placing concrete within ductbank forms and backfilling an NSTAR inspection is required to ensure compliance with all referenced specifications.
- 2.3 DIG Safe marking and notification regulations are to be understood and adhered to during all construction.
- 2.4 All NSTAR safety standards as well as all applicable OSHA and DOT worker safety requirements shall be adhered to at all in times. Refer to NSTAR Work Method Standard, "W1000, Entering and Working in Underground Locations including Subsurface Vaults" specific requirements.

3.0 **Conduit & Fittings Specifications**

All encased conduit shall be PVC conduit (Type EB) and fittings shall be schedule 40 unless otherwise specified by NSTAR. Direct buried conduit and fittings shall be schedule 40 minimum. Refer to NSTAR Material Standard "M1000, PVC Conduit & Fittings" for details.

4.0 **Conduit Plan and Records/Data Requirements**

- 4.1 All proposed electric utility plans shall be approved by NSTAR local engineering dept. before construction begins. New subdivision or commercial development plans to be submitted for local authority petitions (town approval) shall also be provided to NSTAR as AutoCAD data files. These shall show all proposed and existing utility plan view layers including electric, gas, water, sewer, drain, cable/data, telephone, and fire alarm.
- 4.2 The proposed electric utility plans shall include profile views that show relative elevation and clearances where proposed electric duct banks or lines intersect with non-electric utilities. Separation in any direction from electric to other utilities of 12" or less shall be detailed on the drawings.

ISSUED 24-Apr-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 Revision 0 Page 3 of 25
---------------------	--	---

- 4.3 GPS land based x-y-z coordinates shall be in NAD83 state plane feet format, with a minimum one foot accuracy. These plans shall show the road layout, curb lines, property lines (parcel boundaries), utility easements and utilities. Center coordinate positions shall be provided for all new manholes/pull boxes, equipment pads, and riser poles. Conduit location coordinates shall be provided at every 50 ft on straight sections or curves with less than 5 degree radii, and at every 20 ft for curves/sweeps over 5 degrees. GPS data for new conduit and infrastructure shall have accuracy of 6 inches or better.
- 4.4 Contractor shall provide NSTAR Survey and Records department (or local engineering) with as-built new facility location data in electronic file format within 20 business days of completing the project (CD or EFT). All files shall be labeled with the project title, town, NSTAR work order number and date of completion.

5.0 Application

- 5.1 Typically all primary and secondary distribution duct banks shall be unreinforced concrete encased using Type EB conduit. Stocked fittings are generally Schedule 40 unless otherwise specified.
- 5.2 If the interval between concrete pours for a continuous duct bank is expected to be more than 4 hours apart, industry standard construction joints shall be formed to ensure that the continuation of the ductbank pour shall create an interlocking joint between different pours. Refer to Figure "E" for detail.
- 5.3 The concrete specified for ductbanks shall be an approved 2500 psi pea stone mix using Type 2 Portland cement.
- 5.4 Reinforced distribution ductbanks maybe required per NSTAR for locations where ductbanks cross over other utilities and/or a future excavation could expose NSTAR ductbank without support. Reinforced ductbanks may also be required when installation is in soils that do not meet NSTAR specified backfill. For reinforced concrete ductbank standards refer to NSTAR Construction Standard, "C1101, Distribution Duct bank Construction, and (Steel Reinforced Concrete)".
- 5.5 Exceptions to concrete encased ductbanks, i.e. direct buried conduit, may be allowed by NSTAR for secondary conduits installed off roadways and areas not subject to vehicle loads such as greenbelts and yards. Also when approved by NSTAR, single or double primary conduit runs in URD residential subdivisions may be direct buried as long as minimum schedule 40 conduit is used and local regulations allow it.

6.0 Excavation, Backfill and Street Restoration

- 6.1 Excavation
The roadway surface shall be cut in reasonably straight and parallel lines using a jackhammer, saw or other accepted method to insure the least amount of damage to the roadway surface.

ISSUED 24-Apr-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 Revision 0 Page 4 of 25
---------------------	--	---

Sheeting and bracing shall be required for excavations in excess of 5 feet deep in accordance with the latest OSHA Standards.

6.2 Backfill Material

- A. Backfill material shall conform to "MHD M1.03.1 Process Gravel for Subbase". Backfill shall be mechanically compacted in eight inch (8") loose layers to 95% of the maximum density per ASTM D1557 unless otherwise approved by NSTAR.
- B. Excavated material that has been evaluated as unsuitable for backfill shall be removed from the site and disposed of properly.
- C. If directed by NSTAR only "Type IE", (Controlled Density Fill, "CDF", or excavatable flowable fill), shall be used as backfill in certain instances, such as filling hard to reach areas where maneuvering compaction equipment would be difficult or when directed by the governing municipality.
- D. Note, NSTAR approved red caution tape, marked "CAUTION ELECTRIC LINES BURIED BELOW", shall be installed 6-9 inches below surface grade, centered above the buried line or ductbank.
- E. Backfilling shall not commence less than two hours after the duct bank concrete has been placed.

6.3 Street Restoration

All street paving of open excavations shall be restored using temporary or Interim pavement with two – 1-1/2 inch lifts of compacted hot mix asphalt binder (unless otherwise noted by NSTAR). Cold patch repairs when approved by NSTAR shall be cold patch NSTAR Cat ID 1628. Permanent street paving shall be by the governing municipality.

7.0 Installation

- 7.1 Duct Bank Forms – In general duct banks shall be constructed using forms for the sidewalls. Where suitable stable soil conditions exist the trench walls may be used to form the sidewalls. Duct bank standards shall be maintained.
- 7.2 Common Trench – Other utilities sharing a common trench with NSTAR ductbank shall not be enveloped within the same concrete formed encasement, but shall be separate from our encasement and a minimum clearance of 12 inches away.
- 7.3 Cutting Duct – Use a fine tooth wood saw to cut conduit. All ruff or abrasive edges shall be sanded smooth.
- 7.4 Duct Plugs – NSTAR approved duct plugs shall be installed in all open conduit. The plugs shall be installed during construction when a conduit installation is

ISSUED 24-Apr-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 Revision 0 Page 5 of 25
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partially complete to manhole or equipment as well as at all terminations in manholes.

- 7.5 Joining Duct – All conduit ends shall be cleaned by wiping off all dust, dirt and moisture from the surfaces to be cemented and brushed gently with a fine abrasive paper or cloth. Apply the approved PVC solvent cement with a non-synthetic bristle brush evenly coating the full length PVC socket of the fitting. Refer to manufacturers' instructions for additional detail.
- 7.6 Depth of Cover – The minimum depth of cover over a single conduit or multiple duct bank shall be 36 inches unless otherwise directed by NSTAR. In limited situations NSTAR may allow shallow depth ductbank installations less than 36 inches. Prior approval from NSTAR is required for shallow depth construction as well as the requirement to use ¼ inch thick steel plates above and adjacent to the side wall of the ductbank.
- 7.7 Clearance– The minimum clearance between an NSTAR conduit or ductbank and any other subsurface structure or utility (EXCEPT Steam Lines) shall be 12 inches unless otherwise approved by NSTAR. Steam lines shall maintain a 10 ft. minimum from NSTAR ductbank or lines.
- 7.8 Conduit Spacers – Conduit Spacers shall be of the approved type per NSTAR Material Standard, "M1000, PVC Conduit and Fittings". Spacers shall be installed at typically 5 ft. spacing (7 ft. maximum) along the ductbank. Refer to Figure "B" for conduit construction plastic spacers details.
- 7.9 Conduit Sweeps and Bends – Conduit heat bending is not allowed. All sweeps and bends shall be constructed using pre-fabricated approved fittings. Refer to "Table 3 – Conduit Sweeps and Angle Fittings".
- 7.10 Mandrel – Upon completion of the duct bank installation or direct buried ducts, a standard flexible mandrel, (not less than 12 inches long with a diameter not less than ½ inch less than the inside diameter of the duct) shall be pulled through each duct to loosen particles of earth, sand and other foreign material left in the line. A brush with stiff bristles shall then be pulled through each duct to remove the loosened particles. The diameter of the brush shall be the same as, or slightly larger than the diameter of the duct.
- 7.11 Building Wall Construction – When conduit or ductbank enters a structure and differential settlement is expected, construction details shall be per Figure "C".
- 7.12 Riser Construction – When conduit transitions from underground to above ground a galvanized steel conduit with a 36 inch radius sweep shall be used. For typical riser construction details refer to Figure "D".
- 7.13 All conduit shall have "mule tape" or equal, i.e. pulling tape made of woven polyester with a strength of 2500 lbs. installed within.
- 7.14 Transposition of Ducts – When ducts leaving one manhole/pad/equipment foundation require altering the duct bank cross section along the run, the revised configuration (and corresponding duct numbering) shall be as shown on Figure "G" unless otherwise approved by NSTAR.

ISSUED 24-Apr-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 Revision 0 Page 6 of 25
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8.0 Breaking into existing Manholes

- 8.1 Manhole breaks for new ductbank penetrations shall receive prior approval from NSTAR inspector. Contractors must be pre-qualified by NSTAR to work in or break into live manholes. Sidewall breaks are generally not allowed unless prior approval from NSTAR inspector.
- 8.2 All newly formed bell mouths shall be installed per Figure "F".

9.0 Compatible Unit Format for Conduit & Fittings

The Compatible Unit format for Conduit & Fittings, which are considered Non-electric Facilities, is described below:

- 9.1 Conduit, Banks and Riser CU Formats -unit lengths are noted in CU title:

NC (Application/Material) (Size) - (Quantity {row x height})

(Application/Material) -

- D** – Direct Buried (schedule 40 PVC)
- E** – Concrete Encased PVC (Type EB with spacers needed)
- RP** – Riser PVC (pipe and sweep- schedule. 40)
- RS** – Riser steel (pipe and sweep – galv. steel)
- S** – Steel Conduit
- FLEX** – flexible PVC, schedule 40

(Size) – Conduit inside diameter (inches)

(Quantity) – Cross section, rows x height (greater than one only, if one leave blank)

Examples: NCE4-3x3: 3x3 duct bank, 4", PVC type EB

NCRS4: 4", galvanized steel, riser pipe and sweep

NCD2: single 2" schedule 40 PVC duct, direct buried

- 9.2 Conduit Fitting CU Formats:

NF (Material) (Size) - (Type) – {detail below}

(Material) – P – PVC schedule 40 or DB/EB, **S** – Steel, **I** - Iron

(Size) – Conduit inside diameter in inches

(Type) - SW – Sweeps & angle fittings in degrees

(Angle)-(Radius) - For 36 in. radius bends leave blank, show all others.

R - Reducers **(A side – B side)** – in inches

CAP - Riser Caps, **PLUG** – Duct Plugs, **CPL** – Straight Couplings

RADP - Riser Adapter, **FA** – Fairleader, **BEL40** – Endbell – Sch 40,

BELEB - Endbell – EB, **SLIP** – Slip Coupling, **SPLIT** – Split Repair

PS - PVC to Steel Coupling, **GND BUSH** – Grounding Bushing,

GNDUCONN – pipe ground connector

ISSUED 24-Apr-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 Revision 0 Page 7 of 25
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Examples: NFP4-SW90-24: 4", PVC, 90 degree angle sweep with 24 in radius
 NFP5-SW22: 5" PVC duct, 22.5 degree sweep, 36 in radius
 NFP6-CAP: 6" PVC riser cap (for spare)
 NFP5-CPL: 5" PVC straight coupling
 NFS4-GNDBUSH: 4" Grounding Bushing:

9.3 Conduit Accessory CU Formats:

NA (Material) - (Size option if any)

Material – **CM** - PVC cement, **MT** - marker tape, **FL**- fish line, **DX** - duxseal,
DF - duct foam, **CP** - cold patch, **FA** – fairleader

10.0 Ductbank Compatible Units

10.1 Ductbanks shall be designed using Compatible Units (CUs). The table below references the CUs for the most commonly used ductbanks for distribution construction. Refer to NSTAR Material Standard, "M1000, PVC Conduit & Fittings" for additional information.

10.2 Refer to Figure "E" for typical ductbank construction details.

10.3 Figures 1 thru 21 noted below refer to standard cross sections on pages 19-24.

DUCTBANK COMPATIBLE UNIT REFERENCE TABLE

Note: Each single duct bank CU includes 20 ft of trenching, needed lengths of conduit, spacers, concrete, backfill & resurfacing.

FIG	4" Ducts	5" Ducts	6" Ducts
1	NCE4-2x1	NCE5-2x1	NCE6-2x1
2	NCE4-3x1	NCE5-3x1	NCE6-3x1
4	NCE4-2x2	NCE5-2x2	NCE6-2x2
5	NCE4-3x2	NCE5-3x2	NCE6-3x2
8	NCE4-4x2	NCE5-4x2	NCE6-4x2
9	NCE4-3x3	NCE5-3x3	NCE6-4x2
13	NCE4-4x3	NCE5-4x3	NCE6-4x3
21	NCE4-4x4	NCE5-4x4	NCE6-4x4

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11.0 Bill of Materials and Compatible Units – Conduit, Fittings & Accessories – Tables 1- 6

Table 1 - PVC & Steel Conduit Only (not banks)					
Material	Size (ID)	Wall Thickness (Type/ Sch)	Unit Length (Ft)	Catalog ID	Compatible Unit
PVC – rigid	2	40	10	1197	NCD2
“	3	40	10	1198	NCD3
“	4	40	10	1195	NCD4
“	4	EB	20	1362	NCE4
“	5	40	10	1196	NCD5
“	5	EB	20	1363	NCE5
“	6	40	10	15174	NCD6
“	6	EB	20	16047	NCE6
PVC – flexible	1-1/2	40 flex	1	15968	NCFLEX1.5
“	2	40 flex	1	9480	NCFLEX2
“	2-1/2	40 flex	1	15969	NCFLEX2.5
“	3	40 flex	1	9481	NCFLEX3
“	4	40 flex	1	9482	NCFLEX4
Steel, Galv	2	40	10	9474	NCS2
“	3	40	10	1246	NCS3
Steel, Galv	4	40	10	1248	NCS4
“	5	40	10	1249	NCS5
“	6	40	10	15177	NCS6
Table 2 – Straight Couplings, Split Duct and Reducers (PVC to PVC Only)					
Material	Type	Size(s)	Application	Catalog ID	Compatible Unit
PVC	Straight Coupling	2	Joining	1208	NFP2-CPL
“	“	3	Joining	1209	NFP3-CPL
“	“	4	Joining	1210	NFP4-CPL
“	“	5	Joining	16375	NFP5-CPL
“	“	6	Joining	16355	NFP6-CPL
PVC	Split Duct	2	Repair	16873	NFP2-SPLIT
“	“	3	Repair	16874	NFP3-SPLIT
“	“	4	Repair	16875	NFP4-SPLIT
“	“	5	Repair	16876	NFP5-SPLIT
“	“	6	Repair	16831	NFP6-SPLIT

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PVC	Reducer	3 to 2-1/2	change dia.	13661	NFPR3-2.5
"	"	3 to 2	change dia	13639	NFPR-3-2
"	"	4 to 3	change dia.	16043	NFPR-4-3
"	"	5 to 4	change dia.	16044	NFPR-5-4
"	"	6 to 5	change dia.	16045	NFPR-6-5

Table 3 – Conduit Sweeps and Angle Fittings					
Material	Angle (deg)	Size (ID)	Radius	Catalog ID	Compatible Unit
PVC	5	4	N/A	1357	NFP4-SW5
"	"	5	N/A	1358	NFP5-SW5
"	"	6	N/A	16354	NFP6-SW5
"	22.5	3	13	15319	NFP3-SW22-13
"	"	4	36	1168	NFP4-SW22
"	"	5	36	1169	NFP5-SW22
"	"	6	48	16359	NFP6-SW22-48
PVC	45	3	13	15320	NFP3-SW45-13
"	"	4	36	1166	NFP4-SW45
"	"	5	36	1170	NFP5-SW45
"	"	6	48	16358	NFP6-SW45-48
"	90	2	18	1158	NFP2-SW90-18
"	"	3	24	1159	NFP3-SW90-24
"	"	4	36	1167	NFP4-SW90
"	"	4	24	16374	NFP4-SW90-24
"	"	4	16	7746	NFP4-SW90-16
PVC	90	4	48	16385	NFP4-SW90-48
"	"	5	36	1171	NFP5-SW90
"	"	5	60	16361	NFP5-SW90-60
"	"	6	36	16363	NFP6-SW90
"	"	6	60	16364	NFP6-SW90-60
Galv. Steel	90	2	30	16854	NFS2-SW90-30
"	"	3	30	1173	NFS3-SW90-30
"	"	4	36	9898	NFS4-SW90
"	"	5	36	9899	NFS5-SW90
"	"	6	36	15176	NFS6-SW90

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Table 4 – Underground Conduit Plugs and End Bells

Material	Description	Size (ID)	Ends	Catalog ID	Compatible Unit
PVC/rubber	Duct Plug	2	n/a	1634	NFP2-PLUG
"	"	3	n/a	1635	NFP3-PLUG
PVC/rubber	Duct Plug	4	n/a	1636	NFP4-PLUG
"	"	5	n/a	1637	NFP5-PLUG
"	"	6	n/a	16869	NFP6-PLUG
PVC	Sched 40 End Bell	2		9423	NFP2-BEL40
"	"	3		9424	NFP3-BEL40
"	"	4		9425	NFP4-BEL40
"	"	5		16428	NFP5-BEL40
"	"	6		16367	NFP6-BEL40
PVC	Type EB End Bell	2		16365	NFP2-BELEB
"	"	3		16366	NFP3-BELEB
"	"	4		1156	NFP4-BELEB
"	"	5		1157	NFP5-BELEB
"	"	6		16429	NFP6-BELEB

Table 5 – Pole Riser Sections including Fittings (Steel to PVC, Steel to Steel)

Material	Description	Size (ID)	Ends	Catalog ID	Compatible Unit
PVC	External Cap	2		16918	NFP2-CAP
"	"	3		16917	NFP3-CAP
"	"	4		9460	NFP4-CAP
"	"	5		16393	NFP5-CAP
"	"	6		16394	NFP6-CAP
Galv. Steel	Riser Pipe Section (steel sweep, 10 ft Rigid steel conduit, iron slip coupling & PVC-steel coupling)	2	sweep RS cond slip cplg thrd cplg	16854 9474 16351 9513	NCRS2
"	"	3	sweep RS cond slip cplg thrd cplg	1173 1246 1343 9514	NCRS3
"	"	4	sweep RS cond slip cplg thrd cplg	9898 1248 1345 1099	NCRS4

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Galv. Steel	Riser Pipe Section (steel sweep, 10 ft Rigid steel conduit, iron slip coupling & PVC-steel coupling)	5	Sweep RS cond slip cplg thrd cplg	9899 1249 1346 1100	NCRS5
"	"	6	sweep RS cond slip cplg thrd cplg	15176 15177 n/a 16368	NCRS6
Steel	Grounding Bushing	2	threads	15971	NFS2-GNDBUSH
"	"	3	"	1190	NFS3-GNDBUSH
"	"	4	"	1188	NFS4-GNDBUSH
"	"	5	"	1189	NFS5-GNDBUSH
"	"	6	"	16934	NFS6-GNDBUSH
Copper	Pipe Ground Conn.	2"	U bolt	9011	NFS2-GNDUCONN
"	Pipe Ground Conn.	4"	"	15363	NFS4-GNDUCONN
"	Pipe Ground Conn.	5"	"	15363	NFS5-GNDUCONN

Table 6 – Conduit Installation Accessories				
Material	Description	Size	Catalog ID	Compatible Unit
PVC Cement	All season, quick setting cement	Quart	1213	NA-CM
Marker Tape	Caution Tape to install over buried electric lines	1000 ft roll	9913	NA-MT
Fish Line	Pull line, 2500lb strength	3000 ft	16860	NA-FL
Duct Foam	Expands and seals around cables at duct mouths	13 oz can	1380	NA-DF
Dux Seal	Plug compound, nonhardening	Large, 5lb	1239	NA-DX5
"	"	Small, 1lb	9469	NA-DX1
Cold patch	Temporary Pavement	60 lb	1628	NA-CP
Fairleader	For Duct Mouths	3-5	1371	NA-FA

12.0 Typical Construction Plans - Figures A thru F

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C1100
Revision 0
Page 12 of 25

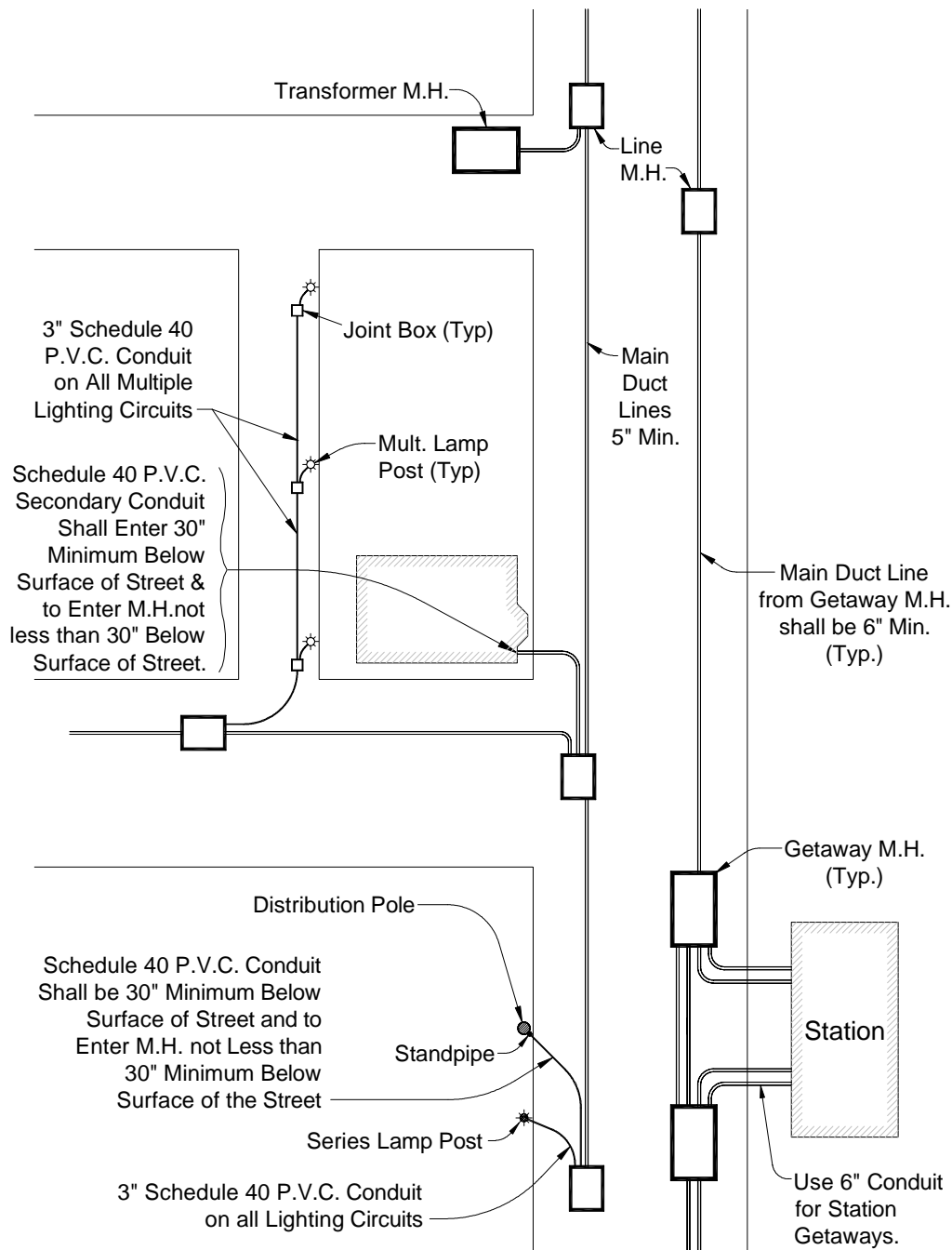


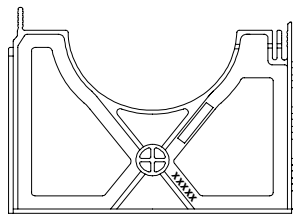
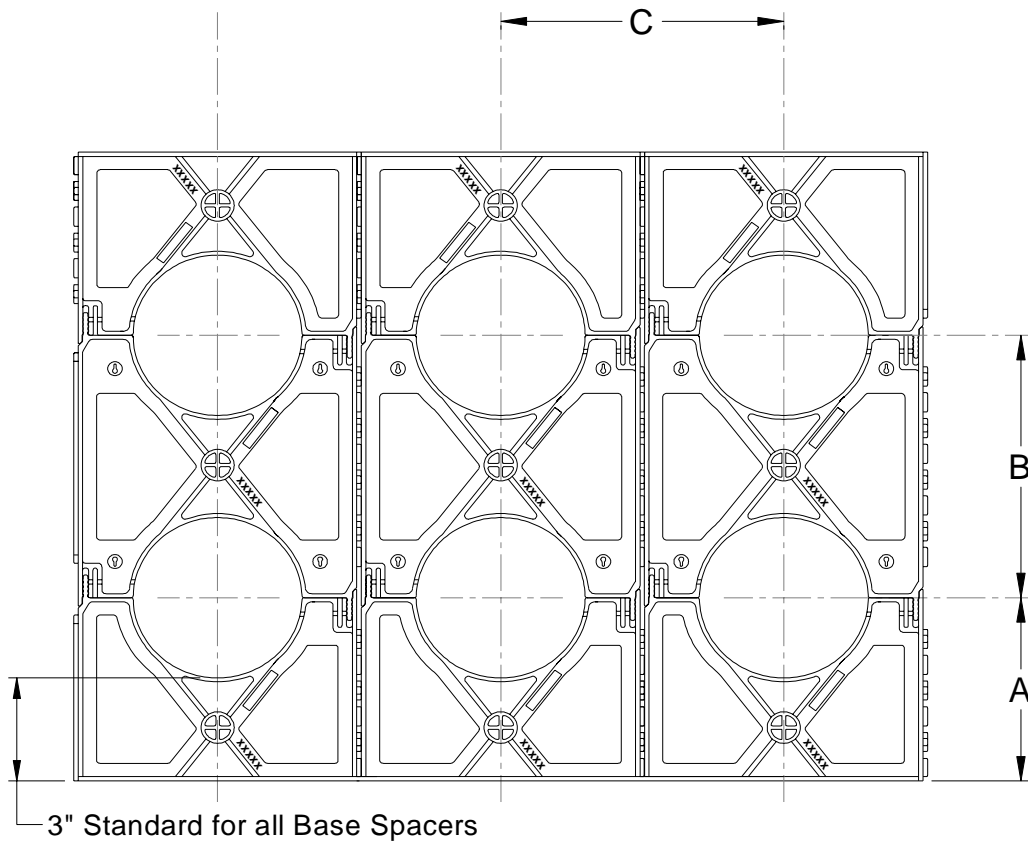
FIGURE A - PLAN VIEW
TYPICAL DISTRIBUTION CONDUIT CONSTRUCTION DETAILS

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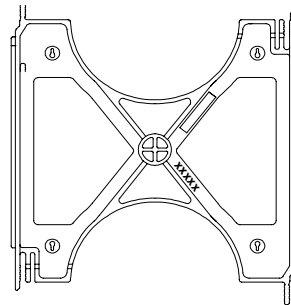
CONSTRUCTION STANDARD
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C1100
Revision 0
Page 13 of 25



BASE SPACERS



INTERMEDIATE SPACERS

Size	Spacing	A	B	C	Base Spacer; Cat. ID	Intermediate Spacer; Cat. ID
4"	1 1/2"	5.310	6.010	6.250	9462	9464
5"	1 1/2"	5.840	7.070	7.310	9465	9463
6"	1 1/2"	6.380	8.140	8.380	16378	16379

Note: Conduit spacers shall be installed every 5 ft. (7 feet maximum).

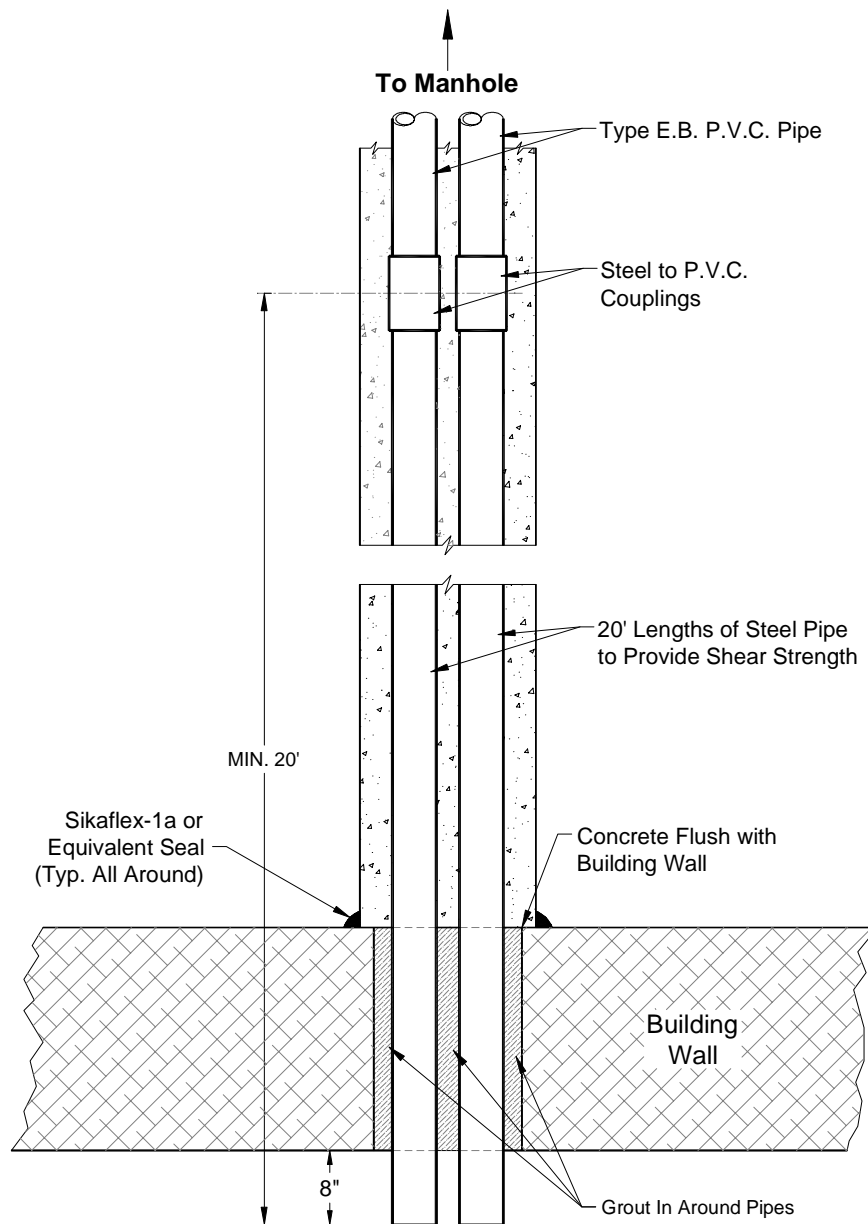
FIGURE B
CONDUIT CONSTRUCTION PLASTIC SPACER
(TYPICAL)

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C1100
Revision 0
Page 14 of 25



Note:

Building wall construction to be used wherever settlement of building or conduit is anticipated.

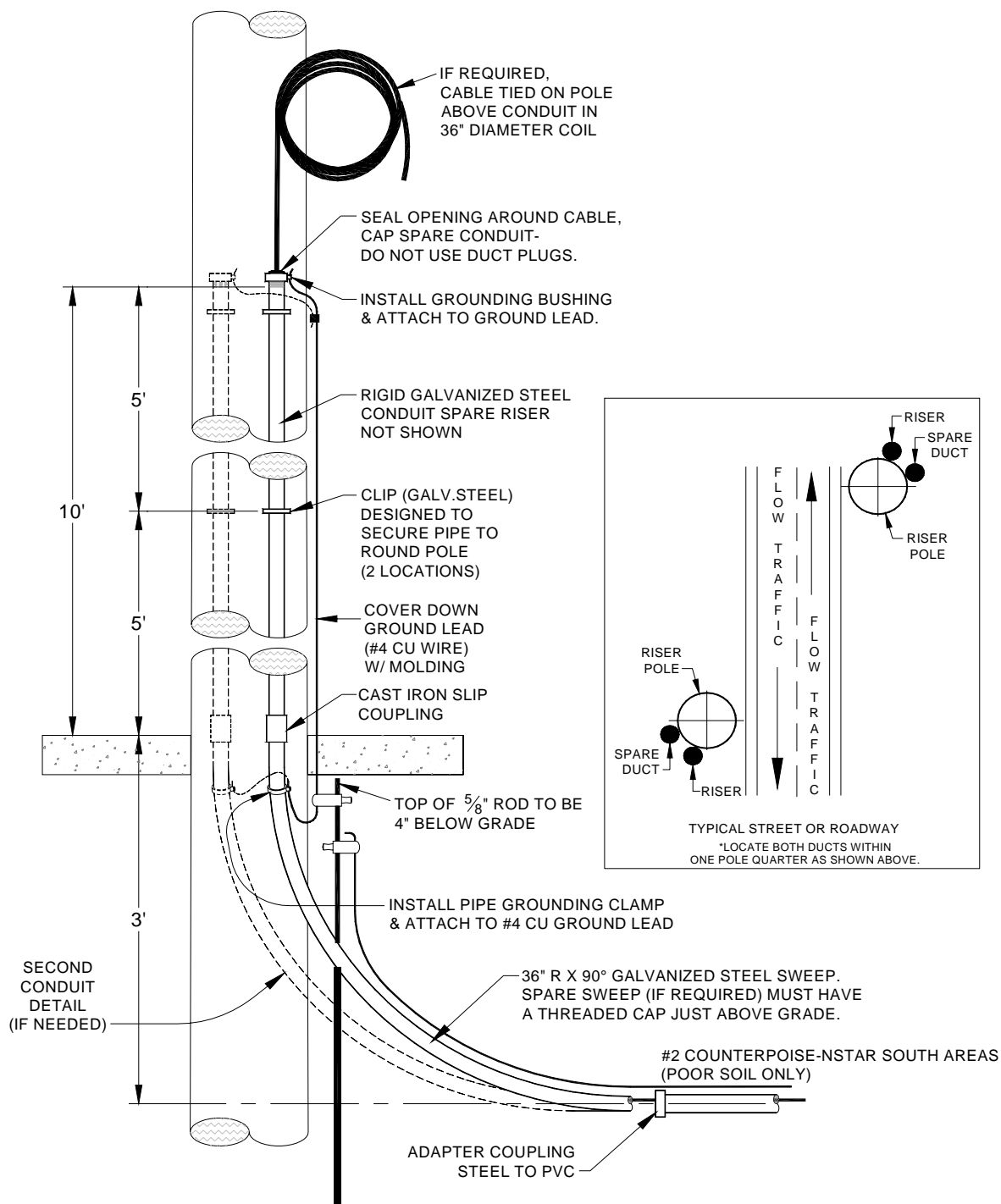
FIGURE C – PLAN VIEW
BUILDING WALL CONSTRUCTION

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CONSTRUCTION STANDARD
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C1100
Revision 0
Page 15 of 25



**FIGURE D – PROFILE
TYPICAL RISER CONSTRUCTION DETAIL**

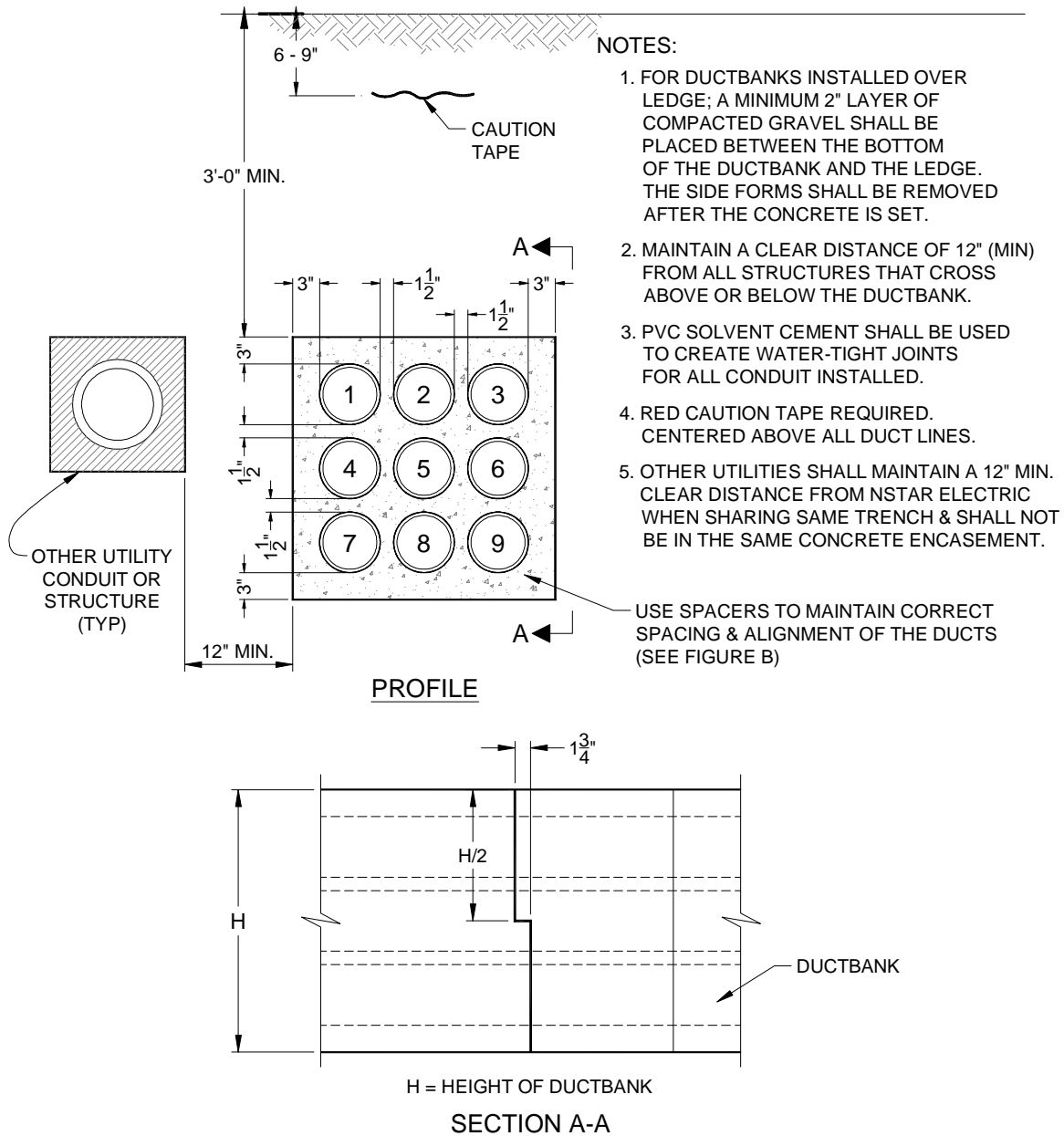
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CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C1100

Revision 0
Page 16 of 25



CONCRETE SPECIFICATION:

CONCRETE SHALL BE NORMAL WEIGHT WITH PEASTONE MIX,
2500 PSI @ 28 DAY COMPRESSIVE STRENGTH.
UNLESS OTHERWISE SPECIFIED, CONSTRUCTION SHALL CONFORM
TO ACI-318 (LATEST EDITION) WHERE REINFORCEMENT IS SPECIFIED.

FIGURE E – PROFILE & SECTION VIEWS
STANDARD UNREINFORCED CONCRETE DUCTBANK
CONSTRUCTION DETAILS

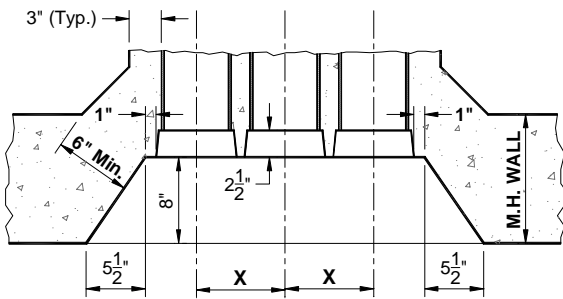
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ELECTRIC OPERATIONS ORGANIZATION

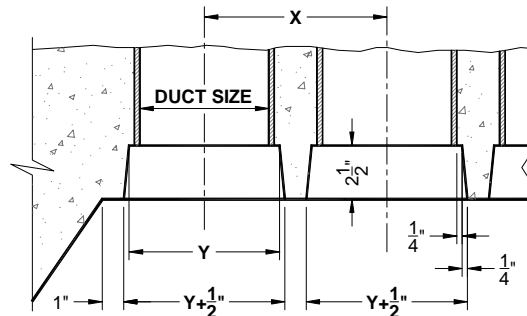


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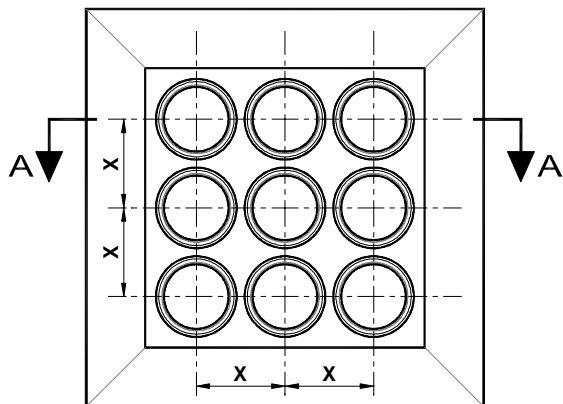
Revision 0
Page 17 of 25



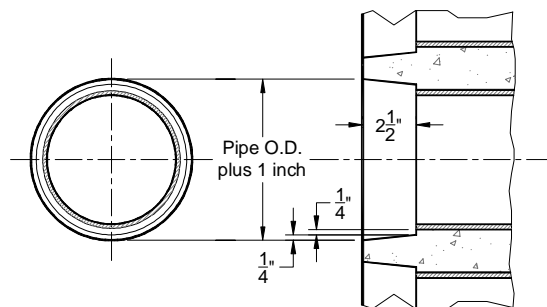
SECTION "A-A"



DETAIL OF DUCT MOUTH



DUCT FACE



DUCT MOUTH FOR SERVICE PIPES, ETC.

Duct Size	X	Y
4"	6 $\frac{1}{2}$ "	5"
5"	7 $\frac{1}{2}$ "	6"
6"	8 $\frac{1}{2}$ "	7"

Notes:

1. Ducts shall be 5" size unless otherwise specified.
2. Ducts shall be terminated with a matching schedule PVC end bell, which shall then be sealed around with mortar mix.

FIGURE F
MANHOLE BELLMOUTH CONSTRUCTION

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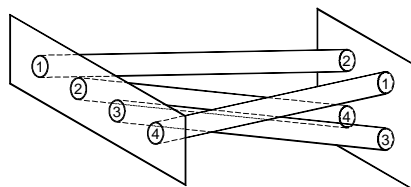


C1100
Revision 0
Page 18 of 25

This Standard Specifies the Typical Arrangement of Transposed Duct Numbering
as the Configuration changes from Horizontal to Vertical or vice versa.

Connect Left to Right
as Follows:

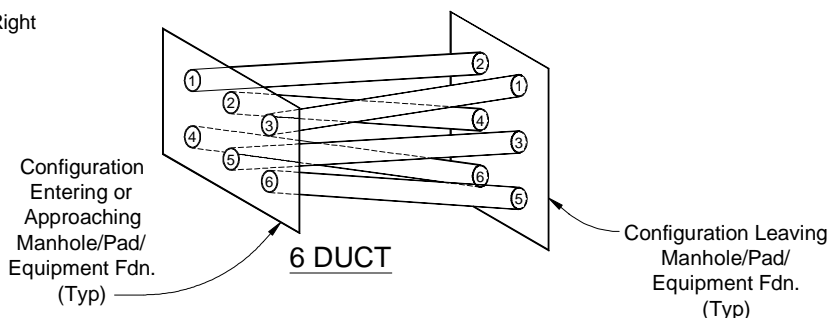
- 1 to 2
- 2 to 4
- 3 to 3
- 4 to 1



4 DUCT

Connect Left to Right
as Follows:

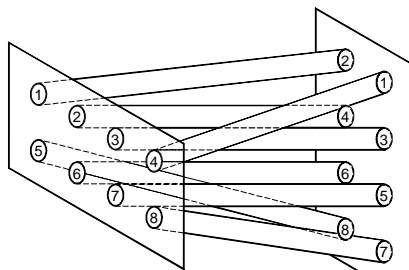
- 1 to 2
- 2 to 4
- 3 to 1
- 4 to 6
- 5 to 3
- 6 to 5



6 DUCT

Connect Left to Right
as Follows:

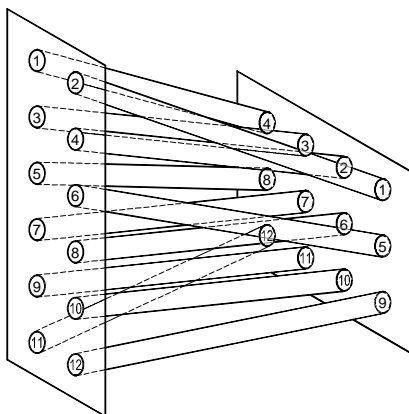
- 1 to 2
- 2 to 4
- 3 to 3
- 4 to 1
- 5 to 8
- 6 to 6
- 7 to 5
- 8 to 7



8 DUCT

Connect Left to Right
as Follows:

- 1 to 4
- 2 to 1
- 3 to 3
- 4 to 2
- 5 to 8
- 6 to 5
- 7 to 7
- 8 to 6
- 9 to 11
- 10 to 10
- 11 to 12
- 12 to 9



12 DUCT

Notes:

1. The open duct ends, as viewed from the center of the Manhole/Pad/Equipment Foundation, shall be numbered as shown on Figures No. 1 - 23.
2. If other duct transpositions are required prior approval from NSTAR is required.

FIGURE G
TRANSPOSITION OF DUCTS – (WHEN NECESSARY)

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CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C1100

Revision 0
Page 19 of 25

13.0 Duct Bank Cross Sections – Figures 1 thru 23
Standard and Nonstandard (Alternate) Designs shown to support old construction.

**DUCT BANK LAYOUT FOR 4", 5", & 6" CONDUIT
(NON-REINFORCED CONCRETE)**

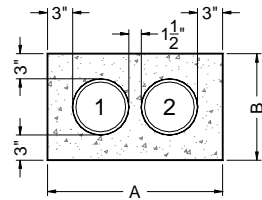


FIG. 1 2-DUCTS

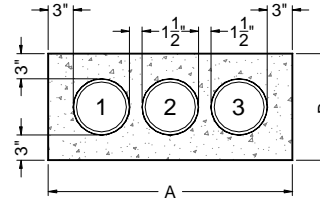
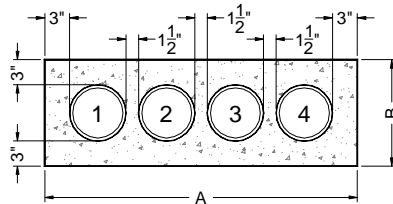


FIG. 2 3-DUCTS



**FIG. 3 4-DUCTS
(Alternate)**

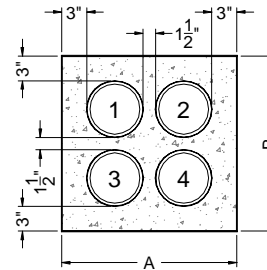


FIG. 4 4-DUCTS

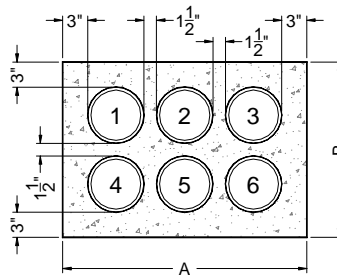


FIG. 5 6-DUCTS

Numbers in Duct Indicate Numbering System when
Viewed from the Open End of a Ductbank.

FIG	DIMENSIONS					
	4" Ducts		5" Ducts		6" Ducts	
	A Inches	B Inches	A Inches	B Inches	A Inches	B Inches
1	16 $\frac{1}{2}$ "	10 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	11 $\frac{1}{2}$ "	21"	12 $\frac{1}{2}$ "
2	22 $\frac{1}{2}$ "	10 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	11 $\frac{1}{2}$ "	29"	12 $\frac{1}{2}$ "
3	28 $\frac{1}{2}$ "	10 $\frac{1}{2}$ "	32 $\frac{1}{2}$ "	11 $\frac{1}{2}$ "	37"	12 $\frac{1}{2}$ "
4	16 $\frac{1}{2}$ "	16 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	21"	21"
5	22 $\frac{1}{2}$ "	16 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	29"	21"

NOTE: See pages 25 for duct bank weights and concrete quantities.

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24-Apr-08

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C1100
Revision 0
Page 20 of 25

DUCT BANK LAYOUT FOR 4", 5", & 6" CONDUIT
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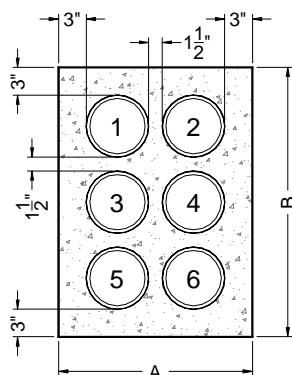


FIG. 6 6-DUCTS
(Alternate)

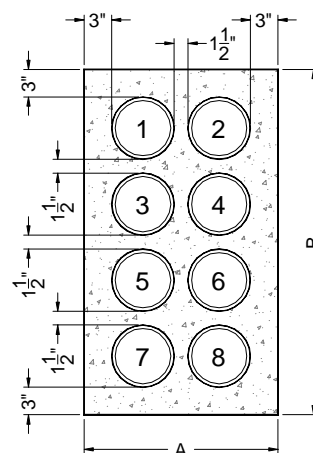


FIG. 7 8-DUCTS
(Alternate)

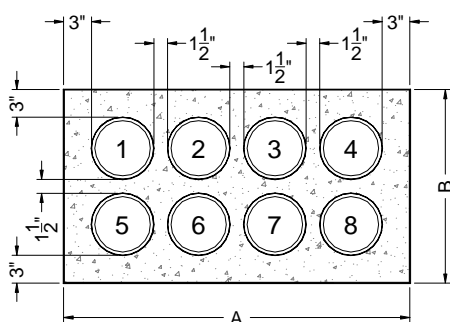


FIG. 8 8-DUCTS

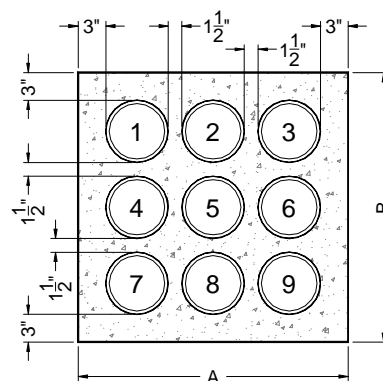


FIG. 9 9-DUCTS

Numbers in Duct Indicate Numbering System when
Viewed from the Open End of a Ductbank.

FIG	DIMENSIONS					
	4" Ducts		5" Ducts		6" Ducts	
	A Inches	B Inches	A Inches	B Inches	A Inches	B Inches
6	16 $\frac{1}{2}$ "	22 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	21"	29"
7	16 $\frac{1}{2}$ "	28 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	32 $\frac{1}{2}$ "	21"	37"
8	28 $\frac{1}{2}$ "	16 $\frac{1}{2}$ "	32 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	37"	21"
9	22 $\frac{1}{2}$ "	22 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	29"	29"

NOTE: See pages 25 for duct bank weights and concrete quantities.

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24-Apr-08

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C1100

Revision 0
Page 21 of 25

DUCT BANK LAYOUT FOR 4", 5", & 6" CONDUIT
(NON-REINFORCED CONCRETE)

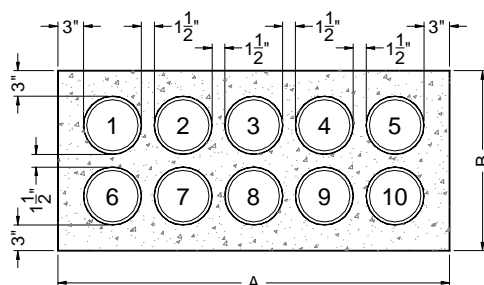
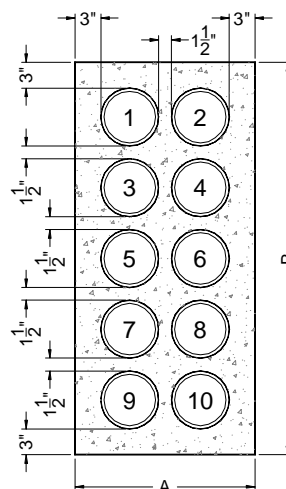
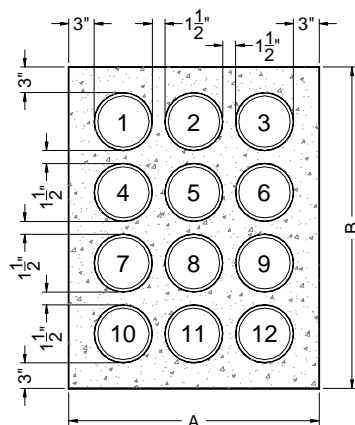


FIG. 10 10-DUCTS



**FIG. 11 10-DUCTS
(Alternate)**



**FIG. 12 12-DUCTS
(Alternate)**

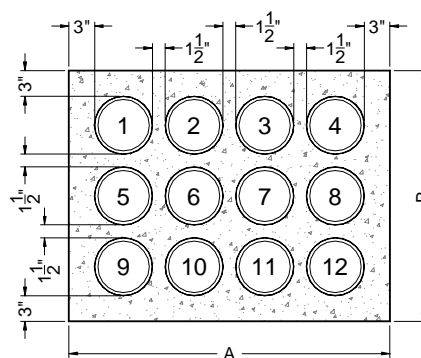


FIG. 13 12-DUCTS

Numbers in Duct Indicate Numbering System when
Viewed from the Open End of a Ductbank.

DIMENSIONS						
FIG	4" Ducts		5" Ducts		6" Ducts	
	A Inches	B Inches	A Inches	B Inches	A Inches	B Inches
10	34 $\frac{1}{2}$ "	16 $\frac{1}{2}$ "	39 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	45"	21"
11	16 $\frac{1}{2}$ "	34 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	39 $\frac{1}{2}$ "	21"	45"
12	22 $\frac{1}{2}$ "	26 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	32 $\frac{1}{2}$ "	29"	37"
13	28 $\frac{1}{2}$ "	22 $\frac{1}{2}$ "	32 $\frac{1}{2}$ "	25 $\frac{1}{2}$ "	37"	29"

NOTE: See pages 25 for duct bank weights and concrete quantities.

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**DUCT BANK LAYOUT FOR 4", 5", & 6" CONDUIT
(NON-REINFORCED CONCRETE)**

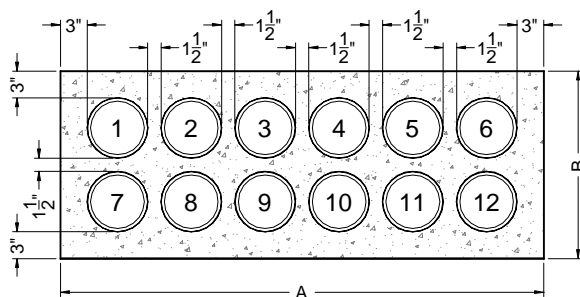
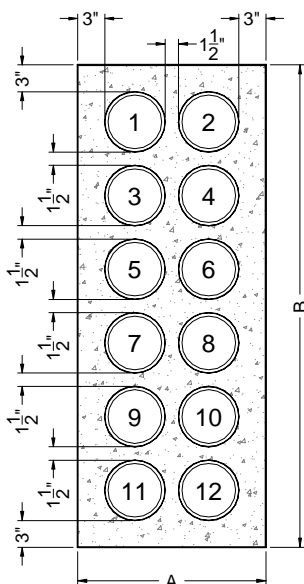
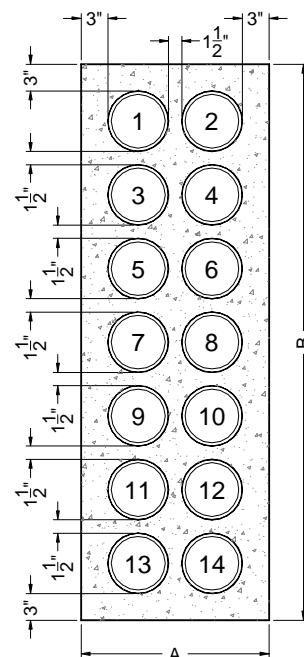


FIG. 14 12-DUCTS



**FIG. 15 12-DUCTS
(Alternate)**



**FIG. 16 14-DUCTS
(Alternate)**

Numbers in Duct Indicate Numbering System when
Viewed from the Open End of a Ductbank.

DIMENSIONS						
FIG	4" Ducts		5" Ducts		6" Ducts	
	A Inches	B Inches	A Inches	B Inches	A Inches	B Inches
14	40 1/2"	16 1/2"	46 1/2"	18 1/2"	53 1/2"	21"
15	16 1/2"	40 1/2"	18 1/2"	46 1/2"	21"	53 1/2"
16	16 1/2"	46 1/2"	18 1/2"	53 1/2"	21"	61"

NOTE: See pages 25 for duct bank weights and concrete quantities.

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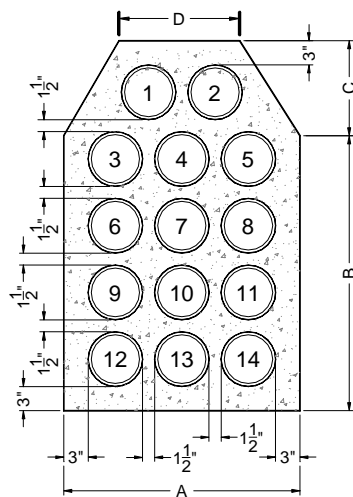
CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C1100

Revision 0
Page 23 of 25

**DUCT BANK LAYOUT FOR 4", 5", & 6" CONDUIT
(NON-REINFORCED CONCRETE)**



**FIG. 17 14-DUCTS
(Alternate)**

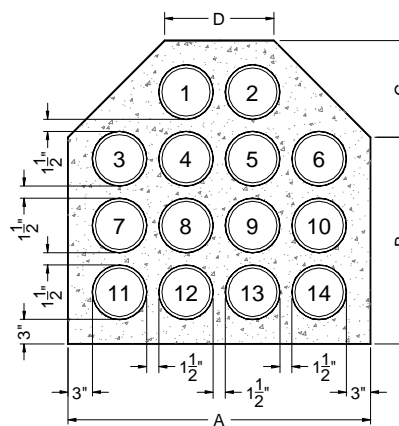
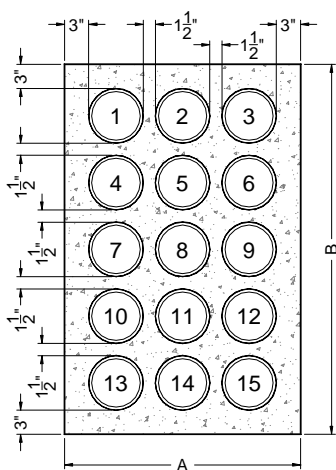


FIG. 18 14-DUCTS



**FIG. 19 15-DUCTS
(Alternate)**

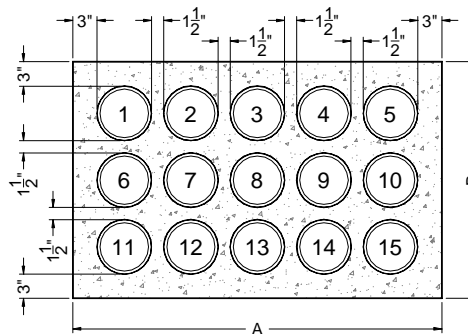


FIG. 20 15-DUCTS

Numbers in Duct Indicate Numbering System when
Viewed from the Open End of a Ductbank.

FIG	DIMENSIONS											
	4" Ducts				5" Ducts				6" Ducts			
	A Inches	B Inches	C Inches	D Inches	A Inches	B Inches	C Inches	D Inches	A Inches	B Inches	C Inches	D Inches
17	22 1/2"	25 1/2"	9"	12"	25 1/2"	29 1/2"	10"	14"	29"	33 1/2"	11"	16"
18	28 1/2"	19 1/2"	9"	10"	32 1/2"	22 1/2"	10"	12"	37"	25 1/2"	11"	14"
19	22 1/2"	34 1/2"	N/A	N/A	25 1/2"	39 1/2"	N/A	N/A	29"	45"	N/A	N/A
20	34 1/2"	22 1/2"	N/A	N/A	39 1/2"	25 1/2"	N/A	N/A	45"	29"	N/A	N/A

NOTE: See pages 25 for duct bank weights and concrete quantities.

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24-Apr-08

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C1100
Revision 0
Page 24 of 25

**DUCT BANK LAYOUT FOR 4", 5", & 6" CONDUIT
(NON-REINFORCED CONCRETE)**

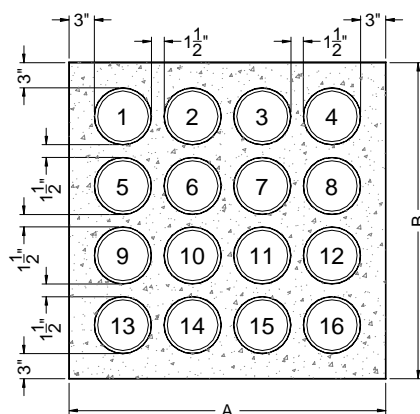
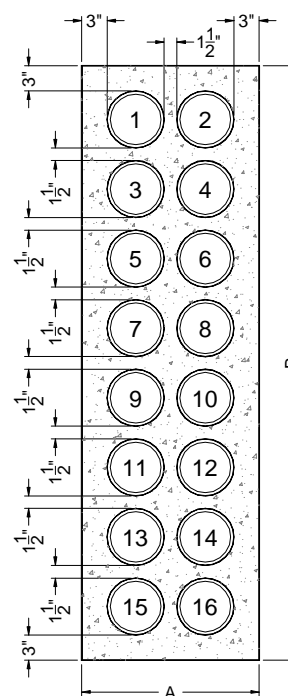


FIG. 21 16-DUCTS



**FIG. 22 16-DUCTS
(Alternate)**

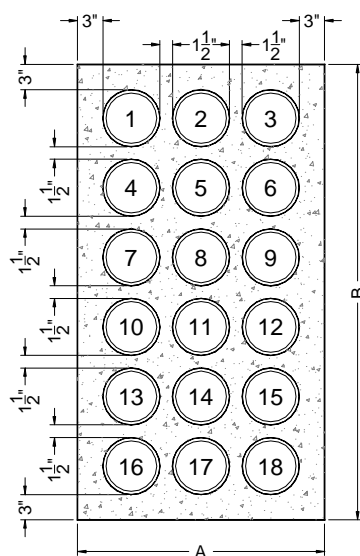


FIG. 23 18-DUCTS

Numbers in Duct Indicate Numbering System when
Viewed from the Open End of a Ductbank.

FIG	DIMENSIONS											
	4" Ducts				5" Ducts				6" Ducts			
	A Inches	B Inches	C Inches	D Inches	A Inches	B Inches	C Inches	D Inches	A Inches	B Inches	C Inches	D Inches
21	28 1/2"	28 1/2"	N/A	N/A	32 1/2"	32 1/2"	N/A	N/A	37"	37"	N/A	N/A
22	16 1/2"	52 1/2"	N/A	N/A	18 1/2"	60 1/2"	N/A	N/A	21"	69"	N/A	N/A
23	22 1/2"	40 1/2"	N/A	N/A	25 1/2"	46 1/2"	N/A	N/A	29"	53 1/2"	N/A	N/A

NOTE: See pages 25 for duct bank weights and concrete quantities.

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14.0 Conduit Bank Concrete Requirements and Weights per linear foot.

CONDUIT CONSTRUCTION DUCT SIZES, WEIGHTS & CONCRETE QUANTITIES						
No. of Ducts	<u>4 Inch Dia.</u>		<u>5 Inch Dia.</u>		<u>6 Inch Dia.</u>	
	Unreinforced Concrete PVC Duct & Cable		Unreinforced Concrete PVC Duct & Cable		Unreinforced Concrete PVC Duct & Cable	
	lbs/lin. ft.	cu.yds/lin. ft	lbs/lin. ft.	cu.yds/lin. ft	lbs/line. ft. ft.	cu.yds/lin. ft.
2	180	0.0363	200	200	228	0.05
3	245	0.0483	274	274	312	0.067
4(2wx2D)	285	0.0536	316	316	373	0.078
4 (4W)	315	0.0606	347	347	394	0.083
6	385	0.0709	432	432	508	0.1037
8	490	0.0882	548	548	641	0.129
9	530	0.0931	590	590	687	0.1367
10	600	0.106	663	663	774	0.154
12 (4Wx3D)	675	0.116	748	748	867	0.17
12 (6Wx2D)	700	0.123	778	778	918	0.183
14	810	0.141	858	858	984	0.191
15	815	0.138	904	904	1048	0.203
16 (4Wx4D)	840	0.141	948	948	1095	0.211
16 (2Wx8D)	865	0.155	961	961	1186	0.231
18 (3Wx6D)	946	0.161	1063	1063	1261	0.24


15.0 Reference Standards

13.1 W1000, "Entering and Working in Underground Locations including Subsurface Vaults"

13.2 C1101, "Distribution Duct bank Construction, and (Steel Reinforced Concrete)"

16.0 Signature Approval

Approved by: Amin Jessa
Director, Distribution Engineering


Issued 21-Jun-04	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C2021
Revised 22-Sep-08		Revision 1 Page 1 of 11

C2021R1

******This Standard Supersedes CE Macros MPR1S, MUR1S, MPR3S & MUR3S and portions of BECo Standards CS2.7-1.1, CS2.7-1.5 & CS2.7-1.7******

PRIMARY URD RISER CONSTRUCTION**TABLE OF CONTENTS**

	Page
1 Scope.....	2
2 Safety.....	2
3 Bill of Material	2-3
4 Compatible Units.....	3
5 Construction.....	4-10
6 Signatures.....	11

Issued 21-Jun-04	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C2021
Revised 22-Sep-08		Revision 1 Page 2 of 11

1.0 Purpose

- 1.1 The purpose of this construction standard is to show the installation of a primary URD riser, for voltages 25kV and below. Risers shall be built to the highest standard operating voltage in the service center, but arresters shall be matched to the operating voltage.

2.0 Safety

- 2.1 Follow all appropriate safety procedures and adhere to all safety requirements for the use of personal protective equipment, headgear, and eye protection. All covered primary taps are to be treated as if bare.

3.0 Bill of Materials

ITEM	DESCRIPTION	CAT ID	Compatible Unit
1	Fused Cutout Polymer, for seacoast use	650 (15 kV) 9045 (27 kV) 15921 (27kV)	CCOFM CCOFH CCOFHP
2	Single phase equip bracket Si Coated, for seacoast use	8934 (fiberglass) 15980 (Silicone)	PBE1 PBE1-SIL
3	Surge Arrester System Voltages: 3740GY or 4160GY 4800 delta or 8320GY 13200GY 13800GY 22860GY	(rating) 8842 (3 kV) 8843 (6 kV) 8847 (10 kV) 15093 (12 kV) 8848 (18 kV)	CSA3 CSA6 CSA10-R CSA12-R CSA18-R
4	Cold Shrink Termination for 15 kV (#1sol, #2str) & 25 kV (#2str, 1/0sol)	9937	UT-URD
17	Cable Grip – 15/25 kV (1" – 1 ¼ ")	9564	
5	Cable Support Bracket	9884	UT-BKT
6,7	Ground Rod (5/8") & Connctr	9229, 9009	CGNP, NCRS4
8	Wire, #4 Cu, ground wire	123	
9	Ground Wire Molding	833	
10	3" Cable U guard molding 2" Cable U guard molding	753 752	UGARD3 UGARD2
11	4" RS Conduit, 10 ft length	1248	NCRS4
12	4" RS Quarter bend, 36" radius	9898	
13	4" PVC to RS Coupling	1099	
14	Ground connector for 4" steel riser pipe and sweep	15363	
16	4" Conduit Strap	1234	


Issued 21-Jun-04	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C2021
Revised 22-Sep-08		Revision 1 Page 3 of 11

ITEM	DESCRIPTION	CAT ID	Compatible Unit
15	4" to 3" PVC riser adapter	9402	NFP4-A32
16	Listed after #14		
17	Listed after #4		
18	Duct Seal	9469 (1 lb)	NADUX1
19	5 kV, #2 Cu EPR/Hypalon	15537	CWT-2
20	3 Position Equipment Bracket SI Coated, for seacoast use	8932 15979	PBE3 PBE3-SIL
21	15 kV Spacer Anti-sway Bar	8851	CSP-MAS
22	Small, bronze hot line connctr	8964	
23	Line Duc for messenger, 4ft	735	CSP-LDUC
24	4" PVC cap, external fit	9460	NFP4-CAP
25	Crossarm, double fir	8839 (8 pin)	PCD10
26	Crossarm braces, flat	8928	
27	Slip Coupling, 4" cast iron	1345	NCRS4
28	Ground Bushing connector	1188	NFS4-GNDBUSH

4.0 Compatible Units

Compatible Units (CUs) are materials used together to build to standards. They may include individual or groups of items, sometimes called Compatible Unit Assemblies. Below are key riser CU Assemblies and related items.

CU Name	Title	Components		
		CatID Description	CatID	Qty
NCRS4	Riser, 4"x10' steel standpipe w/ sweep	All materials detailed in bill of materials to build single riser – steel conduit, sweep & ground rod		
CGNP	#4 Cu Pole Ground	Pole ground w/ 35 ft of #4 Cu Wire, connect to grounding installed with riser pipe		
UT-URD	Cable Termination 15/25KV, single, #1S-1/0S-#2 Al/Cu	Single cold shrink termination for 25/15kV URD cable 1/0sol, #1 sol or #2 str with pin terminal connector and cable grip		
UTUA-3PH	URD Termination Assembly, 15/25KV 3 Ph, #1S-1/0S-#2 Al/Cu, w/ crossarms & U-guard	15/25 kV Cold Shrink Termination	9937	3
		Cable Grips	9564	3
		10' 8pin arms & braces	8839	2
		3" U-guard, 10 ft	753	2

Issued 21-Jun-04	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C2021
Revised 22-Sep-08		Revision 1 Page 4 of 11

UTUA-1PH	URD Termination Assembly, 15/25KV 1 Ph , #1S-1/0S-#2 Al/Cu, w/ fiberglass bracket & U-guard	15/25 kV Cold Shrink Termination	9937	1
		Cable Grips	9564	1
		Fiberglass Equip Bracket, 18"	8934	1
		2" U-guard, 10 ft	759	2
UTUA- 2PH	URD Termination Assembly, 15/25KV 2 Ph , #1S-1/0S-#2 Al/Cu, w/ fiberglass brackets & U-guard	15/25 kV Cold Shrink Termination	9937	2
		Cable Grips	9564	2
		Fiberglass Equip Bracket, 18"	8934	2
		3" U-guard, 10 ft	753	2
CSA__	Surge Arrester(s)	Match Arrester to operating voltage, specify qty		

5.0 Construction

- 5.1 Locate the riser and spare duct according to Figure 1. If it is necessary to install a second riser (single phase only) on a pole, locate as indicated.
- 5.1a No more than 2-single phase or 1-three phase primary risers shall be allowed on a pole.
- 5.1b At ground level, the pole's circumference cannot be more than 45% encircled with risers from all utilities.

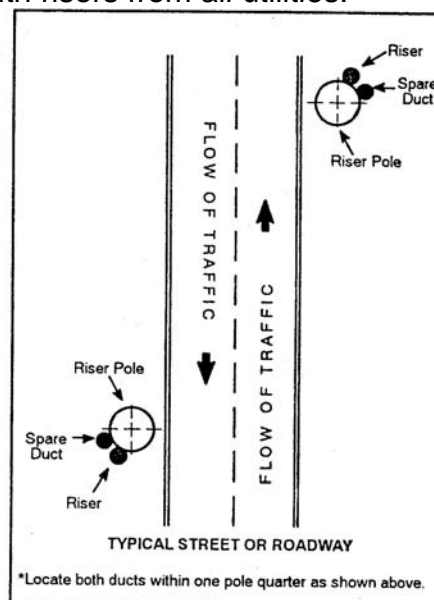


Figure 1 – Location of Riser

Issued 21-Jun-04	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C2021
Revised 22-Sep-08		Revision 1 Page 5 of 11

- 5.2 Cables that are not to be immediately terminated shall be left individually coiled, with adequate length to apply a termination & connect to the primaries, and supported above the steel riser pipe. Minimum safe bending radius for the cable is 12X cable diameter. Coils left above the riser shall have a 36" diameter to avoid cable damage.
- 5.3 If the cables left coiled above the riser are not of adequate length to connect to the primary, they shall be the contractor's, installer of the cable, responsibility to replace.
- 5.4 Surge arrester leads should be kept as short as possible to maximize protection.
- 5.5 Riser Grounding (See C5000 for more grounding details)
- 5.5a Bond all steel riser pipes to pole ground. Note: Grounding bushings may be used as an alternative to the U shaped pipe ground connector.
- 5.5b If cast iron slip couplings are used, the steel sweep bellow ground shall have its own ground connector connected to the pole ground and rod.
- 5.5c To prevent theft and vandalism the ground wire molding shall be stapled every 6".
- 5.5d In NSTAR south locations, a bare 1/0 copper ground wire shall be installed, in the trench, from the riser to the first pad or pull box ground ring.
- 5.5e In 4800 Volt delta primary areas, do not connect the arrester grounds to the secondary/system neutral. See C4402 for more details
- 5.6 Seal any gaps between the cable and the riser cap or adapter with duct seal. Any unused ducts shall be capped.
- 5.7 Minimum 45' pole size is preferred, however, 40' poles may be utilized where clearances allow.

<p>Issued 21-Jun-04</p> <p>Revised 22-Sep-08</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C2021</p> <p>Revision 1 Page 6 of 11</p>
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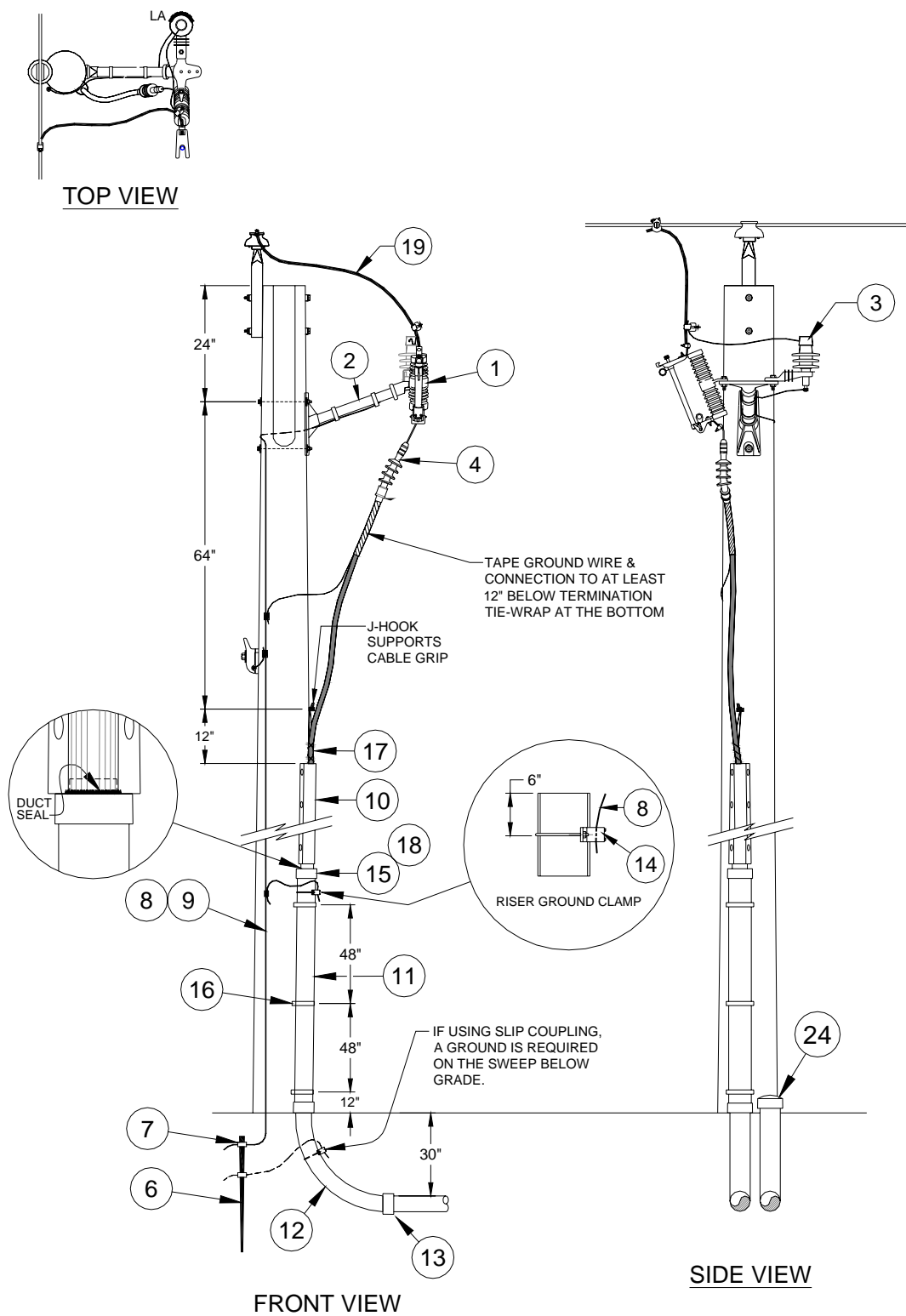


Figure 2 – Single-Phase Riser - Open Wire Main Line

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21-Jun-04

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION

C2021

Revised
22-Sep-08



Revision 1
Page 7 of 11

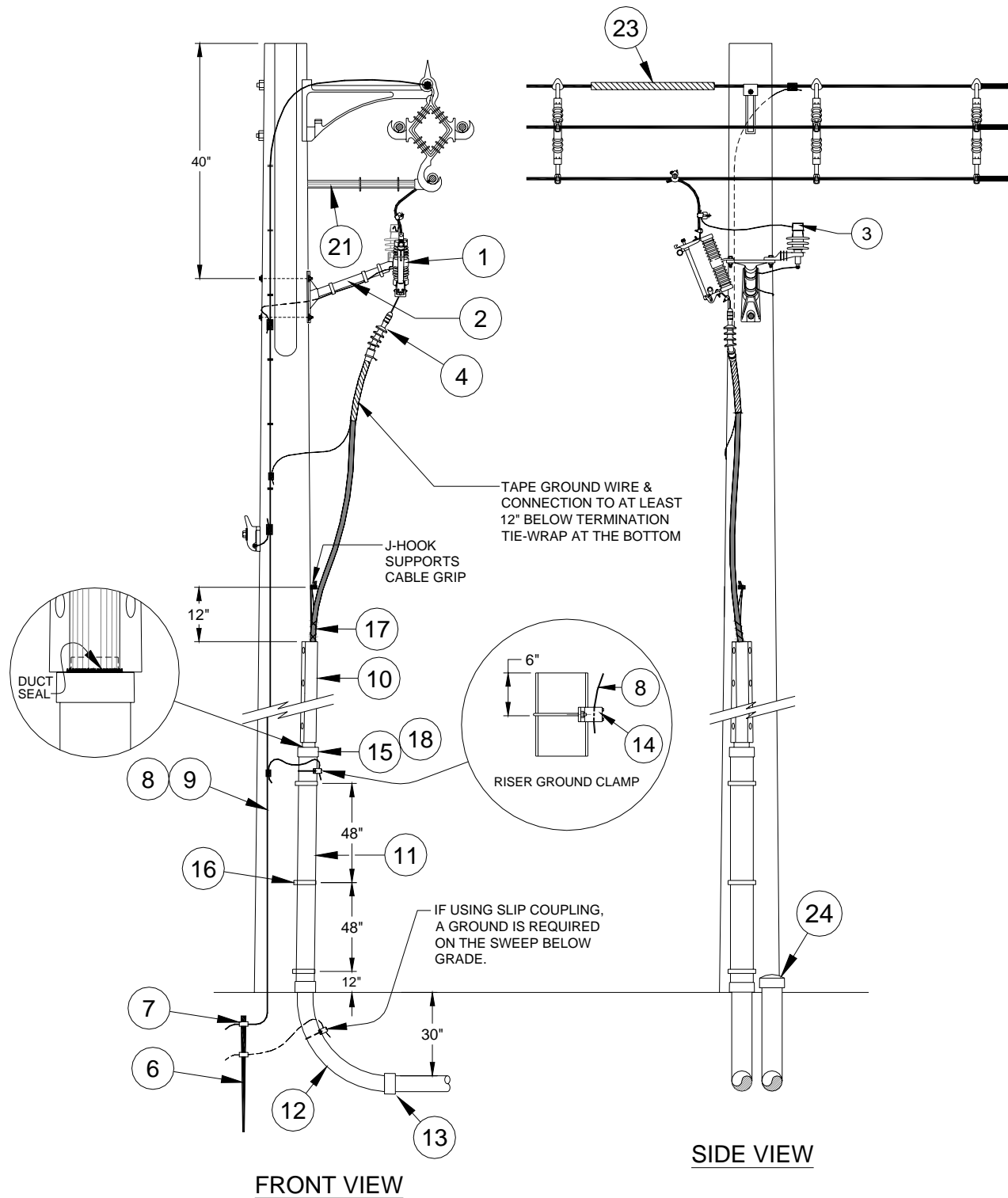


Figure 3 – Single-Phase Riser - Spacer Cable Main Line

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21-Jun-04

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ELECTRIC OPERATIONS ORGANIZATION

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22-Sep-08



Revision 1
Page 8 of 11

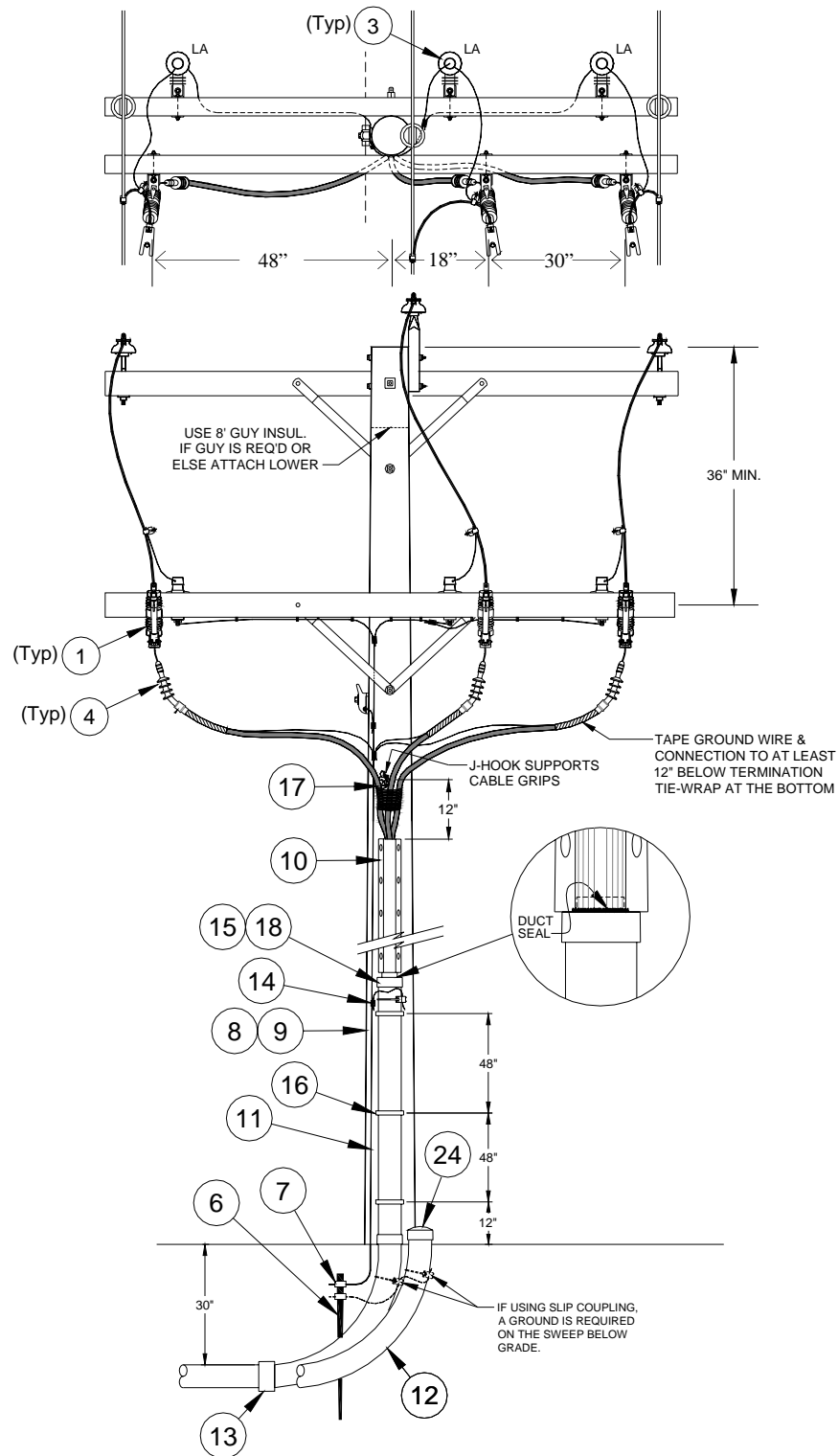


Figure 4 - Three-Phase Riser - Open Wire Main Line

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22-Sep-08



Revision 1
Page 9 of 11

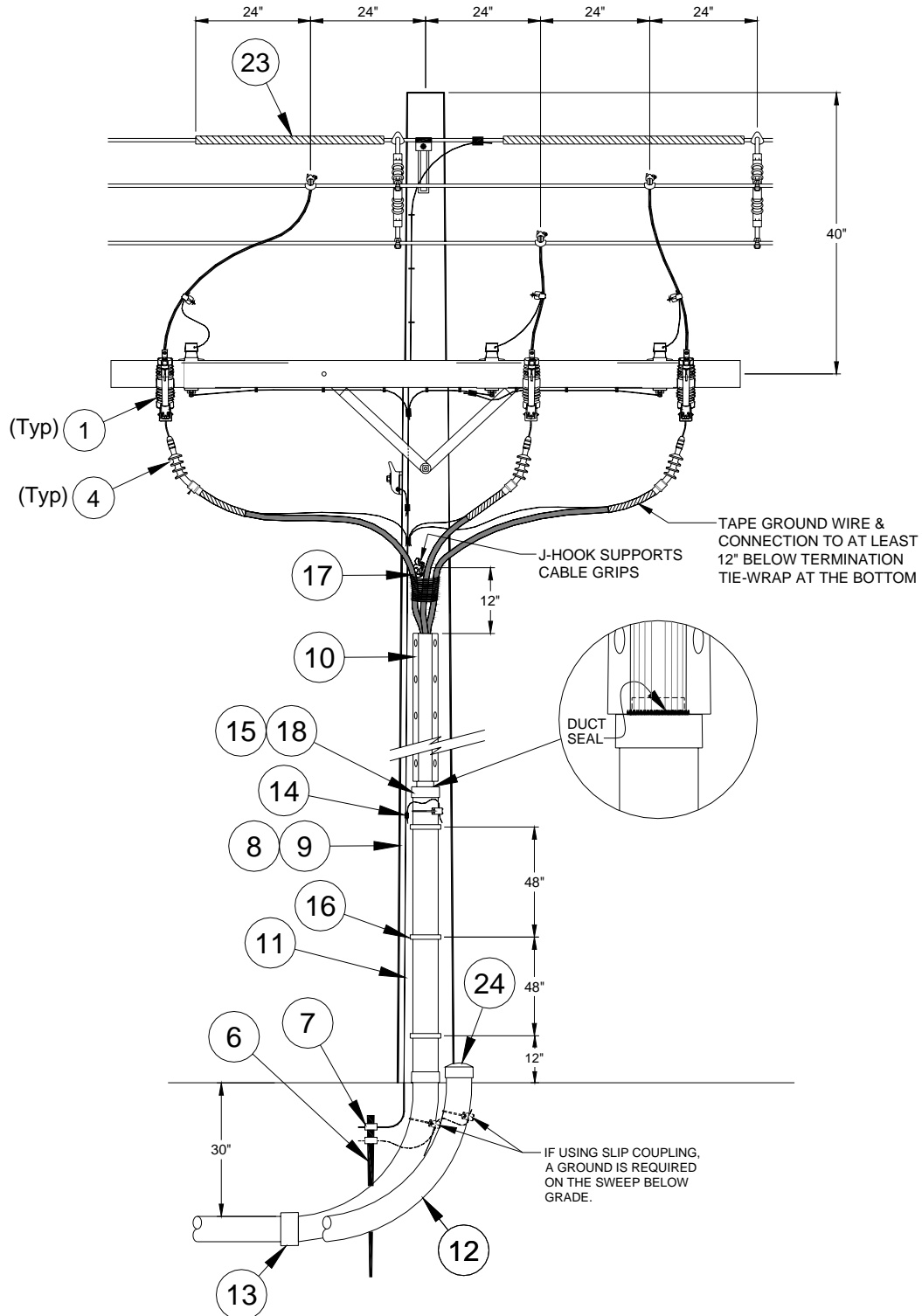


Figure 5 - Three-Phase Riser - Spacer Cable Main Line

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22-Sep-08



Revision 1
Page 10 of 11

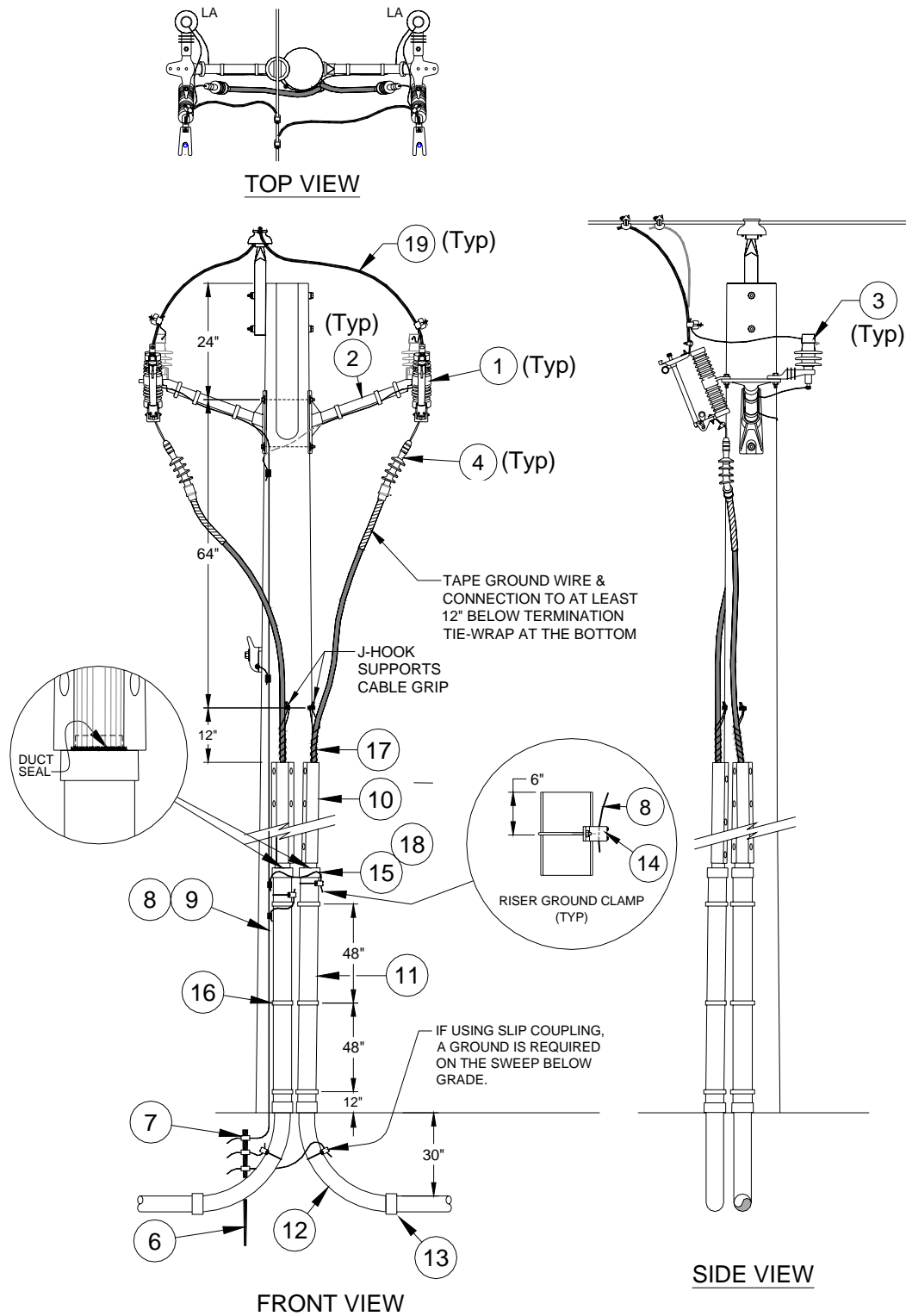


Figure 6 - Single-Phase Loop Riser

<p>Issued 21-Jun-04</p> <p>Revised 22-Sep-08</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p></p>	<p>C2021</p> <p>Revision 1 Page 11 of 11</p>
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6.0 Approval Signature

Approved by: Amin Jessa
Director, Distribution Engineering

Issued 11/29/05	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C2022 Revision #0 Page 1 of 7
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C2022

******This Standard Supersedes portions of BECo Standards CS2.7-1.1, CS2.7-1.5 & CS2.7-1.7******

POWER CABLE RISERS FOR 25 KV AND BELOW

1.0 Purpose

- 1.1 The purpose of this construction standard is to show the installation of a power cable riser, for all NSTAR distribution voltages.
- 1.2 Risers shall be built to the highest standard operating voltage in the service center.

2.0 Bill of Materials

ITEM	DESCRIPTION	CAT ID
1	Surge Arrester: 3740GY or 4160GY 4800 delta or 8320GY 13200GY 13800GY 22860GY	8842 (3 kV) 8843 (6 kV) 8847 (10 kV) 15093 (12 kV) 8848 (18 kV)
2	Cold Shrink Termination Kits: 15 kV (500-1000MCM) & 25 kV (250-800MCM)	13717
	25 kV (900-1750)	9948
	Heat Shrink Termination Kits: 4/0 AWG to 350 MCM (HVT-152-BECo) 15kV	1423
	500 MCM to 1000 MCM (HVT-153-BECo) 15kV	1424
	Heat Shrink Skirt Kits For Outdoor Applications 4/0 AWG to 350 MCM (RS-3-2)	1696
	500 MCM to 2500 MCM (RS-4-2)	1697

Issued 11/29/05	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C2022 Revision #0 Page 2 of 7
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ITEM	DESCRIPTION	CAT ID
	Heat Shrink Tube (20") for Overhead Applications: #1 A1/ #2 - 350MCM (BPTM 30/12-510) 500 - 2500MCM (BPTM 50/20-510)	1428 1429
3	Crossarm	8838 (6 pin) 8839 (8 pin)
4	Crossarm braces	8928
5	Cable Support (for termination)	9884
6	Ground Rod (5/8")	9229
7	Ground Rod Connector #4sol-1/0 str	9009
8	Wire, #4 Cu, ground wire	120
9	Ground Wire Moulding	833
10	3" Cable U guard	753
11	RS Conduit	1248 (4") 1249 (5")
12	RS Quarter bend, 36" radius	9898 (4") 9899 (5")
13	PVC to RS Coupling	1099 (4") 1100 (5")
14	Grounding clamp for 4" or 5" steel riser pipe	15363
15	4" riser pipe reducing cap adapter to 2" or 3" molding	9402
16	Conduit Strap	1234 (4") 9348 (4") 1235 (5")
17	Cable Grip – 15 kV – 25 kV	9564 (1.00-1.24") 1395 (1.25-1.40")
18	Duct Seal	1239 (5 lbs) 9469 (1 lb)
19	5 kV, 250 MCM, tap wire	141
20	3 Phase Equipment Bracket	8932
21	Hot line clamp	
22	Disconnect switch	681 (15 kV) 9357 (27kV)
23	600A, Vertical Mount, Unitized Switch	9361 (15kV) 14639 (27kV)

Issued 11/29/05	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C2022 Revision #0 Page 3 of 7
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ITEM	DESCRIPTION	CAT ID
24	PVC cap -4 in	9460 (4") 5"???
25	Recloser	As needed
26	Pin insulator	Various
27	Crossarm pin	Various
28	2 Hole Terminal Lug	
	250 Cu	1399
	500 Cu	1403
	700 Cu	1511
	750 Cu	1528
29	Eyebolt Connector	8878

3.0 Construction

- 3.1 Risers should be located on the pole in the safest available position with respect to climbing space and exposure to traffic damage. install riser and spare duct according on the field side quarter of the pole, away from the direction of traffic flow (See Figure 1).
- 3.2 Only 1 three phase primary riser shall be allowed on a pole. Where practicable, risers should not be placed on the same pole as communication risers or equipment.
- 3.3 Spare conduit riser bend should be capped (not with duct plug) or have coupling and second conduit length installed to prevent damage/vandalism.
- 3.4 Cables that are not to be immediately installed should be left individually coiled and supported above the steel riser pipe. Minimum safe bending radius for the cable shall be 12X cable diameter.
- 3.5 Vertical electrical supply conductors on riser poles shall be protected by a covering that gives suitable mechanical protection. This protection, conduit and/or U guard, shall extend from secondary pole attachment level to a minimum of 1' below grade.
- 3.6 Surge arrester leads should be kept as short as possible to maximize protection. All primary leads are to be made with covered wire.
- 3.7 Disconnect switches shall be installed vertically. Loadbreak switches (Figure 3) should be installed at locations that are expected to be routine

Issued 11/29/05	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C2022 Revision #0 Page 4 of 7
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load switching points. Disconnect switches are intended to isolate underground sections typically, but not always, under no load conditions.

- 3.8 Bond all steel riser pipes to common neutral and pole ground.
- 3.9 In 4800 Volt delta primary areas, do not connect the arrester grounds to the secondary/system neutral. See C4402 for more details.
- 3.10 The installation should be designed so that water does not stand in riser pipes above the frost line. Seal any gaps between the cable and the riser cap or adapter with duct seal.
- 3.11 Preferred construction for recloser installations is to have the disconnect located on a separate pole.
- 3.12 Minimum 45' pole size with 50/50(equal) ownership is required.

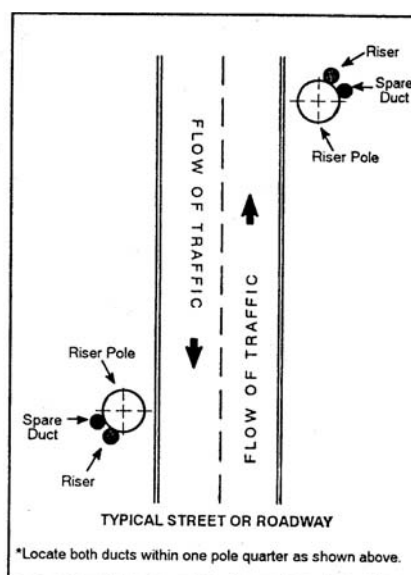


Figure 1 – Location of Riser

<p>Issued 11/29/05</p>	<p style="text-align: center;">NSTAR <i>ELECTRIC</i> ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;">Construction Standard</p>	<p>C2022</p> <p>Revision #0 Page 5 of 7</p>
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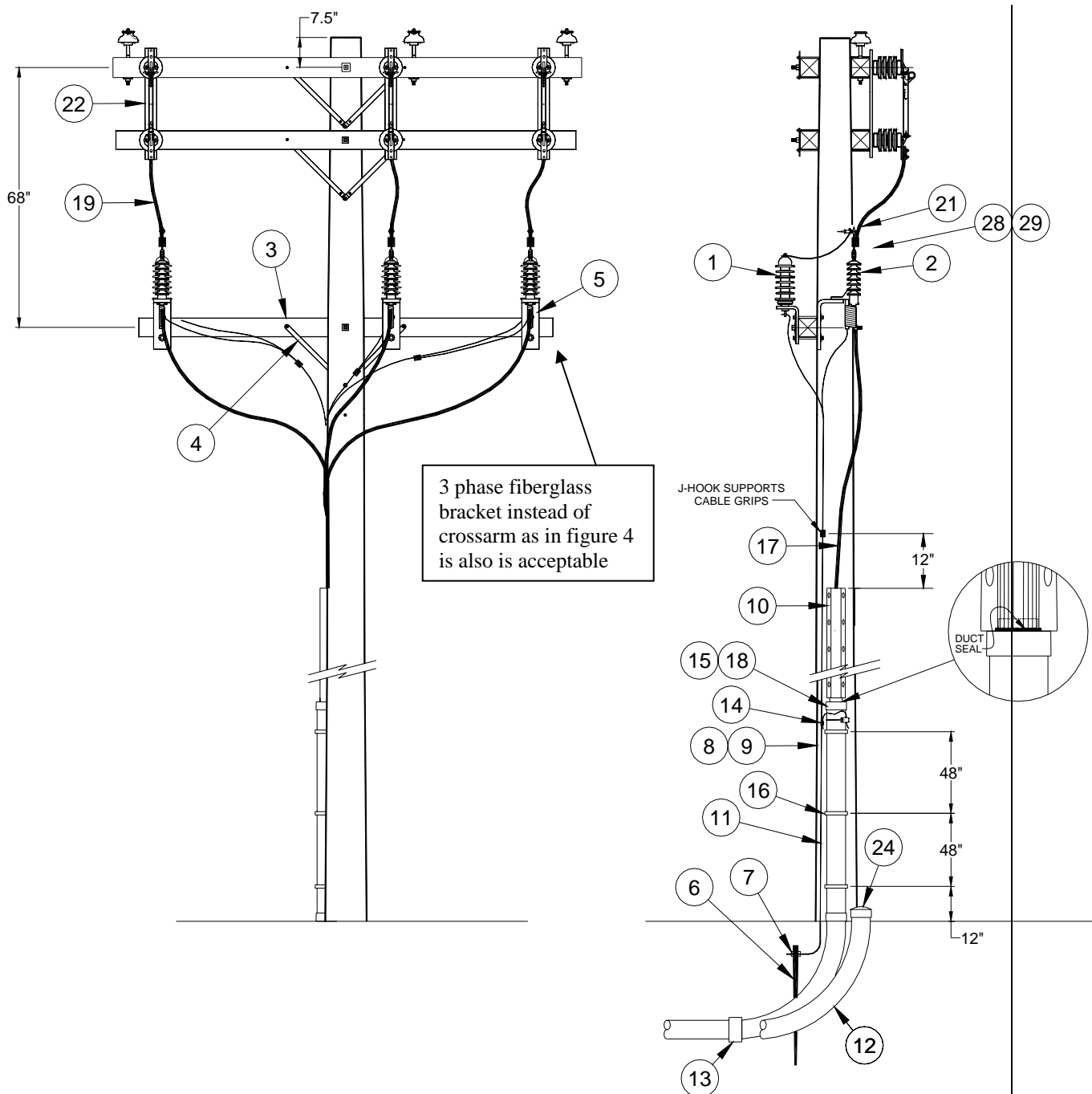


Figure 2 — Disconnect

<p>Issued 11/29/05</p>	<p style="text-align: center;">NSTAR <i>ELECTRIC</i> ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;">Construction Standard</p>	<p>C2022</p> <p>Revision #0 Page 6 of 7</p>
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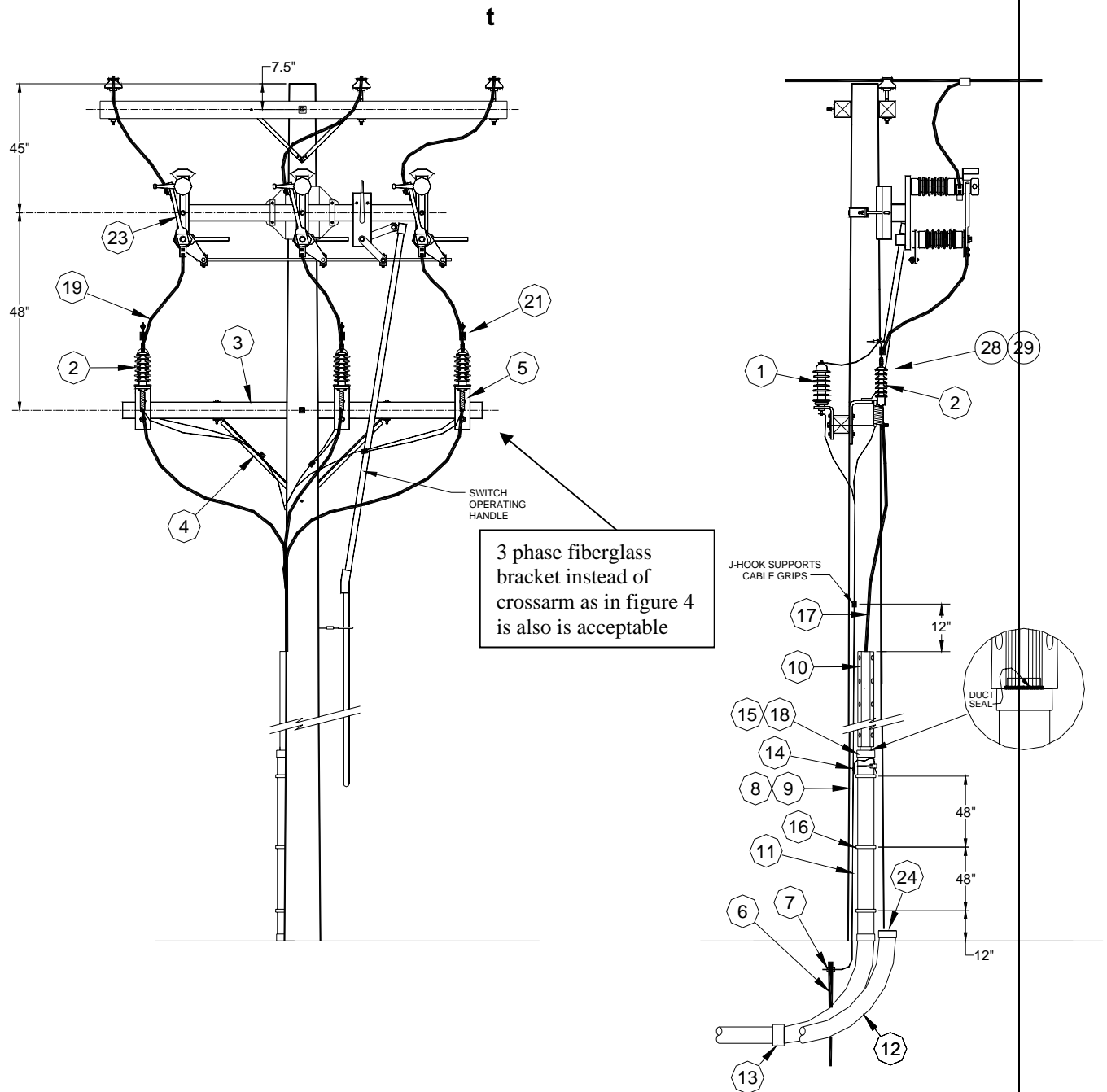


Figure 3 - Loadbreak Switch

<p>Issued 11/29/05</p>	<p style="text-align: center;">NSTAR <i>ELECTRIC</i> ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;">Construction Standard</p>	<p>C2022</p> <p>Revision #0 Page 7 of 7</p>
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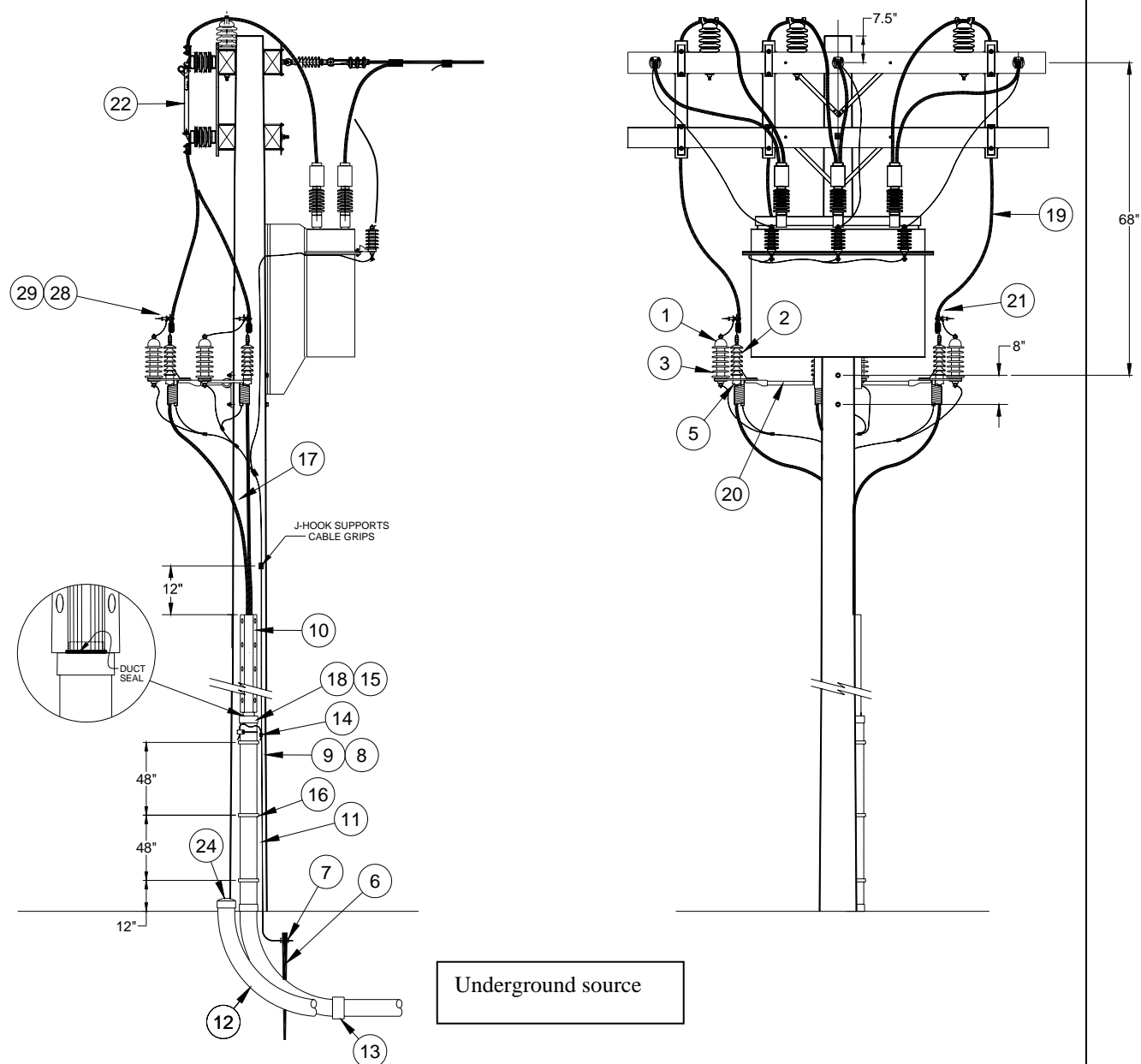


Figure 4 - Recloser

Approved by: Elizabeth J Leonard
 Manager, Distribution
 Technical Engineering

Issued 13-Aug-02 Revised 27-Jan-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3801 Revision #2 Page 1 of 7
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C3801

****This standard supercedes BECo CS2.12-2.18, COM/E 4-0835 NE-2 and COM/E 1-0796 NE-13, NE-13A, NE-14

INSTALLATION OF PRECAST PAD FOUNDATIONS FOR 4KV, 15KV, & 25KV PAD MOUNTED, THREE-PHASE DISTRIBUTION TRANSFORMERS

Table of Contents

	Page
1) Scope.....	2
2) Bill of Materials.....	2
3) General Notes.....	2-4
4) Construction Drawings.....	5-7
5) Related Standards.....	7
6) Approvals.....	7

Issued 13-Aug-02 Revised 27-Jan-09	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C3801 Revision #2 Page 2 of 7
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1.0 PURPOSE

This standard illustrates the approved construction practices for the installation of precast pad foundations for three-phase distribution transformers up to 2500 kVA installed outdoors.

2.0 BILL OF MATERIALS

Material Description	Catalog ID
Precast Concrete Pad Foundation	
Pad #1 (Transformers up to 300kVA)	14706
Pad #2 (Transformers 500 to 2500kVA)	14715
1/2" Thick Plywood - 60" x 24" (minimum size)	
42" x 15" (cutout opening for Pad #1)	N/A,
54" x 15" (cutout opening for Pad #2)	See M3801
1-1 1/2" Diameter Crushed Stone	N/A
5/8" x 8' Ground Rod	9229
4/0 AWG Bare Copper Wire	104
1/0 AWG Bare Copper wire	100
4/0 to Ground Rod Connector, 4/0 Wire – Rod	597
Sand/Topping Concrete Mix, Quickrete	N/A
Product No. 1103 or approved equal	
Sikaflex – 1a Concrete Sealant or equal	N/A
4" Diameter Insulated Grounding Bushing	1188
5" Diameter Insulated Grounding Bushing	1189
#4 AWG Bare Copper Wire	114
Ground Wire Connector – 4/0-1/0, 1/0-#4 Cu	608

3.0 GENERAL NOTES

- 3.1 Prior to backfill **NSTAR inspection** and **approval** of grounding and pad installation **is required**. The contractor shall be responsible for ensuring that NSTAR inspection is scheduled and completed.
- 3.2 The installation (including grounding), using the appropriate precast pad, (based on transformer size, see "Bill of Materials" above) is detailed in Figures 1 & 2. Grounding connection between the ground rods and 4/0 ground wire shall be direct burial rated Hy-Ground compression, Cadweld, or mechanical grounding connectors as approved by NSTAR.

Issued 13-Aug-02 Revised 27-Jan-09	<div style="text-align: center;"> CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION  </div>	C3801 Revision #2 Page 3 of 7
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- 3.3 All Catalog IDs that are "N/A" shall be furnished by contractor.
- 3.4 Ground surface shall be level for at least two feet away from the edge of the pad on all sides. Top of pad shall be 4" min., 5" max. above finished grade.
- 3.5 If possible, avoid locating pad at low points in final grade or on abrupt slopes. A pre-cast retaining wall (Catalog ID 14672) may be required if there is a possibility of equipment being undermined or covered over. Avoid locations likely to be covered by plowed snow or made inaccessible.
- 3.6 Pad shall be set on mechanically compacted 1 - 1 ½" diameter crushed stone (refer to appropriate figure for depth of stone) over virgin or mechanically compacted soil. All deleterious soils including organics, ashes, cinders, shells or frozen materials shall be removed and replaced with suitable backfill before installing the foundation.
- 3.7 For recommended minimum clearances from foundation (pad) to buildings, building openings, landscaping, or traveled ways refer to NSTAR Construction Standard C3802 for Clearance Requirements around Padmounted Electrical Equipment.
- 3.8 A maximum number of eight (8) secondary conduits shall be permitted with conductor sizes up to 750 kcmil copper or aluminum. For installations with more than eight sets of secondary conductors (in parallel), a secondary bus transclosure cabinet is required. The secondary bus transclosure cabinet shall be sized and installed in accordance with the National Electrical Code and state/local requirements. Refer to Figure 3 for location.
- 3.9 When installed the front (door side) of the distribution transformer will cover the pad cutout. Primary cable sweeps shall terminate within the pad cutout below the primary compartment of the transformer (the left side of the pad cutout when looking at the front of the transformer). The secondary conduit risers shall terminate within the pad cutout below the secondary compartment of the transformer (the right side). Refer to Figures No. 1 & 2 for typical positioning of installed conduits within the precast pad cutout.
- 3.10 Plug all conduit ends to prevent moisture and debris from entering conduits prior to transformer installation. Do not install mule tape in new conduits until after the bottom of the cutout is sealed with sand/topping concrete mix per 3.11.

Issued 13-Aug-02 Revised 27-Jan-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3801 Revision #2 Page 4 of 7
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- 3.11 After pad is installed and set level on the crushed stone with the conduits in place, one inch depth of the crushed stone shall be removed (and properly disposed of) from the entire area within the bottom of the cutout. A sand/topping concrete mix (refer to Bill of Materials) shall be placed within the cutout to seal the bottom as shown in Figures 1 & 2. All conduits shall be sealed with PVC fitted caps before the mix of concrete is placed within the cutout. The sand/topping mix of concrete shall be hand troweled and pitched so that the middle of the cutout bottom is lower than the surrounding edges. The purpose of sealing the bottom of the cutout is to prevent small amounts of leaking and dripping transformer fluids from seeping through the crushed stone beneath the precast pad. A cleanup of small amounts of transformer fluids can be cleaned up more efficiently and less costly within the cutout.
- 3.12 Grounding bushings shall be installed on all primary and secondary conduits. A #4 AWG Bare Copper Wire shall be mechanically connected to all conduit bushings and to the 1/0 AWG Bare Copper Grounding Wires within the cutout as shown in Figures No. 1 & 2.
- 3.13 Around the perimeter of the cutout opening apply a ½" wide x ½" high bead of "Sikaflex-1a" polyurethane elastomeric sealant/adhesive (or approved equal). This caulking material is to be applied ¼" from the edge of the opening. The purpose of this "dam" is to divert small oil leaks away from the cutout out and to the edge of the pad where the leak will be noticed sooner. Allow material to cure before installing diamond plate cover.
- 3.14 Cable pulling mule tape may be installed after all prior steps are complete. Temporary caps may be used until all cable is pulled in, but known spare ducts must be plugged with expanding type plugs that seal against the inner duct wall. Coil all ground wires and mule tape ends inside cutout.
- 3.15 Opening in top section of pre-cast pad shall be completely covered with ½" thick plywood and secured with ½" diameter bolts aligning with the predrilled inserts in the pre-cast pad. Plywood cover shall remain in place until the transformer is installed. Refer to M3801 "Material Standard for Precast Pads" for plate details.

Issued 13-Aug-02 Revised 27-Jan-09	<div style="text-align: center;"> CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION  </div>	C3801 Revision #2 Page 5 of 7
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4.0 CONSTRUCTION DRAWINGS

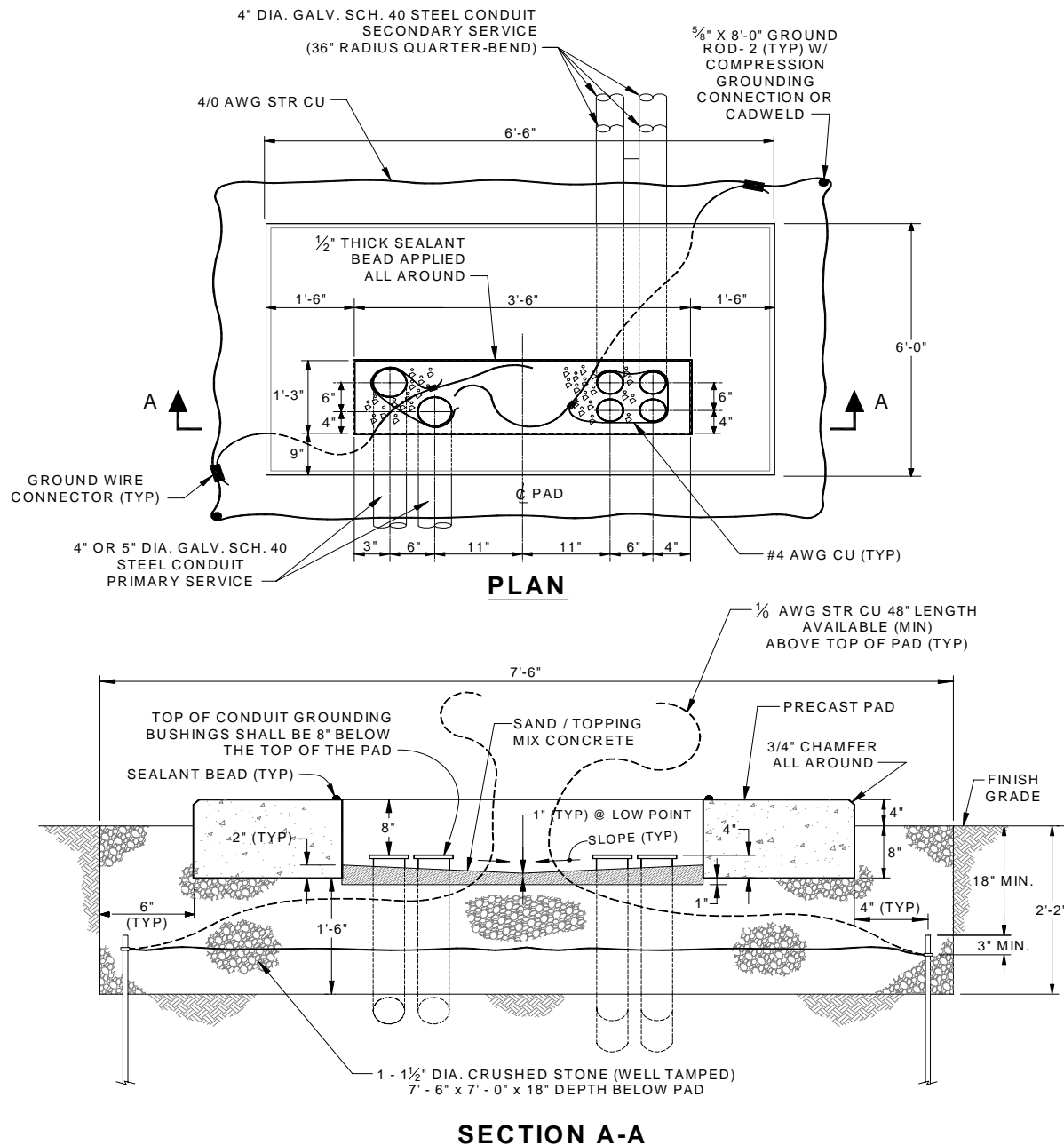


Figure 1 – Pad #1: Three-Phase 75 - 300kVA Transformer Precast Pad Installation & Grounding Detail

Note: Contractor is responsible to obtain NSTAR approval before backfilling conduit and precast pad.

<p>Issued 13-Aug-02 Revised 27-Jan-09</p>	<p align="center">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p align="center"></p>	<p align="right">C3801 Revision #2 Page 6 of 7</p>
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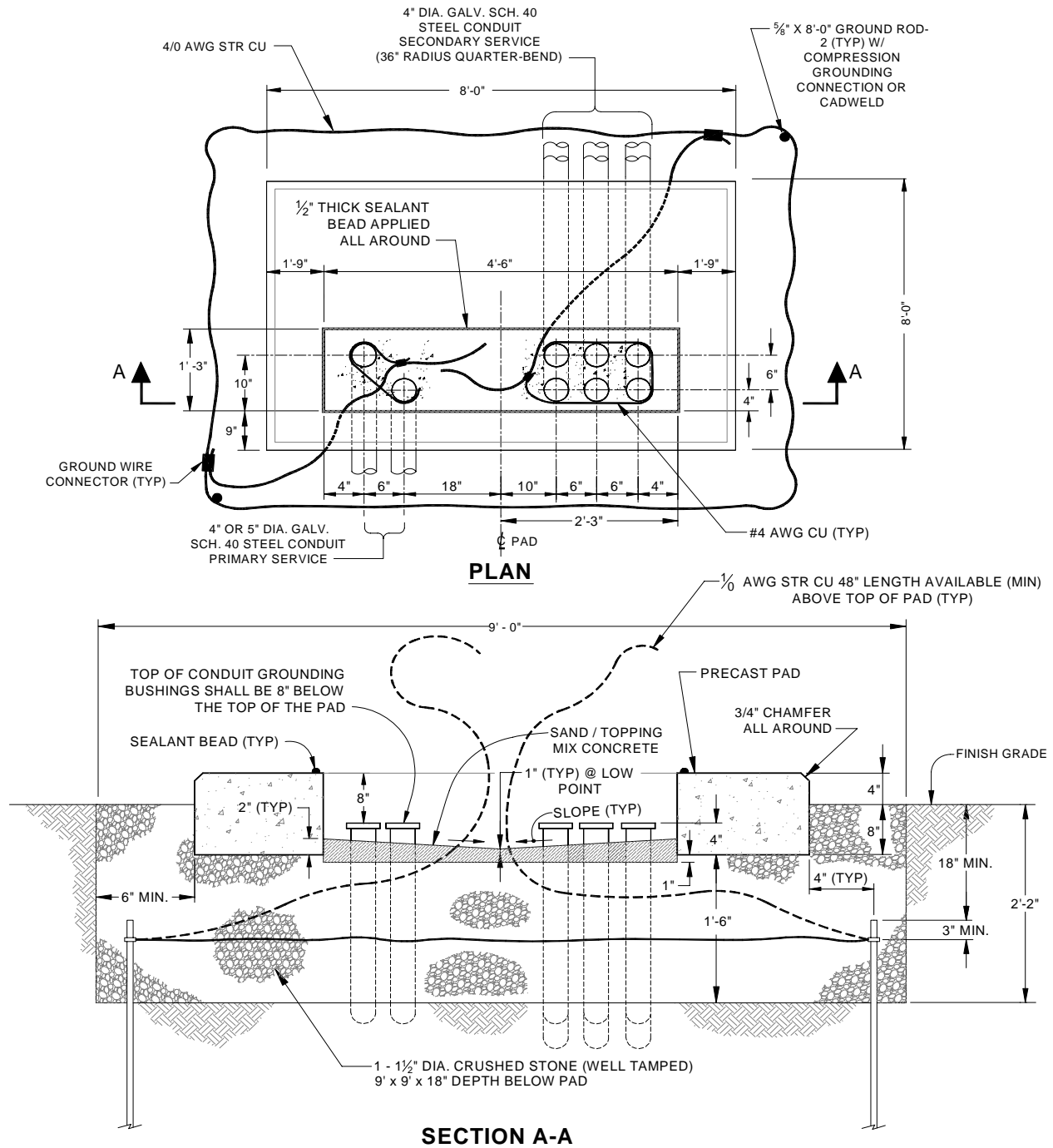


Figure 2 – Pad #2: Three-Phase 500 - 2,500 kVA Transformer Precast Pad Installation & Grounding Detail

Note: Contractor is responsible to obtain NSTAR approval before backfilling conduit and precast pad.

Issued 13-Aug-02 Revised 27-Jan-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3801 Revision #2 Page 7 of 7
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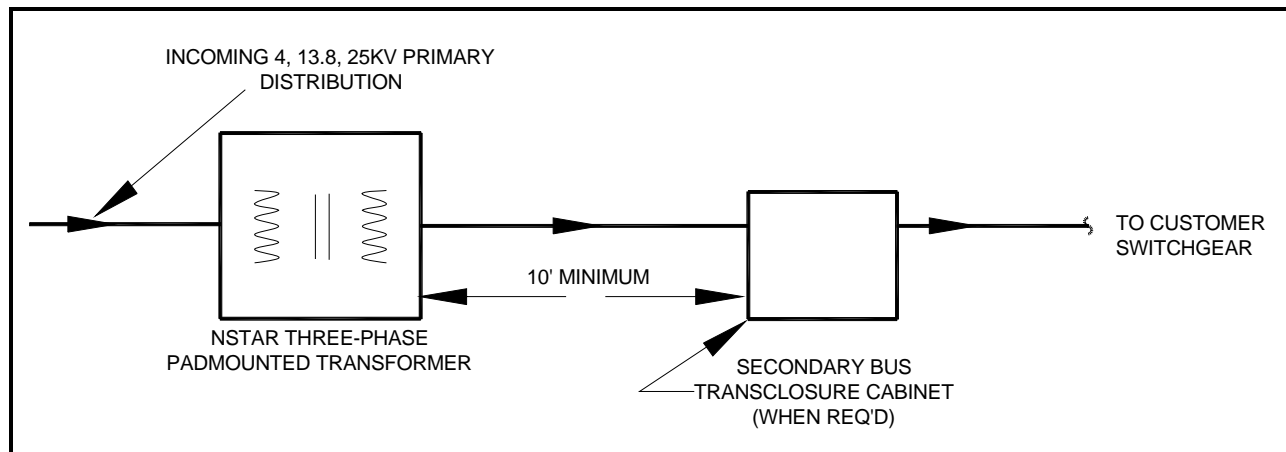


Figure 3 - Transformer Pad and Transclosure Cabinet Detail

5.0 RELATED STANDARDS

- 5.1 M3801 Material Standard for Precast Pads and Covers
- 5.2 M3907 Three Phase Distribution Padmount Transformers 300-2500kVA
- 5.3 C3802 Clearance Requirements Around Padmounted Electrical Equipment
- 5.4 C1100 Distribution Duct Bank Construction and Materials
- 5.5 D3820 200 Amp Underground Distribution Design Standard

6.0 APPROVALS

Approved by: Amin Jessa
Director, Distribution Engineering

Issued 20-Mar-02	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C3802 Page 1 of 4
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C3802 **** Supersedes ComElectric CUDS Specification 1-0796, Section G2****

**RECOMMENDED MINIMUM CLEARANCES FROM THREE-PHASE DISTRIBUTION
TRANSFORMER FOUNDATION TO BUILDINGS, BUILDING OPENINGS, LANDSCAPING,
OR TRAVELED WAY**

1.0 PURPOSE

The purpose of this standard is to illustrate guidelines for minimum clearances when locating pad mounted distribution transformers near buildings, traveled way, landscaping and other obstructions.

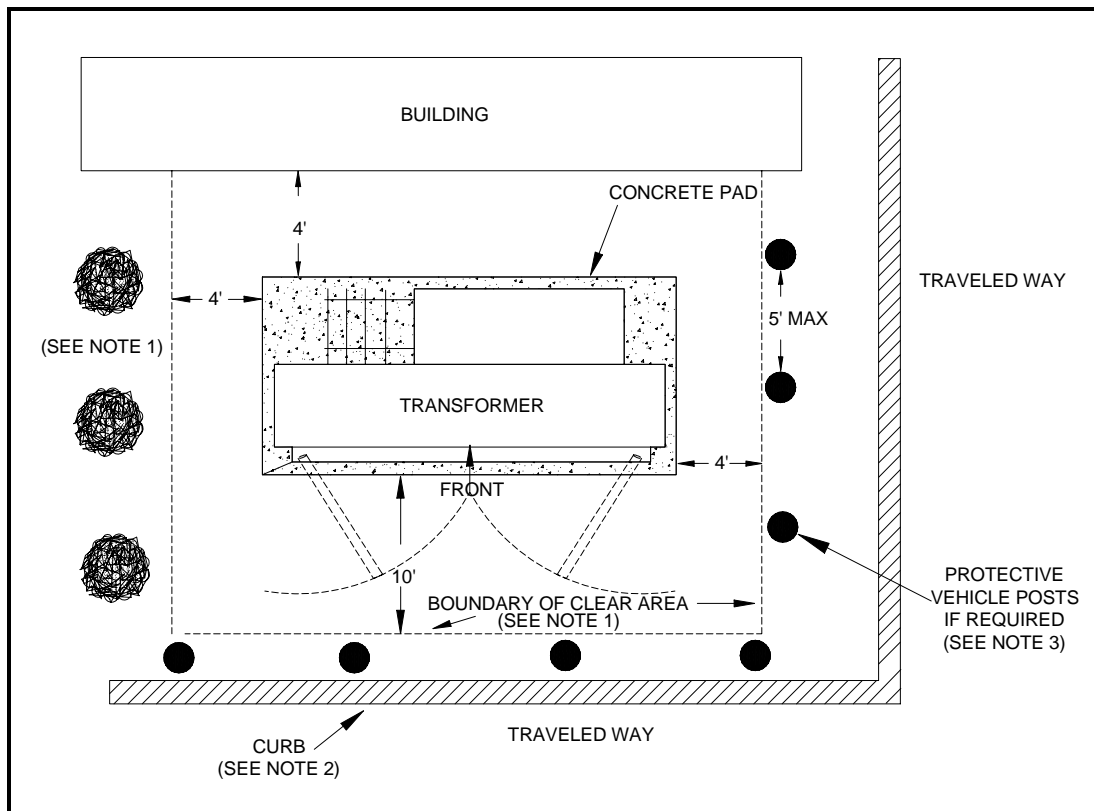


Figure 1 – Minimum Clearances

Notes:

1. The above Specified clear area distances to buildings, landscaping or other structures shall be maintained to: inspect, provide access, perform switching and ventilate the transformer.
2. If no curb exists, or transformer is located closer than 10 feet to the traveled way, protective vehicle posts shall be installed on exposed sides as specified.
3. Vehicle posts shall be 4" galvanized steel pipe minimum, filled with concrete and extend 42" above and below grade. Larger diameter posts may be required for some installations.
4. Minimum clearance from emergency generators (not shown) shall be 20'-0" minimum, unless separated by an 8" block wall, 8'-0" high, 4' minimum from pad. The length of wall shall be determined by NSTAR depending upon the transformer dimensions.
5. Approval of NSTAR Construction Supervisor required for clearances less than recommended minimums.

Issued 20-Mar-02	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C3802 Page 2 of 4
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2.0 NON-COMBUSTIBLE WALLS

Padmounted type transformers may be located as close as four feet to any non-combustible wall if the following clearances are maintained from doors, windows and other building openings. (See Figure 1).

2.1 Padmounted type transformers shall not be located within a zone extending twenty feet outward and ten feet to either side of a building door. (See Figure 2)

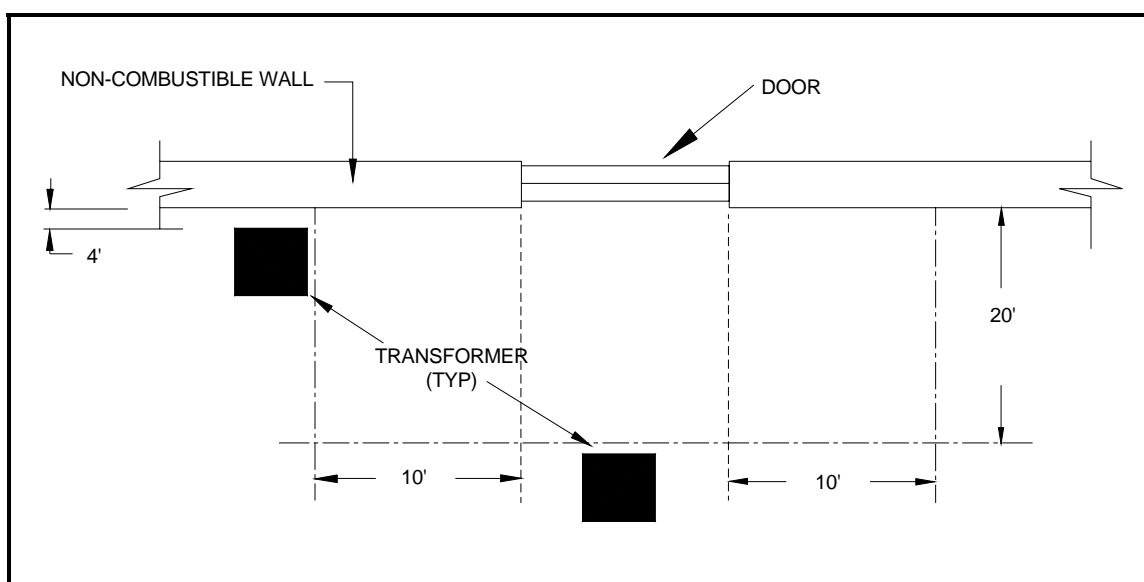


Figure 2 – Clearance From Door (Non-Combustible Wall)

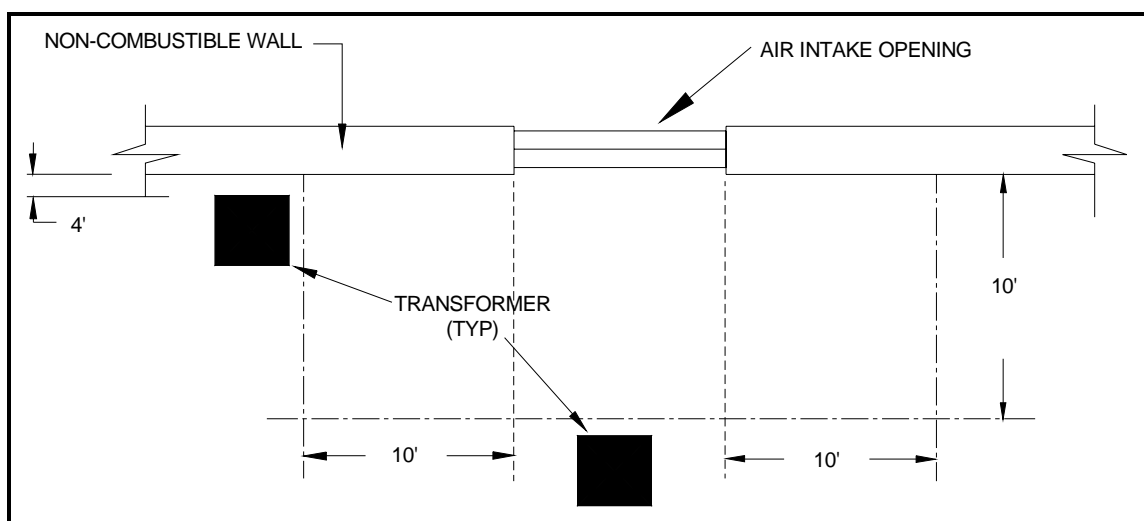


Figure 3 – Clearance From Air Intake (Non-Combustible Wall)

Issued 20-Mar-02	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C3802 Page 3 of 4
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2.0 Non-Combustible Walls, cont'd

- 2.2 Padmounted type transformers shall not be located within a zone extending ten feet outward and 10 feet to either side of an air intake opening. If the air intake opening is above the transformer, there must be a twenty-five foot vertical distance from the opening to the transformer. (See Figure 3)
- 2.3 Padmounted type transformers shall not be located within a zone extending ten feet outward and three feet to either side of a building window. (See Figure 4)
- 2.4 For second story windows, the transformer shall not be located less than five feet from any part of said window. (See Figure 5)

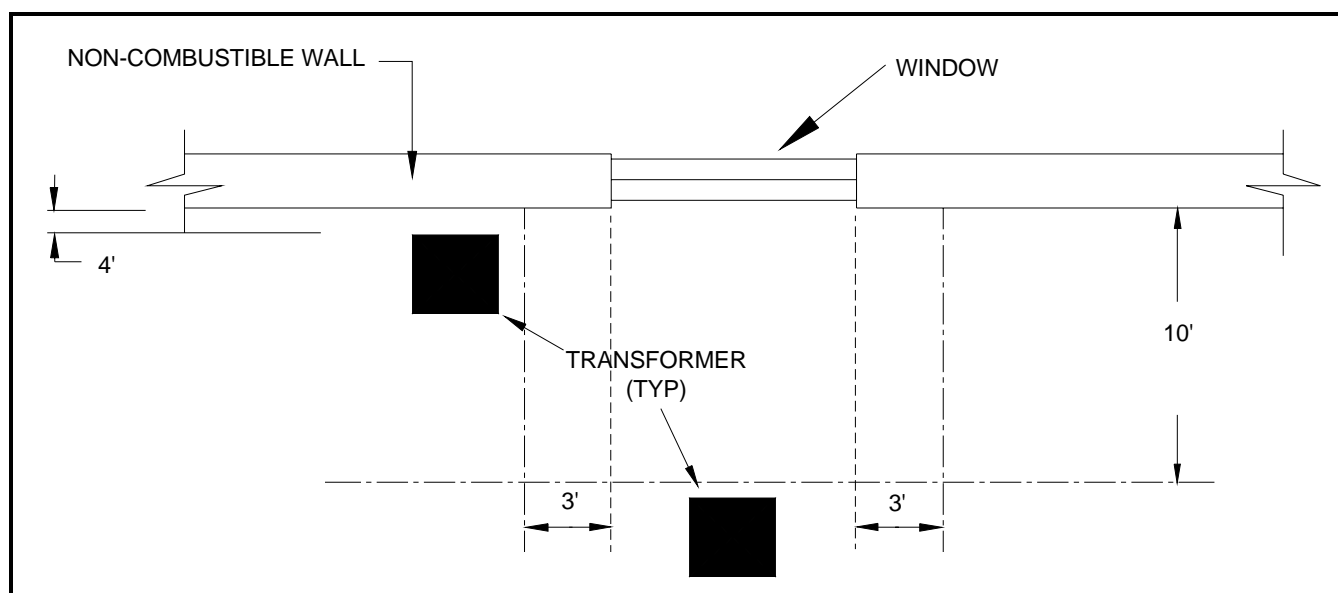


Figure 4 – Clearance From Windows (Non-Combustible Wall)

3.0 COMBUSTIBLE WALLS

- 3.1 Padmounted type transformers in sizes up to 100kVA shall be located according to the provisions set forth for non-combustible walls.

Issued 20-Mar-02	<div style="text-align: center;">  ELECTRIC OPERATIONS ORGANIZATION Construction Standard </div>	C3802 Page 4 of 4
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3.0 Combustible Walls, cont'd

3.2 Padmounted type transformers in sizes above 100kVA shall be located a minimum of ten feet from the building wall in addition to the clearances from building doors, windows and other openings set forth for non-combustible walls. Also, a sump shall be installed for transformers in sizes exceeding 400kVA if the immediate terrain is pitched toward the building. Consult with local NSTAR Engineer for sump specifications and additional requirements.

4.0 FIRE ESCAPES

Padmounted type transformers shall be located such that a minimum clearance of twenty feet is maintained from fire escapes at all times.

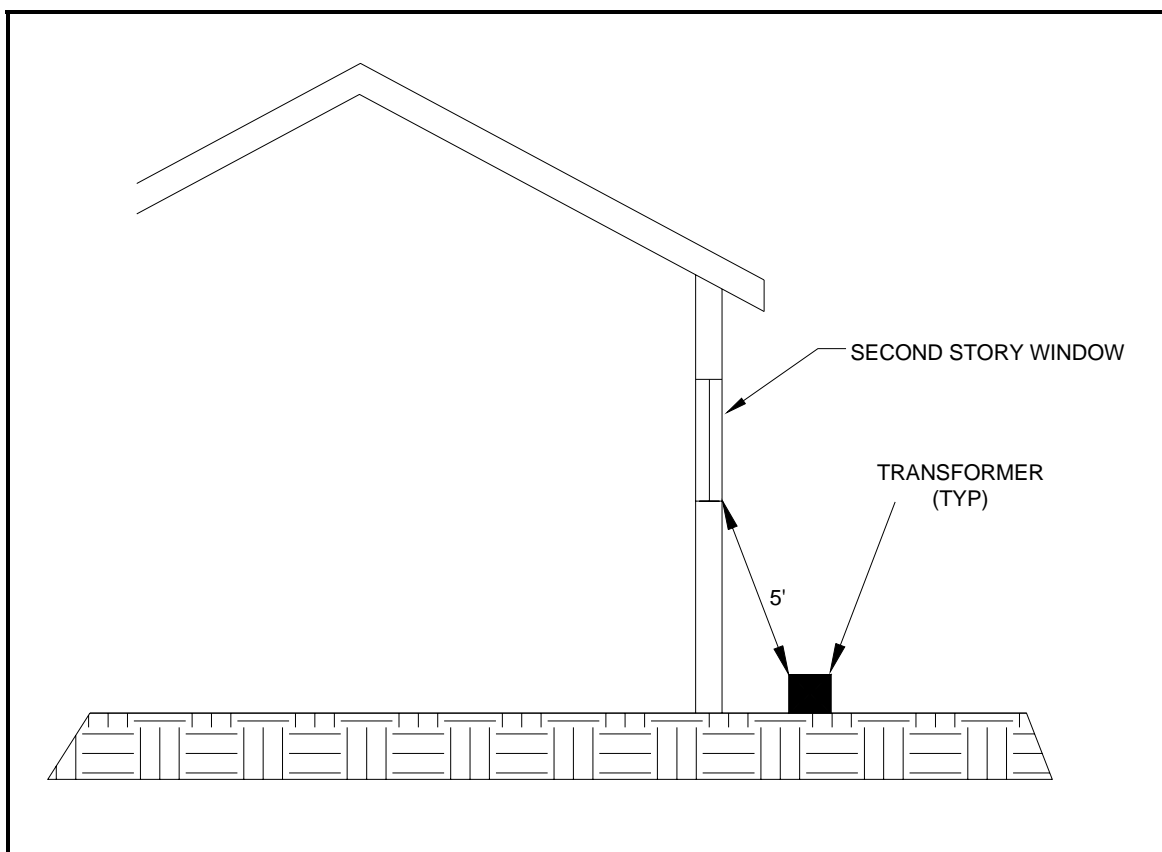


Figure 5 – Clearance From Second Story Window

Approved by: Elizabeth J. Leonard
 Asset Strategy - Distribution
 Technical Manager

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C3813

INSTALLATION OF PRECAST CONCRETE MANHOLES

1.0 Purpose

This purpose of this standard is to detail construction and materials required for the installation of precast concrete manholes, including frames and covers.

2.0 Bill Of Materials

Note: Table lists common standard sizes, covers and frames. Refer to NSTAR Material Standard Index for less commonly needed manholes.

Item	Description	Catalog ID	Compatible Unit
1	Common Manholes (Inside Dim. W x L x Ht), Material Standard Numbers Listed:		
	M1201 - 4'x4'x4'ht -secondary, split fiber w/bottom	16246	NMH-4x4x4
	M1202 - 4'x6'x6'ht - primary splicing (URD)	16238	NMH-4x6x6
	M1203 - 6'x10'x6'ht - primary splicing	16239	NMH-6x10x6
	M1204 - 6'x10'x8'ht - primary splicing	16240	NMH-6x10x8
	M1205 - 6'-6"x12'-6"x7'-10" ht - HA-300	16241	NMH-6x13x8
	M1208 - 4'x4'x4'ht -secondary (URD, open bottom)	9435	NMH-4x4x4NB
	M1212 - 10'x13'x8'ht - 3-way station get-a-way	16243	NMH-10x13x8
	M1214 - 8'x14'x8'ht - station get-a-way	16245	NMH-8x14x8
	M1216 - 5'x5'x5'ht - primary splicing (URD)	9437	NMH-5x5x5
	M1217 - 13'x13'x8' ht - 4-way station get-a-way	18090	NMH-13x13x8
2	Manhole (MH) Frames and Adapters:		
	Standard Cover and Frame Assembly: No. 1 MH Frame & Solid Cover (2 catalog ID items)	1384 & 1347	NMCF-1C
	M1303 – No. 1 MH Frame only (standard size)	1384	NMCF-1
	M1304 – No. 1-L MH Frame only (low profile)	1385	NMCF-1L
	M1305 – No. 0 MH Frame (large round opening) M1306 – Reducing Adapter for No. 0 MH Frame	1382 & 1097	NMCF-LR
	M1307 – No. 00 MH Frame (square opening) M1308 – Square to Round Adapter for No. 00 Manhole Frame	1383 & 1098	NMCF-SQ

ISSUED 21-Nov-08	<p style="text-align: center;">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	C3813 Revision 0 Page 2 of 9
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Item	Description	Catalog ID	Compatible Unit
3	Manhole Covers, Material Standards: M1300 – Solid Cover – line, switch MHs M1301 – Slotted Cover – hot MHs, not in sidewalk M1302 – Venting Hole Cover – Xfmr & sidewalk	1347 1348 16296	NMCC-S NMCC-V NMCC-H
4	5/8 " X 8'L Copperweld Ground Rod	9229	See Page 4
5	Mechanical Connector, 4/0 Cu – Ground Rod	597	See Page 4
6	Mechanical Connector, 1/0 Cu – Ground Rod	9009	See Page 4
7	4/0 Mechanical Connector, 4/0 – 4/0 Cu wire	608	See Page 4
8	Manhole ID Tag Holder	366	See Page 6

3.0 General

- 3.1 The precast manhole(s) to be installed shall be NSTAR approved precast manhole(s). Refer to the Bill of Materials list of commonly used approved NSTAR precast manholes.
- 3.2 The manhole frame and cover shall also be approved NSTAR items, refer to Bill of Materials.
- 3.3 The location of proposed precast manholes shall be approved and located per NSTAR local engineering dept. before installation begins.
- 3.4 All excavation, backfill and paving shall be done in accordance with this standard and all applicable local and state regulations. When conflicts exist between local/state regulations and this standard the more stringent requirement shall be adhered to unless otherwise directed by NSTAR.
- 3.5 DIG Safe marking and notification regulations are to be understood and adhered to prior and during all construction.
- 3.6 All NSTAR safety standards as well as all applicable OSHA and DOT worker safety requirements shall be adhered to at all in times.
- 3.7 Test pits shall be dug at proposed location of precast manhole before installation is confirmed. Test pits shall extend 12 inches beyond the extreme length and width and depth of the proposed manhole.

ISSUED 21-Nov-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3813 Revision 0 Page 3 of 9
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4.0 Excavation and Installation

- 4.1 The excavation shall be made to fully accommodate the proposed precast manhole, allowing for a minimum of 12 inches clear all around the outside length and width dimensions (of the manhole) and of sufficient size to safely and properly install all required shoring and bracing. The depth of the excavation shall be a minimum of 6 inches deeper than the installed underside of the manhole to allow for a minimum of 6 inches of bedding.
- 4.2 Manhole shall be installed using properly rated rigging equipment, adhering to OSHA work methods. The manhole shall be set level on firm well compacted bedding.
- 4.3 Install, operate and maintain pump or dewatering equipment as necessary to prevent water from accumulating in excavation during excavation and installation of manhole.

5.0 Backfill Material

- 5.1 Backfill material to be used for bedding shall be 6 inches (minimum) of ¾" diameter crushed stone per Figure 1, page 7.
- 5.2 Backfill material to be used between the surrounding earth and the exterior sidewalls of the manhole and shall be "Type IE", (Controlled Density Fill, "CDF", or excavatable flowable fill).
- 5.3 Backfill material above the top of the manhole to final grade or paving if required shall conform to Massachusetts Highway Department Specification, "MHD M1 M1.03.1 Process Gravel for Subbase". Backfill shall be compacted mechanically in eight inch (8") loose layers to 95% of the maximum density per ASTM D1557 unless otherwise approved by NSTAR.

6.0 Pavement Cuts

- 6.1 All cuts in bituminous or concrete pavement shall be vertical and made with the proper tools to ensure minimum repaving. The pavement cut shall be straight and uniform.
- 6.2 Excavated pavement and street base, if any, shall be kept at least two (2) feet back from the edge of the excavation cut and shall be piled so as not to endanger the work or restrict, hamper or inconvenience owners or tenants of property or interfere with the normal flow of traffic. All excess

ISSUED 21-Nov-08	<p style="text-align: center;">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	C3813 Revision 0 Page 4 of 9
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materials not suitable for backfill shall be removed from the job site and disposed of as directed by NSTAR.

7.0 **Sod Removal**

Sod shall be removed carefully, when possible, in regular and uniform blocks with sharp edged tools. It shall be placed in uniform piles along the excavation and kept moist until time for relaying. The Contractor shall be responsible for suitable reseeding, if necessary and shall maintain until grass has grown.

8.0 **Street Restoration**

All street paving of open excavations shall be restored using temporary or Interim pavement with two – 1-1/2 inch lifts of compacted hot mix asphalt binder (unless otherwise noted by NSTAR). Cold patch repairs when approved by NSTAR shall be cold patch NSTAR Cat ID 1628. Permanent street paving shall be by the governing municipality.

9.0 **Grounding of Manhole**

9.1 Manhole grounding shall be as detailed on Figure 2, page 8. Refer to table below for typical manhole grounding accessories and compatible unit assemblies.

9.2 Install two copperweld ground rods, one outside each corner of manhole. Connect 4/0 bare copper wire to ground rods using grounding mechanical or exothermic connector in two places. Connect 4/0 bare copper wire to 4/0 copper ground wire tails projecting from manhole with two mechanical connectors.

Table of Precast Manhole Ground Ring Accessories

Description	Quantity	Catalog ID	Compatible Unit
4'x4' or 5'x5' – small manhole ground ring includes: -5/8" x 8' Ground rod -1/0 Cu Ground wire -Ground Rod Connector to 1/0 Cu wire -Ground Wire connector 1/0-1/0 Cu wire	2 40 2 4	9229 100 9009 608	UGN4x4

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Description	Quantity	Catalog ID	Compatible Unit
<p>10'x6'– standard manhole ground ring includes:</p> <p>-5/8" x 8' Ground rod</p> <p>-4/0 Cu Ground wire</p> <p>-Ground Rod Connector to 4/0 Cu wire</p> <p>-Ground Wire connector, bronze , 4/0-4/0 Cu wire</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">55</p> <p style="text-align: center;">2</p> <p style="text-align: center;">4</p>	<p style="text-align: center;">9229</p> <p style="text-align: center;">116</p> <p style="text-align: center;">597</p> <p style="text-align: center;">608</p>	<p style="text-align: center;">UGN10x6</p>
<p>14'x8'– large manhole ground ring includes:</p> <p>-5/8" x 8' Ground rod</p> <p>-4/0 Cu Ground wire</p> <p>-Ground Rod Connector to 4/0 Cu wire</p> <p>-Ground Wire connector 4/0-4/0 Cu wire</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">65</p> <p style="text-align: center;">2</p> <p style="text-align: center;">4</p>	<p style="text-align: center;">9229</p> <p style="text-align: center;">116</p> <p style="text-align: center;">597</p> <p style="text-align: center;">608</p>	<p style="text-align: center;">UGN14x8</p>

10.0 Manhole Frame & Cover

- 10.1 NSTAR approved manhole frame(s) shall be installed on a two brick collar course (unless required otherwise by NSTAR) over the opening(s) on the roof of the manhole as shown in Figure 1, page 7. Refer to NSTAR Standards in the Bill of Materials for approved frames and covers.
- 10.2 The brick collar course shall be installed directly around the manhole roof opening as shown on Fig. 1, page 7. The bricks shall consist of the best quality steam cured brick manufactured per the latest revision of ASTM Standard C55 or the latest revision of ASTM Standard C32 (if red brick is specified). The brick collar and flange of the manhole frame shall be completely covered with a concrete seal. The concrete (approved 2500 psi pea stone mix using Type 2 Portland Cement) seal shall completely encase the lower 3 inches of the frame and the brick course layers.

11.0 Miscellaneous Manhole Accessories

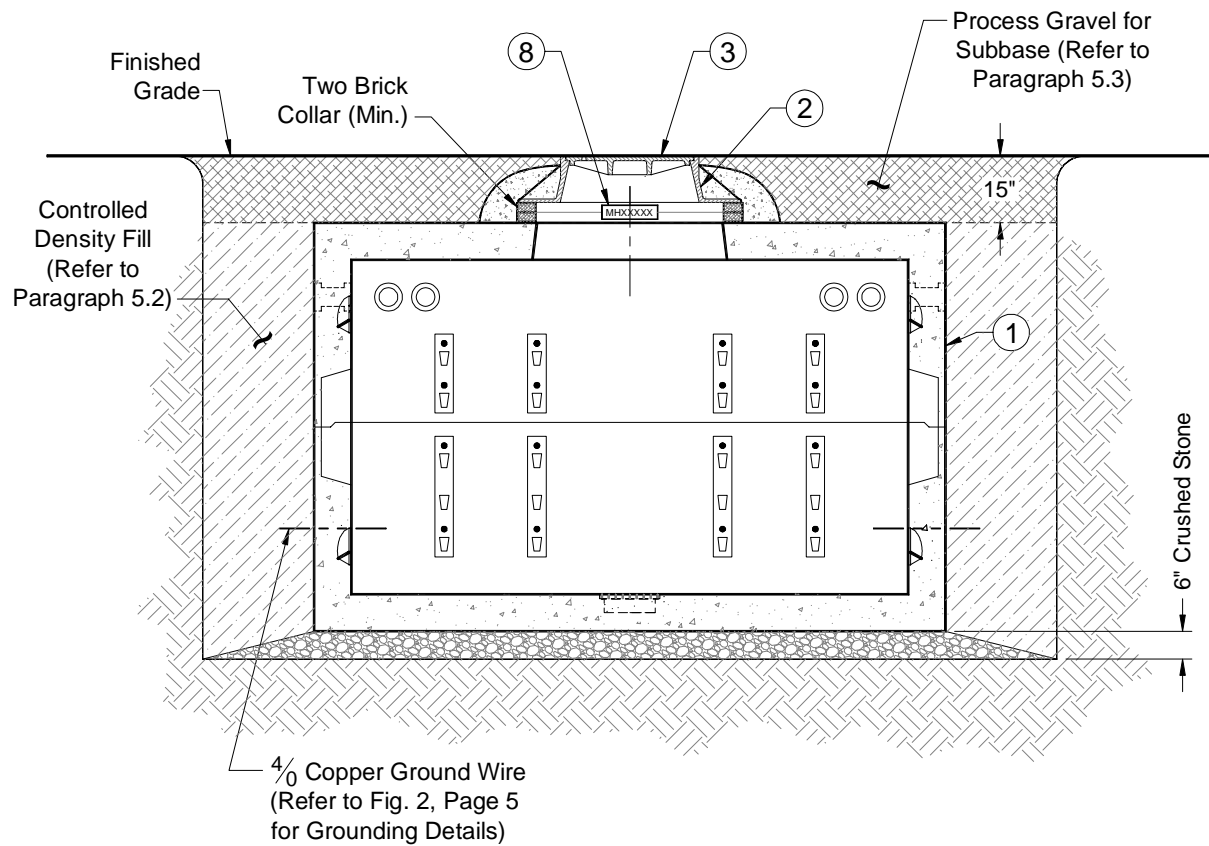
- 11.1 The items in the table, on page 6 (not shown on figures in this standard) are either pre-installed by precast manhole vendor or installed as required after installation.
- 11.2 All manholes shall have Manhole ID Tag fastened to the chimney. Refer to Figure 1, page 7.

ISSUED 21-Nov-08	<p align="center">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p align="center"></p>	<p align="center">C3813</p> <p align="center">Revision 0 Page 6 of 9</p>
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Table of Miscellaneous Manhole Accessories

Description	Catalog ID	Compatible Unit
Cable Arm Stanchions: Single Position Two Position Three Position Four Position Five Position Six Position	1750 1751 1752 17534 1754 1755	USTN1 USTN2 USTN3 USTN4 USTN5 USTN6
Cable Support Arms: One Position Two Position Three Position	1140 1141 1146	USTC1 USTC2 USTC3
Duct Plugs: 4 inch diameter 5 inch diameter 6 inch diameter	1636 1637 16896	NFP4-PLUG NFP5-PLUG NFP6-PLUG
Fairleader:	1371	NA-FA
Duct Seal: Small Package Large Package	9469 1239	NAS-DX NAL-DX
Manhole ID Holder	366	N/A

<p>ISSUED 21-Nov-08</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C3813</p> <p>Revision 0 Page 7 of 9</p>
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TYPICAL SECTION
Showing Manhole Frame Installation

FIGURE 1

ISSUED 21-Nov-08	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION NSTAR ELECTRIC	C3813 Revision 0 Page 8 of 9
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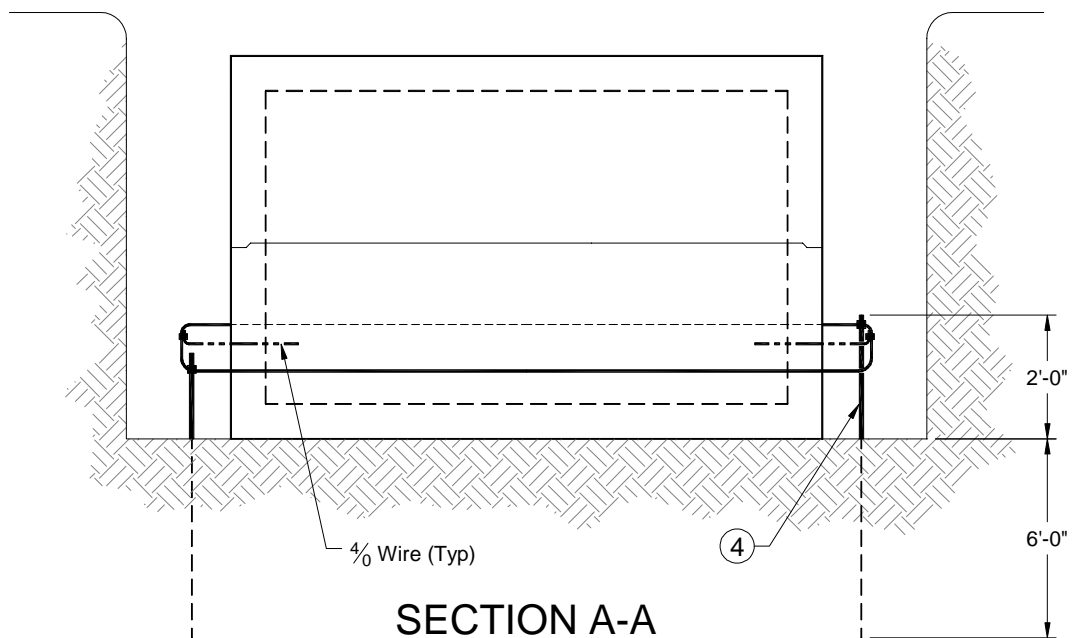
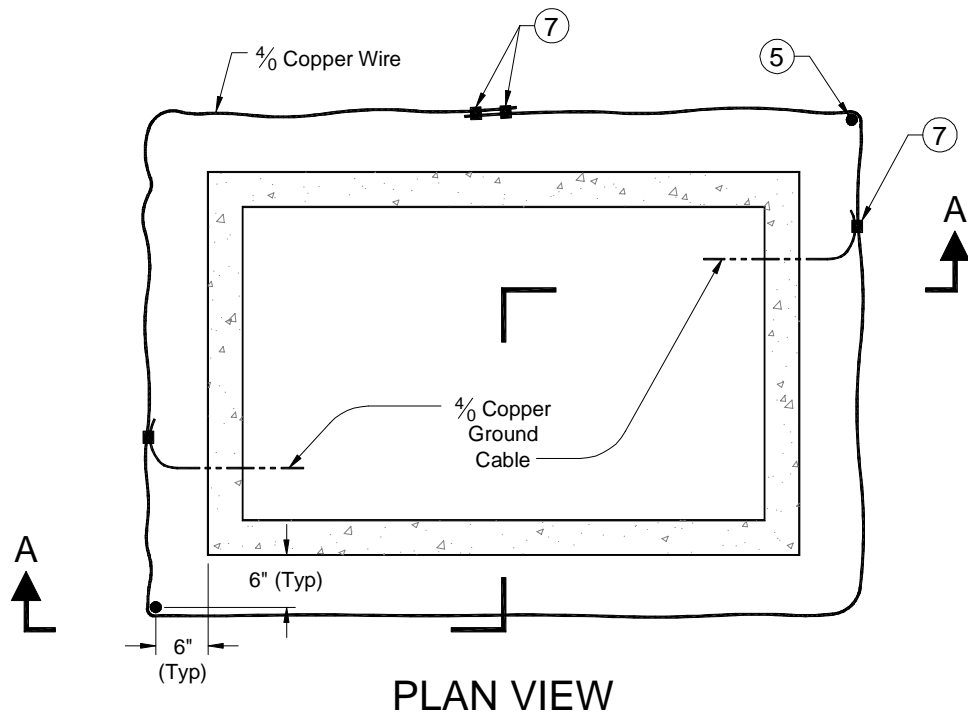


FIGURE 2
MANHOLE GROUNDING DETAILS

Note: 5'x5' and Smaller Manholes Require 1/0 Ground Wire instead of 4/0.

<p>ISSUED 21-Nov-08</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	<p>C3813 Revision 0 Page 9 of 9</p>
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12.0 References

Refer to NSTAR Material Standard Index for complete list of all NSTAR approved precast manholes, frames and covers.

Approved by: Amin Jessa
Director, Distribution Engineering

ISSUED 07-Aug-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3814 Revision 0 Page 1 of 17
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C3814

****This standard supersedes the following standards of COM/E 4-0835 & COM/E 1-0796; NE-2, NE-5 NE-12, NE-16C & NE-16D, and sections of BECo 2.10-10.3

INSTALLATION OF HANDHOLES & BOX PADS

<u>Table of Contents</u>	<u>Page</u>
1.0 Purpose.....	2
2.0 Safety.....	2
3.0 Bill of Materials and Drawing Index.....	2-3
4.0 General.....	4
5.0 Excavation.....	4
6.0 Concrete Anchor/Thrust Block.....	5
7.0 Backfill Material.....	5
8.0 Pavement Cuts.....	6
9.0 Sod Removal.....	6
10.0 Landscaping Restoration.....	6
11.0 General Requirements for Installation of Handholes.....	6
12.0 General Requirements for Installation and Grounding of Box Pads.....	8
13.0 Special Requirements for 600V Secondary Bus Enclosure.....	8
14.0 Construction Drawings.....	9 -16
15.0 References.....	17
16.0 Approval Signature.....	17

ISSUED 07-Aug-09	<p style="text-align: center;">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: center;">C3814</p> <p style="text-align: center;">Revision 0 Page 2 of 17</p>
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1.0 Purpose

This purpose of this standard is to provide installation methods and materials required for the installation of fiberglass, high density polyethylene (HDPE) or composite (polymer concrete) handholes and box pads. The handholes and box pads may be used for service connections, primary splices, transformer foundations, switching stations, or miscellaneous equipment foundations. All fiberglass box pads shall herein be referred to as box pads.

2.0 Safety

Providing a work environment free of recognized hazards is a value at NSTAR. Therefore, prior to the start of any work, ensure that you are familiar and knowledgeable with any and all NSTAR Safety Rules, Policies and Procedures that are applicable to the work and tasks at hand and perform a job brief at the job site, prior to commencing work.

PPE requirements to protect the worker shall be followed as required in the NSTAR Incident Prevention Manual.

3.0 NSTAR approved Handholes and Box Pads

Figure No.	Page No.	Description & Application (Dimension are for top surface x ht.)	Catalog ID	Compatible Unit
Handholes				
1	7	Fiberglass handhole: 15"x10"x12"	840	NHHPS
1	7	Fiberglass handhole: 23"x14"x15"	9571	NHHPM
1	7	Fiberglass handhole: 30"x17"x18"	841	NHHP
1	7	Composite handhole: 30"x17"x18"	9572	NHHC
Box Pads				
2	9	Fiberglass box pad for 15kV PME-9 Switches manufactured after January 2001: 75"x72"x36" (top opng = 65"x62")	14024	NPDS-F75x72
n/a	n/a	Base fiberglass cover for use with Cat. ID 14024	14078	NFDS-F75x72COV
2	9	Fiberglass box pad for use with older 15kV PME-9 switches manufactured prior to January 2001	1621	NFDS-F69x65x36
n/a	n/a	Base fiberglass cover for use with Cat. ID 1621	1350	NPDS-F69X65COV
3	10	Fiberglass box pad for use with 25kV PME-9 Switchgear: 86"x84"x36" (two pieces)	14556	NFDS-F86-84
n/a	n/a	Fiberglass base cover for use with Cat. ID 14556	14557	NFDS-F86x84COV

ISSUED 07-Aug-09	<p style="text-align: center;">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	C3814 Revision 0 Page 3 of 17
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4	11	Fiberglass box pad: 43"x37.5"x32" Use for NSTAR North Single Phase Transformers. Also as base for old compact style Cable Switching Station (CSS) Enclosures (top opening = 26"w x 32"d)	1622	NPDX-FN
4	11	Fiberglass box pad/splice box: 43"x37"x32" Use for NSTAR South Single Phase Transformers (top opening= 26"w x 26"d)	16955	NPDX-FSO
Figure No.	Page No.	Description & Application (Dimension included are top surface x ht.)	Catalog ID	Compatible Unit
4*	n/a	Fiberglass box pad/splice box: 43"x37.5"x15" Use for NSTAR North Single Phase Transformers (shallow depth) or splice box (top opening = 26"w x 32"d) *similar to Fig. 4	7747	NPDX-FNS
n/a	n/a	Fiberglass cover (Use with Cat. IDs 1622 & 7747)	1349	NPDX-F1PCOV
5	12	Fiberglass box pad for single phase primary splice or three phase primary splice (with 3 - #1 AL only): 43"x37.5"x32"	1622	NPDX-FN
6	13	Fiberglass box pad for 3 phase primary splice box: 75"x72"x36" (top opng = 65"x62")	14024	NPDS-F75x72
n/a	n/a	Pad Adapter Plate (15 KV only) to fit new PME-9 switches on old fiberglass bases	14025	n/a
7	14	Fiberglass box pad for use with 15kV PVI-9, SF-6 Switchgear: 102"x60"x36"	15568	NPDS-F60x102
8	15	Single Phase Primary Cable Switching Station, 4 position multitap, 15kV	9533	U2MJCAB – 1PH
8	15	Single Phase Primary Cable Switching Station, 4 position multitap, 25kV	9534	U2HJCAB – 1PH
9	16	Three Phase Primary Cable Switching Station, 3x4 position multitap, 15kV	2590	U2MJCAB – 3PH
9	16	Three Phase Primary Cable Switching Station, 3x4 position multitap, 25kV	9536	U2HJCAB – 3PH
Grounding Accessories				
n/a	n/a	5/8" Dia. Ground Rod	9229	UGN4x4
n/a	n/a	1/0 Copper Ground Wire	100	"
n/a	n/a	Ground Wire Connector, 1/0-1/0 Cu Wire	608	"
n/a	n/a	Ground Rod to 1/0 Cu Wire Connector	9009	"

ISSUED 07-Aug-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3814 Revision 0 Page 4 of 17
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4.0 **General**

- 4.1 This standard references cat IDs (for handholes and box pads) typically required for a specific application, i.e. various handholes and box pads which are used for splicing, pulling, equipment foundation, enclosures, etc. If specific application/equipment requires unique installation details they should be referenced in the specific installation standard or in the NSTAR plans or work order.
- 4.2 The handholes and box pads to be installed shall be approved NSTAR items, refer to list of approved NSTAR items with corresponding Catalog ID's in the Bill of Materials.
- 4.3 Location of handholes and box pads shall be in accordance with NSTAR Standard, "D3820, 200 Amps UDS Design Standard" and NSTAR's "Information and Requirements for Electric Service", latest version. Final approval required by NSTAR before installation.
- 4.4 Do not locate handholes, pads or splice boxes at low points in the final grade, on abrupt slopes, in a paved way, in the line of or close to driveways or where they are likely to be covered by plowed snow or otherwise endangered or made inaccessible.

5.0 **Excavation**

- 5.1 All excavation shall be done In accordance with this standard and all applicable local and state regulations. When conflicts exist between local/state regulations and this standard the more stringent requirement shall be adhered to unless otherwise directed by NSTAR.
- 5.2 DIG Safe marking and notification regulations are to be understood and adhered to prior and during all construction.
- 5.3 All NSTAR safety standards as well as all applicable OSHA and DOT worker safety requirements shall be adhered to at all in times.
- 5.4 Test pits shall be dug at proposed location for all box pads when the depth of excavation required for installation is greater than 24 inches or if ledge/large rock outcrops are in the immediate vicinity. Test pits shall extend 12 inches beyond the extreme length and width and depth of the proposed pad.
- 5.5 The excavation shall be made to fully accommodate the proposed pad, allowing for a minimum of 12 inches clear all around. The depth of the excavation shall be a minimum of 6 inches (3 inches for handholes)

ISSUED 07-Aug-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3814 Revision 0 Page 5 of 17
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deeper than the installed underside of the pad to allow for a minimum of 6 inches (3 inches for handholes) of bedding.

- 5.6 Excavated materials, shall be kept at least two (2) feet back from the edge of the excavation cut and shall be piled so as not to endanger the work or restrict, hamper or inconvenience owners or tenants of property or interfere with the normal flow of traffic. All excess materials not suitable for backfill shall be removed and disposed of as directed by NSTAR.
- 5.7 Box pads shall be installed using properly rated lifting equipment (when required), adhering to OSHA work safety methods. The box pads shall be set level on firm well compacted bedding.
- 5.8 Proper clearances shall be maintained around all sides of handholes and boxpads allowing unobstructed access for operation and/or maintenance.

6.0 Concrete Thrust Block

- 6.1 Due to the occasional shifting and movement of the conduit sweeps as cable is pulled through the conduit a concrete thrust block shall be cast-in-place and formed around the conduit sweeps as shown on the corresponding Figures Nos. 2 through 7. The top of the concrete block shall be a minimum of 2 inches below the bottom flange of the box pad.
- 6.2 A ready mix batch of 2500 psi concrete shall be used to form the thrust block which shall be installed as follows:
 - A. Prepare the forms to the dimensions shown in the applicable figure. Make sure all ducts are temporarily capped.
 - B. Carefully place the mixed concrete into the forms to a depth not less than 2 inches below the installed bottom elevation of the fiberglass box pad. This is to allow for the installation of the grounding pig tails which shall be installed over the thrust block and under the box pad.
 - C. Let concrete set a minimum of 15 minutes before backfilling.

7.0 Backfill Material

- 7.1 Backfilling shall not be started until approval from NSTAR has been obtained and once approved, shall be commenced promptly.
- 7.2 Backfill shall be the best of excavated material. All deleterious soils including organics, ashes, cinders, shells or frozen materials shall be removed and replaced with suitable backfill before installing the foundation.

ISSUED 07-Aug-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3814 Revision 0 Page 6 of 17
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- 7.3 Backfill material around the sidewalls of the pad shall be placed in uniform, mechanically compacted layers not more than 12 inches thick.

8.0 **Pavement Cuts**

- 8.1 All cuts in bituminous or concrete pavement shall be vertical and made with the proper tools to ensure minimum repaving. The pavement cut shall be straight and uniform.
- 8.2 Excavated pavement and street base, if any, shall be kept at least two (2) feet back from the edge of the excavation cut and shall be piled so as not to endanger the work or restrict, hamper or inconvenience owners or tenants of property or interfere with the normal flow of traffic. All excess materials not suitable for backfill shall be removed from the job site and disposed of as directed by NSTAR.

9.0 **Sod Removal**

- 9.1 Sod shall be removed carefully, when possible, in regular and uniform blocks with sharp edged tools. It shall be placed in uniform piles along the excavation and kept moist until time for relaying. The Contractor shall be responsible for suitable reseeding, if necessary and shall maintain until grass has grown.

10.0 **Landscaping Restoration**

- 10.1 Provide sod for grass areas disturbed by construction activity and replace shrubbery and trees damaged, removed or disturbed by construction activity.
- 10.2 Restore existing grades where disturbed. Sidewalks and paved areas shall be restored to its original (or better) condition. Permanent street paving shall be by the governing municipality.

11.0 **General Requirements for installation of Hand Holes**

- 11.1 Refer to Figure 1, page 7 for typical installation details of fiberglass HDPE (high density polypropylene) and composite handholes. Grounding is not required for splices on secondary cables installed within handholes.

A. Types of hand holes. Dimensions are for top by inside depth:

1. Fiberglass or High Density Polyethylene (HDPE) :

15"x10"x12" (inside depth) – cat ID 840 (street lighting only)

ISSUED
07-Aug-09

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C3814
Revision 0
Page 7 of 17

23"x14"x14" (inside depth) – cat ID 9571

30"x17"x18" (inside depth) – cat ID 841 (standard use)

Fiberglass and HDPE handholes must be installed in unpaved areas, areas not subject to any incidental traffic, traveled ways or sidewalks. These handholes are typically made from a plastic/fiberglass material or similar and shall be installed 2 inches above final grade.

2. Concrete Composite Hand hole:

Concrete composite hand holes are rated for H-20 vehicle load, and are to be used in light traffic or paved areas only (e.g. – parking lots, sidewalks). They are not intended for roadways.

30"x17"x18" (inside depth) – cat ID 9572

B. Application:

This composite handhole is rated acceptable for incidental traffic, (H20 Loading) such as in a driveway, parking lot, or on a sidewalk. It is not rated for constant vehicular traffic, such as would be typical in a public roadway. The composite handhole is made from fiberglass/concrete composite materials or similar and shall be installed flush with final grade.

- 11.2 Covers shall be made of material compatible with its use and securely fastened with a minimum of two penta head bolts.

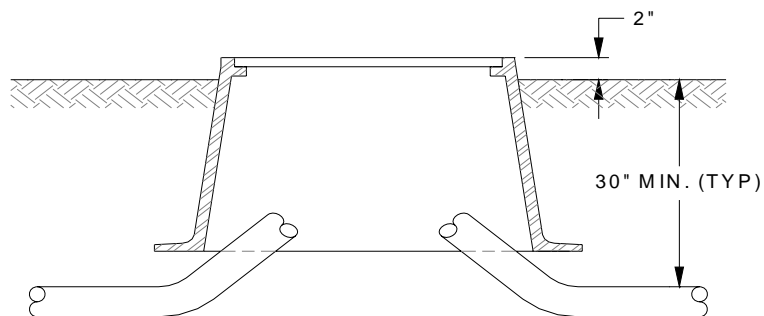


Figure 1 - Typical Handhole Installation

Notes:

1. $\frac{3}{4}$ " dia crushed stone bedding 6 inch (min) depth below base of handhole.
2. Within paved/sidewalk areas, install top of handhole flush with grade.

ISSUED 07-Aug-09	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3814 Revision 0 Page 8 of 17
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12.0 General Requirements for Installation and Grounding of Box Pads:

- 12.1 Installation requirements specific to the equipment installed (or how the boxpad is used) shall be as contained within this standard.
- 12.2 All pads enclosing splices or supporting equipment shall be located to allow unobstructed safe access to all sides for operation and safe passage. For guidance on clearance refer to Standard C3802, "Recommended Minimum Clearances from Three-Phase Distribution Transformer Foundation to Building Openings, Landscaping or Traveled Way". Location of all pads shall be approved by NSTAR Inspector before installation.
- 12.3 The box pad's top surface shall be a minimum of 2" (4" maximum) above the surrounding grade. This minimum clearance is needed to open compartment doors. The orientation shall be such that the doors open toward the roadway unless otherwise specified by the engineer.
- 12.4 Grounding of all boxpads require the installation of two 5/8" diameter copperweld ground rods (3/4" diameter acceptable) outside the perimeter of the box pad, 18" min. below grade at opposite corners of the box pad.
- 12.5 A 1/0 AWG copper ground wire shall be fastened to the ground rods by Cadweld or with compression grounding connections. Any connectors used must be bronze/copper, rated for grounding and direct burial.
- 12.6 Locations where conduits have been installed under a proposed pad location shall be inspected to ensure that the backfill over the installed conduit has been thoroughly compacted and firm.
- 12.7 Backfill material to be used for bedding shall be 12 inches (minimum) of 3/4" diameter crushed stone.

13.0 Special Requirements for Installation of 600V Secondary Bus Enclosure

- 13.1 There is no NSTAR specified Catalog ID for the fiberglass box pad to be used for this installation.
- 13.2 The installation requirements of the fiberglass box pad and the grounding requirements shall be similar to the details in Figure 5 of this standard.
- 13.3 Secondary Bus Enclosure (SBE) (reference NSTAR Material Standard M2301) shall be installed on a Fiberglass Box Pad sized to satisfy the manufacturers' dimensional requirements of the structural supporting frame as well as the fiberglass enclosure which houses the secondary bus.

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07-Aug-09

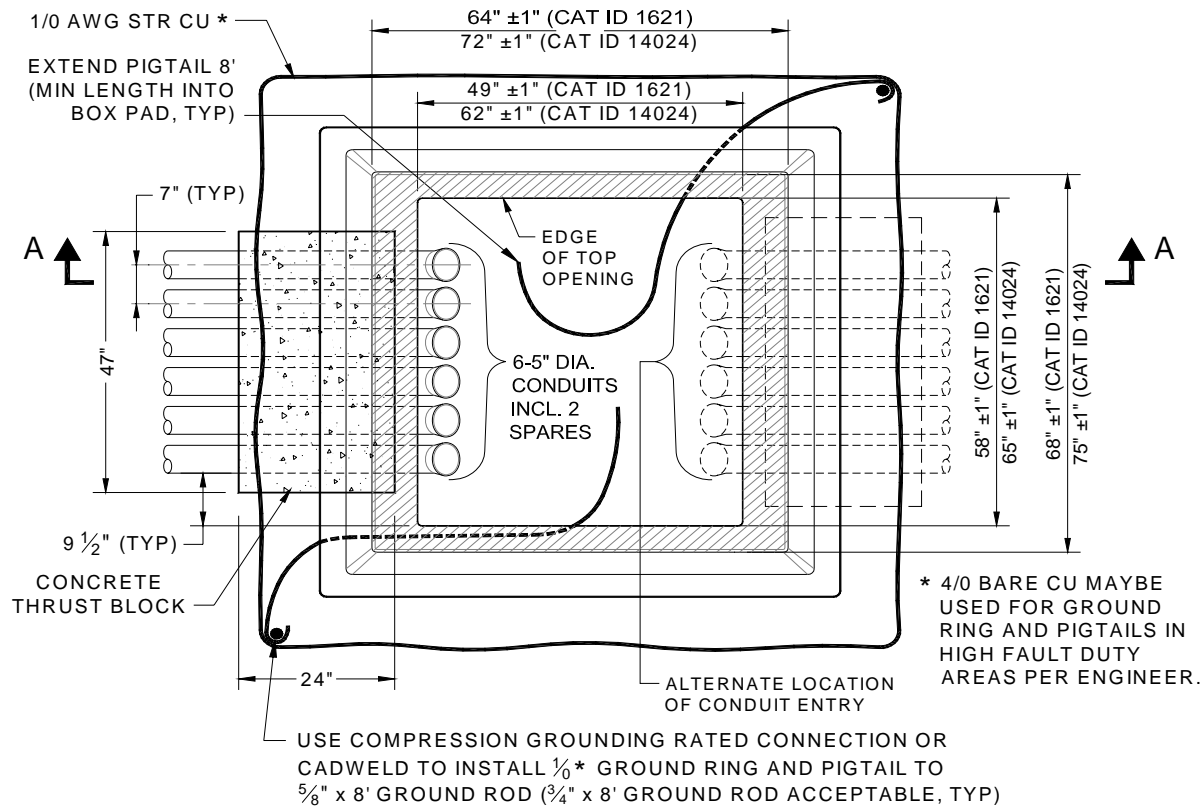
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ELECTRIC OPERATIONS ORGANIZATION



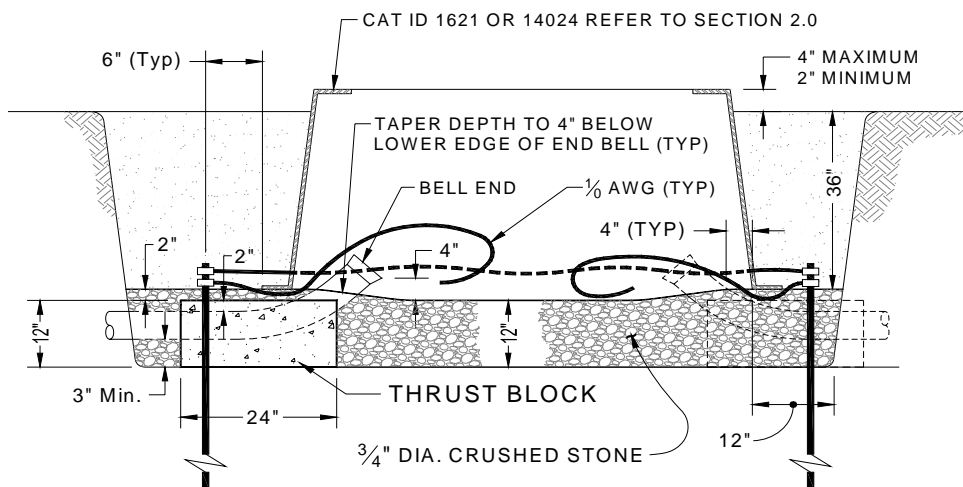
C3814

Revision 0
Page 9 of 17

14.0 Construction Drawings



TOP VIEW



SECTION A-A

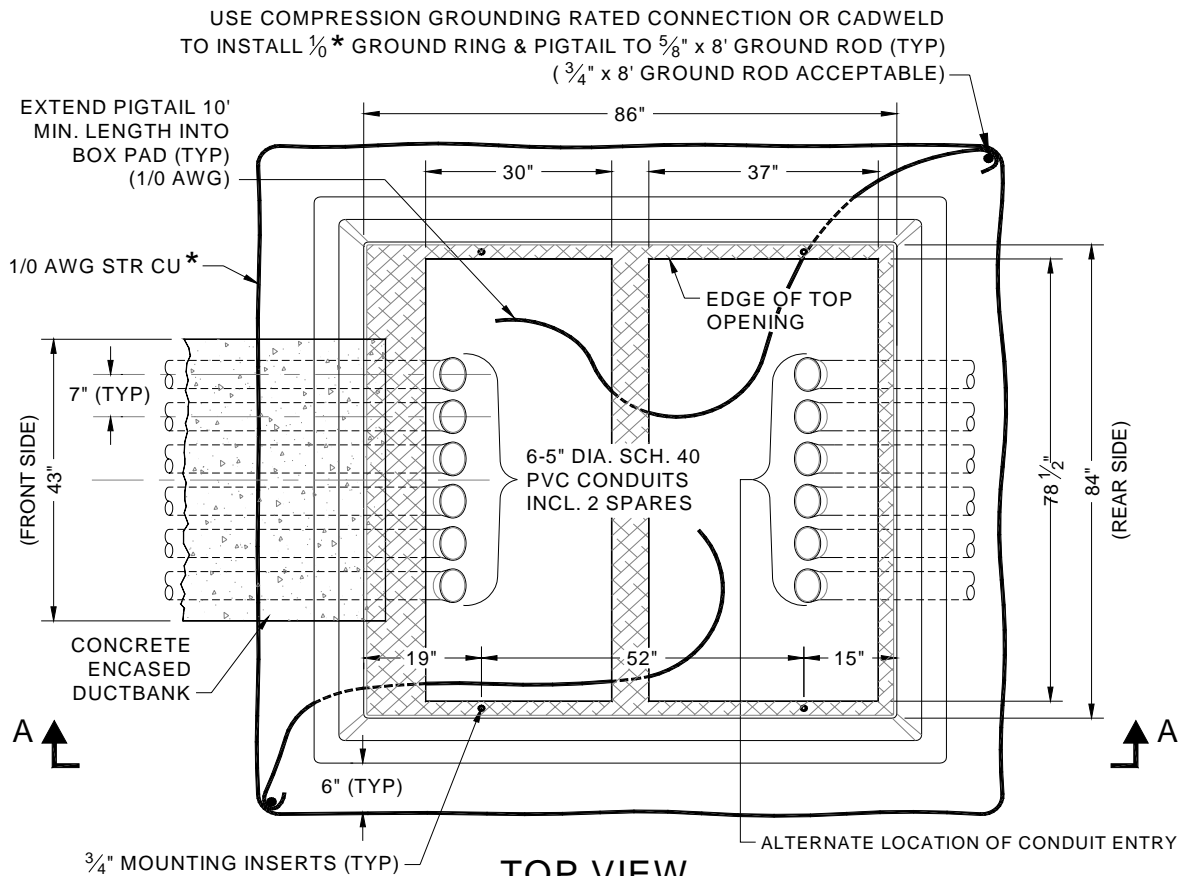
Figure 2 – Typical Fiberglass box Pad Installation Details to support 15kV PME-9 Switches

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07-Aug-09

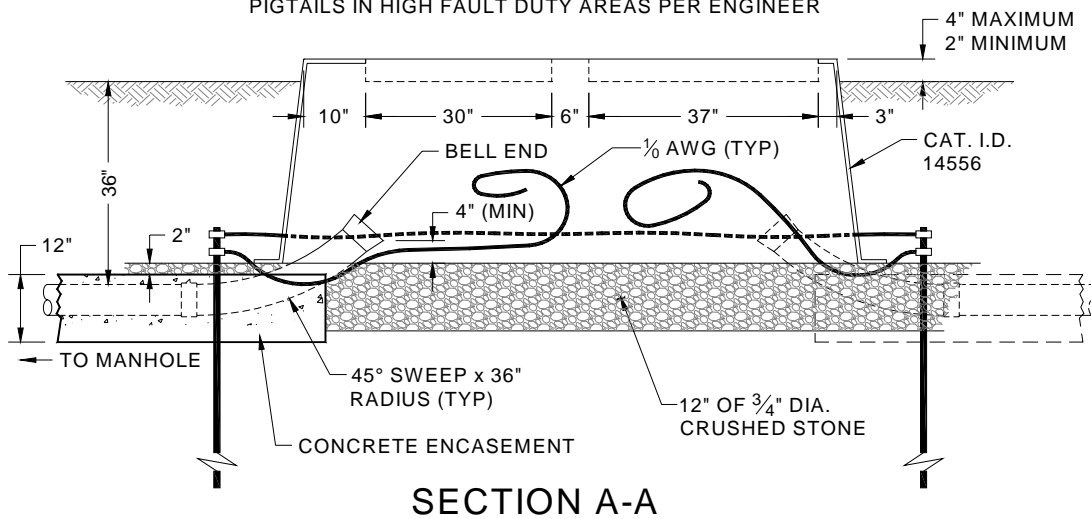
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ELECTRIC OPERATIONS ORGANIZATION



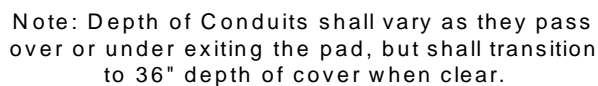
C3814
Revision 0
Page 10 of 17



* $\frac{4}{0}$ BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER



**Figure 3 – Typical Fiberglass box Pad Installation Details to support 25kV
PME-9 Switches**



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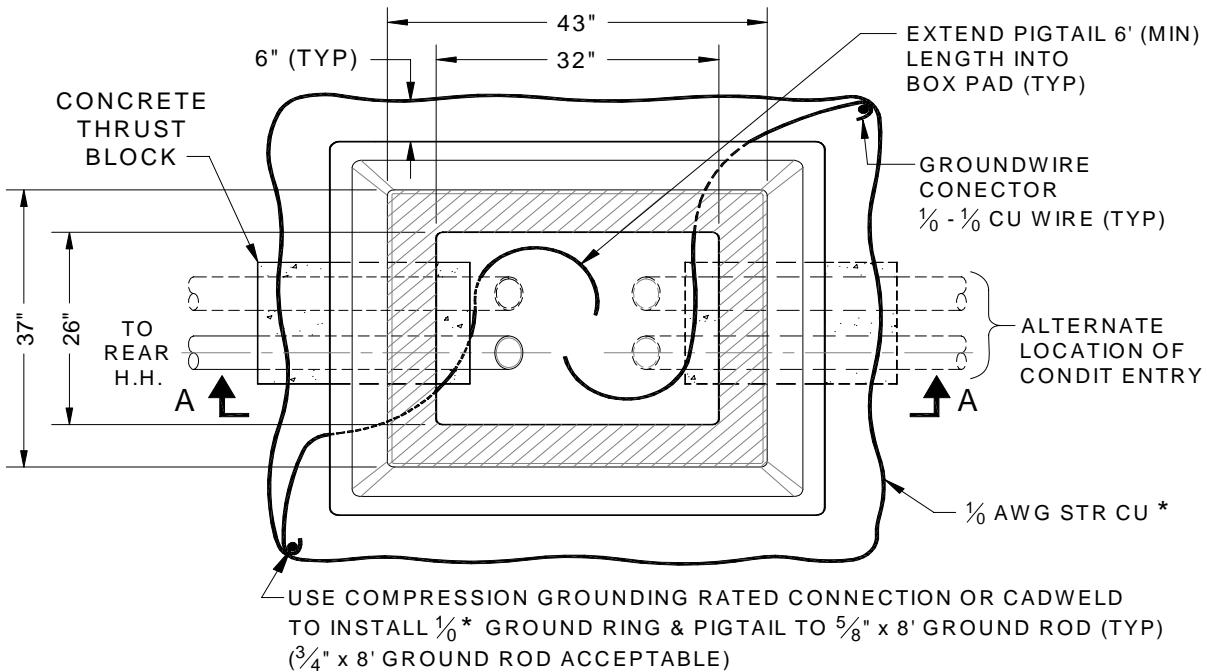
ISSUED
07-Aug-09

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C3814

Revision 0
Page 12 of 17



PLAN VIEW

* $\frac{1}{8}$ " BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER

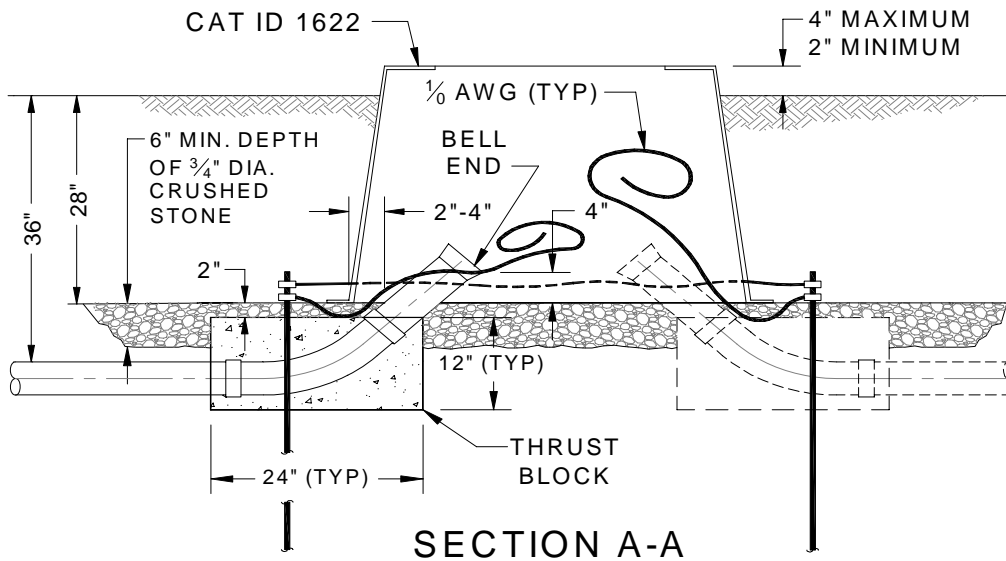


Figure 5 – Typical Fiberglass box Pad Installation Details to support Single Phase Primary Splice or Three Phase Primary Splice (with 3- #1 AL only)

ISSUED
07-Aug-09

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C3814
Revision 0
Page 14 of 17

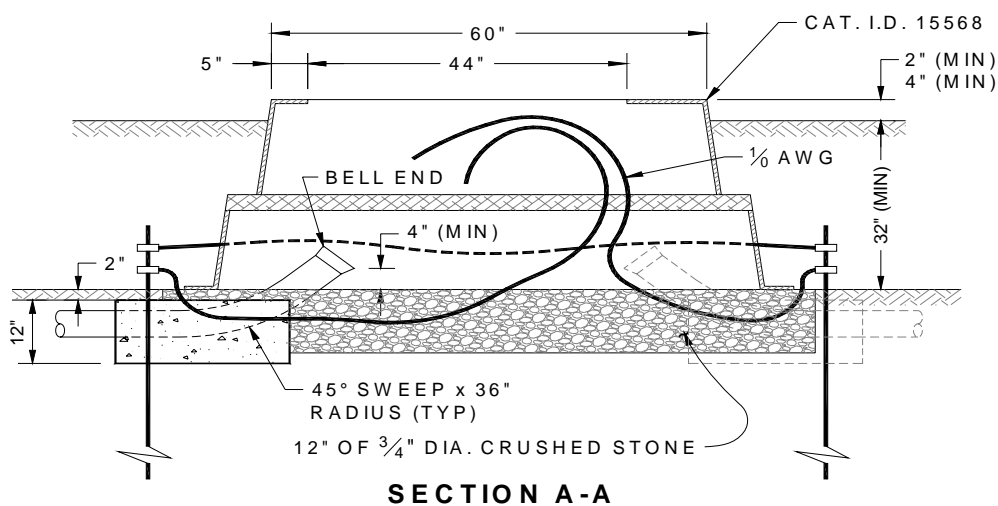
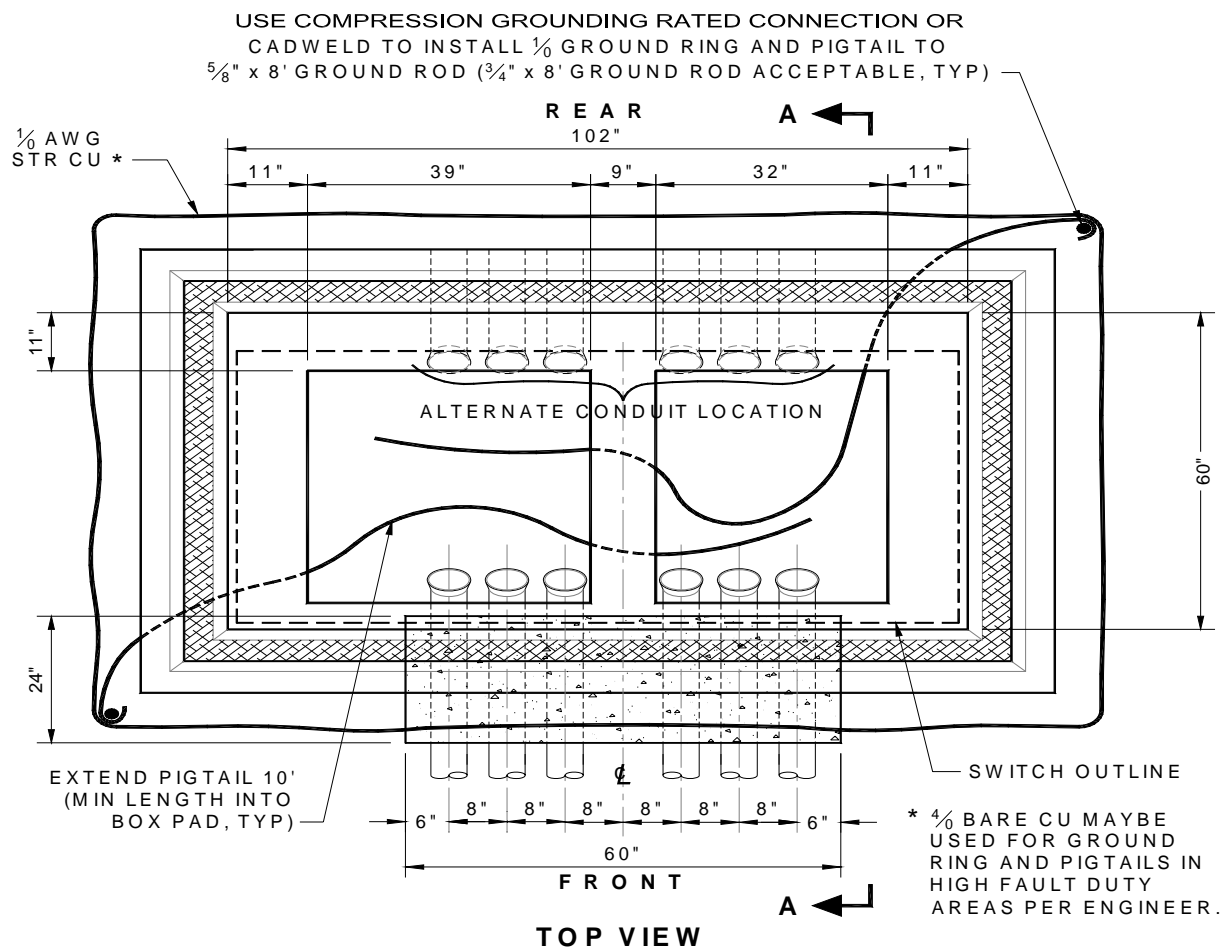


Figure 7– Typical Fiberglass box Pad Installation Details to support 15kV, G & W Model PVI-9, SF-6 Switch

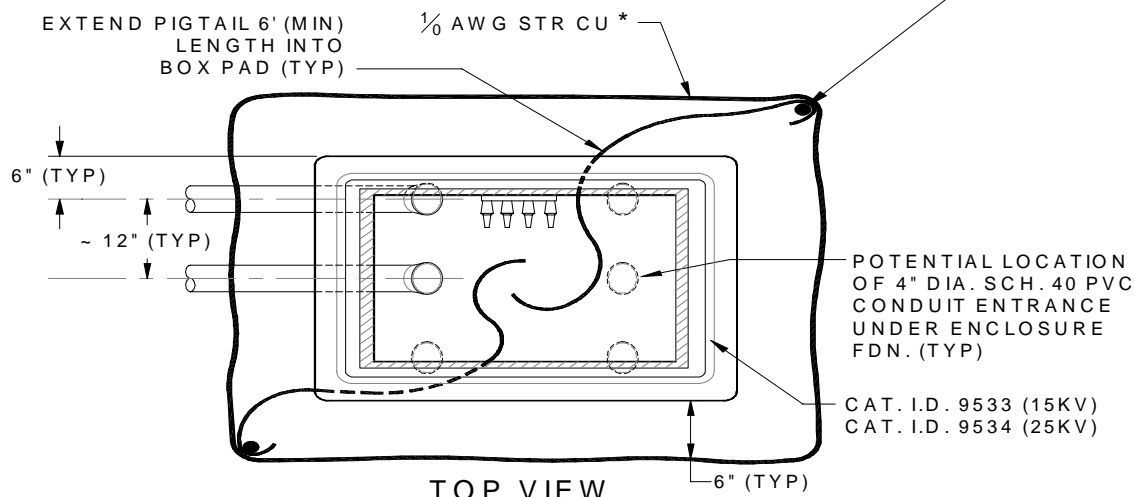
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07-Aug-09

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ELECTRIC OPERATIONS ORGANIZATION

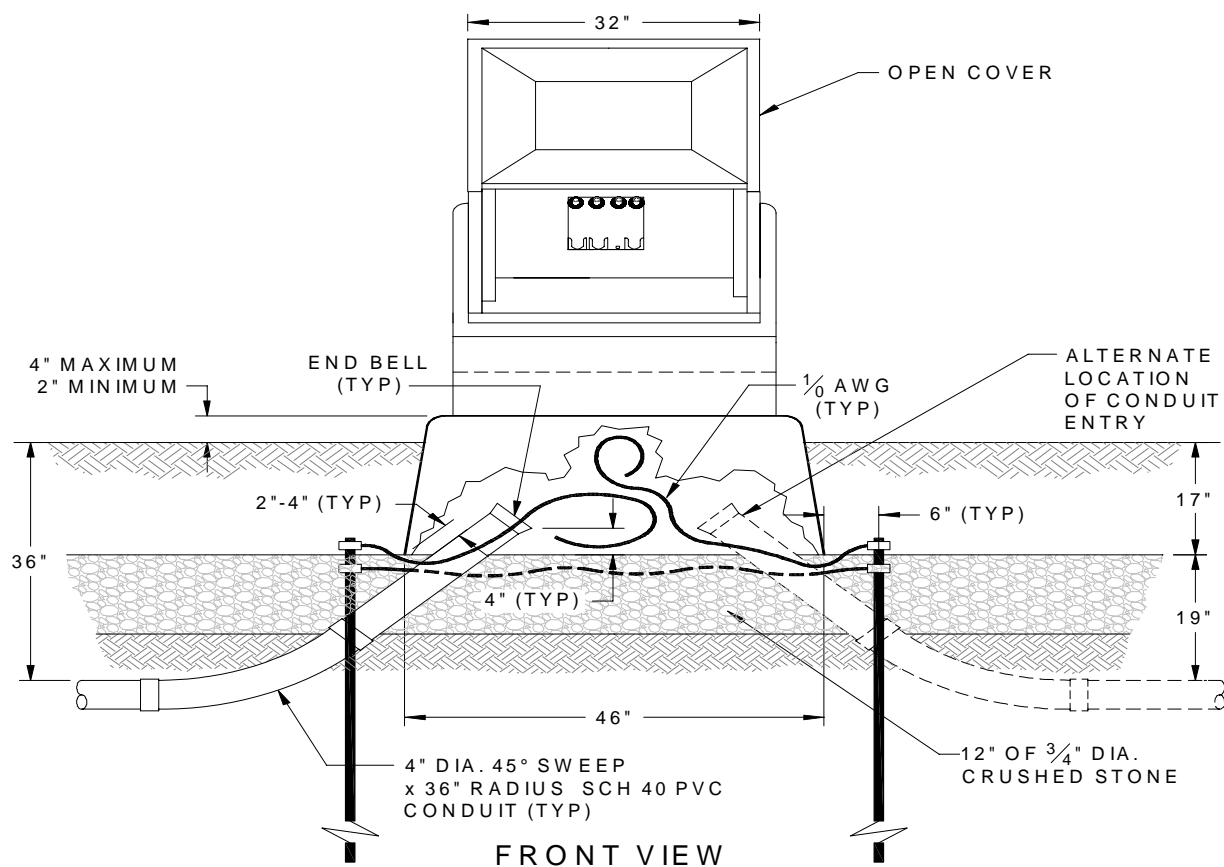


C3814
Revision 0
Page 15 of 17

USE COMPRESSION GROUNDING RATED CONNECTION OR CADWELD
TO INSTALL $\frac{1}{0}$ * GROUND RING & PIGTAIL TO $\frac{5}{8}$ " x 8' GROUND ROD (TYP)
($\frac{3}{4}$ " x 8' GROUND ROD ACCEPTABLE)



* $\frac{4}{0}$ BARE CU MAY BE USED FOR GROUND RING AND PIGTAILS IN HIGH FAULT DUTY AREAS PER ENGINEER



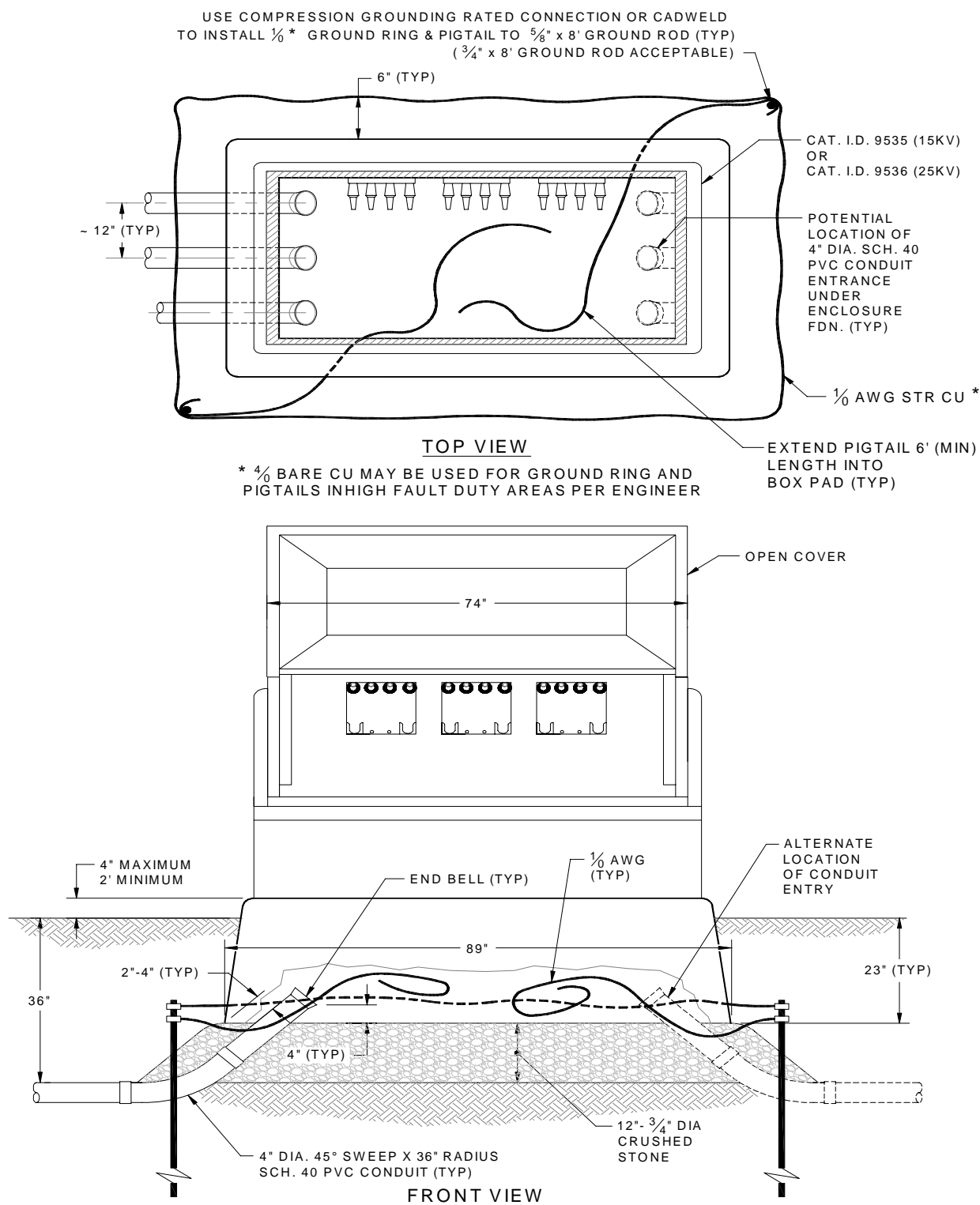
**Figure 8 – Single Phase Primary CSS Junction/Enclosure Installation
(15kV or 25kV)**

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07-Aug-09

CONSTRUCTION STANDARD
ELECTRIC OPERATIONS ORGANIZATION



C3814
Revision 0
Page 16 of 17



**Figure 9 – Three Phase Primary CSS Junction/Enclosure Installation
(15kV or 25kV)**

ISSUED 07-Aug-09	<p style="text-align: center;">CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p style="text-align: center;"></p>	<p style="text-align: center;">C3814</p> <p style="text-align: center;">Revision 0 Page 17 of 17</p>
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15.0 References

- 15.1 For PME-9 Switch Fiberglass Box Pad selection and additional switch installation requirements refer to Construction Standard *"C3800, Installation of a PME-9, Pad Mounted Switch, 15 & 25kV, 600 Amp, Manual or Motor-Operated Source Transfer Switch (Including RADSEC with either Power Fuses, Current Limiting Fuses or Fault-Filters)"*.
- 15.2 For PVI-9 Switch installation requirements refer to Construction Standard *"C3810, Installation of G & W Model PVI-9, 15kV, 600 Amp, Unfused, Padmounted, Front Access, SF-6 Switch"*.
- 15.3 For recommended minimum clearances from transformers, switches and other equipment to buildings openings, landscaping or traveled ways refer to Construction Standard, *"C3802, Recommended Minimum Clearances from Three-Phase Distribution Transformer Foundation to Building Openings, Landscaping or Traveled Way"*.
- 15.4 For Secondary Bus Enclosure (SBE) refer to Material Standard *"M2301, 600V Secondary Cable Termination and Buswork Padmount Enclosure"*.

16.0 Approval Signature

Approved by: Amin Jessa
Director, Distribution Engineering

Issued 30-May-02	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C5000
Revised 23-Oct-07		Revision #1 Page 1 of 11

C5000

******This Standard Supersedes BECo CS2.13-2.3 & ComElectric OH Construction Manual, System Grounding Section, drawings CGND, GRDSUM, and C2******

GROUNDING AND BONDING POLE-MOUNTED EQUIPMENT

1.0 Bill of Materials

Item	Description	Stock Symbol
1	Wire, ground #4 copper covered	120
2	5/8" x 8' sectional ground rod, threaded at both ends.	9229
3	Molding, ground wire	833
4	Staple, ground wire molding	9332
5	Ground rod coupling, 5/8" x 2"	10234
6	Copper Pole Butt Plate, 7" diam.	9200
7	Staples (fence) to secure wire to pole	6341
8	Ground rod driver, fits 5/8" and 3/4" ground rods. Use in conjunction with Cat ID # 15295	15450
9	Ground rod driving cap, fits 5/8" and 3/4" ground rods. Use in conjunction with Cat ID # 15450	15295
10	Ground rod connector, range #8 solid – 1/0 stranded copper.	9009
11	Wire, tinned # 4 solid copper	114
12	1/0 AWG polyethylene covered stranded copper wire	123
13	Ground resistance tester (if needed)	15892

2.0 Procedure

- 2.1 Use this procedure for updated bonding and grounding requirements for distribution equipment, to comply with the National Electric Safety Code. Low resistance earth grounding is essential to provide the level of protection required to protect personnel, equipment, and the public from shock hazards. Proper grounding will provide a more stable system with a minimum of transient over voltage and electrical noise. Proper grounding will also provide a path to ground in fault conditions and protection from large electrical disturbances (such as lightning) by creating a low resistance path to earth.

Issued 30-May-02	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C5000
Revised 23-Oct-07		Revision #1 Page 2 of 11

2.2 Grounding Pole-Mounted Equipment on Grounded-Wye System.

- A. All equipment cabinets, tanks, frames, and mounting brackets shall be grounded to the system neutral.
- B. Surge or lightning arrester ground terminals should be connected with the shortest, most direct path to earth/ground.
- C. Transformer mounted arresters are connected directly to the grounded tank.
- D. Any new or upgraded pole-mounted equipment, except for streetlights, will be connected to the existing system neutral. A new ground rod will be installed if one does not already exist at the pole.
- E. All new equipment poles require a butt plate and a ground rod. Switch handles, streetlight fixtures, down guys, and transformer secondaries must be properly grounded.
- F. The system neutral shall be connected to any grounding that exists on a distribution pole.
- G. Grounding equipment will protect people from energized wires that are no longer properly insulated for their voltage.

2.3 Pole Grounding Butt Plate Requirements.

- A. All new poles that will support electrical wire or cable shall have a minimum #4 copper wire pole down ground installed. Before the pole is set in the ground, that wire shall be connected to a copper pole butt plate with a mechanical connector. That wire shall be stapled along the pole to a point just above ground level, where it will be secured as a small coil. After the pole is set, the wire shall be uncoiled and connected up to the system neutral, and any messenger cable, if present.
- B. The pole butt plate is not a substitute for a driven ground rod. If a new pole is to have any equipment requiring a ground rod, then one or more shall be installed as required elsewhere in this document.

2.4 Ground Rod Requirements.

- A. Drive ground rods four (4) inches below the finished surface. Ground rods must be driven into undisturbed soil at a minimum distance of twelve to eighteen inches from the pole. **If the pole setting foam is used, the ground rod must not be encased in this foam** Be sure dig safe markings are clearly visible in the area. Where rocky soil or other field conditions prohibit driving ground rods to a depth of eight (8) feet, install additional ground rods at adjacent poles.

Issued 30-May-02	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C5000
Revised 23-Oct-07		Revision #1 Page 3 of 11

- B. Where practicable, a reading of 25 ohms or less between the underground and the earth is desired. If you are in an area where the soil conditions are highly resistive, (sandy, dry, less than ideal soil conditions...) install an additional ground rod above the first, resulting in a 16-foot driven ground. When rocky soil or other conditions prohibit driving ground rods to 16 feet, install the additional rod adjacent to the first no closer than six (6) feet to any existing rod, and connect rods with a bare #4 copper wire. See Figure 2.
- C. For both open wire and spacer cable overhead installations, install ground rods at all pole locations having transformers, switching devices, disconnects, sectionalizers, reclosers, voltage regulating devices and/or lighting arrestors, at all dead-ends, and at all riser poles. For spacer cable construction, install ground rods at every pole.
- D. Bonding Requirements
 - 1) Bonding conductors shall be bare tinned copper wire or covered copper wire.
 - 2) Minimize joints in bond wires. If joints are unavoidable, use compression or solder connectors.
 - 3) Use bonds as a permanent connection between otherwise isolated circuits and/or equipment to equalize potentials. When bonding conductors are in direct contact with the earth, the wire MUST be covered.

2.5 Pole Installations.

- A. Attach #4 pole down grounds to driven ground rods in accordance with Figures 2 and 3 when a continuous metallic underground system is not available.
- B. Terminate the down grounds from pole mounted equipment to the common neutral as shown in Figure 3, providing a disconnect point to safely remove grounds when required to perform work on the pole.
- C. Power risers – Pole grounds shall be upgraded to 1/0 copper size from the ground rod to the system neutral and up to the primary area grounds.

Issued 30-May-02	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C5000
Revised 23-Oct-07		Revision #1 Page 4 of 11

3.0 **Intercompany Bonding**

Intercompany grounding/bonding requirements as defined in the National Electric Safety Code (NESC), the Joint Ownership (JO) agreements, and the Intercompany Operating Procedures (IOP's) between the company and communication companies follow. Communication lines and communication company messengers include (by NESC definition) all lines used for public or private signal or communication service. Included are telephone, telegraph, railroad signal, fire and police alarms, cable television, and various other non-electrical supply lines.

- 3.1 Electric supply and communication systems shall be bonded together in accordance with NESC requirements. The purpose of bonding is to reduce the possibility of electric shock and minimize plant damage in the event of accidental contact.
- 3.2 Overhead NESC Rule 097G defines the required bonding between communication systems and electric supply systems on joint use poles.
 - a) If a single pole ground is used, it must be connected to both the supply neutral and the communication messengers.
 - b) If separate pole grounds are run to the supply neutral and the communication messengers, the pole grounds must be bonded together.
 - c) If isolation is being maintained between the primary and the secondary neutrals, such as for stray voltage, the communication messengers shall be connected only to the primary grounding conductor.
- 3.3 Underground NESC Rule 384C requires that above ground metallic power and communication apparatus such as pedestals or transformer cases that are six feet or less apart be bonded together. A bond is not required if the separation is greater than six feet. See Figure 1.

<p>Issued 30-May-02</p> <p>Revised 23-Oct-07</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C5000</p> <p>Revision #1 Page 5 of 11</p>
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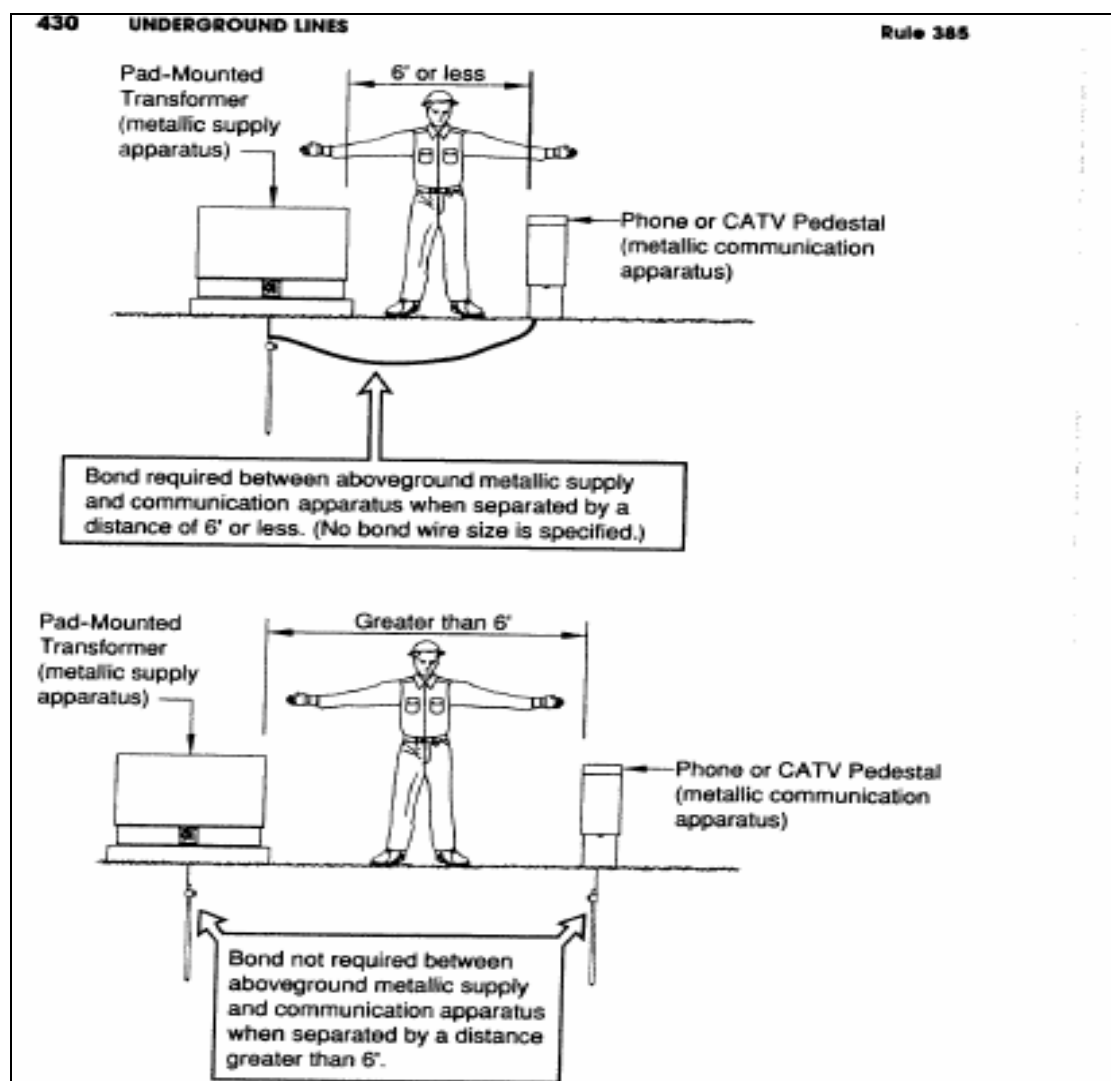


Figure 1

NESC reference Rule 97G refers to bonding of communication systems to electric supply systems where all systems on the pole are grounded on a joint use structure. A single grounding conductor shall be used for all systems or the electric and communication grounding conductors shall be bonded together. An exception to this rule is where separation is required by Rule 97A. This rule requires the electric supply utility to maintain isolation between primary and secondary neutrals; the communication system ground shall be connected only to the primary grounding conductor. Typical installations are outlined in Figure 4.

<p>Issued 30-May-02</p> <p>Revised 23-Oct-07</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C5000</p> <p>Revision #1 Page 6 of 11</p>
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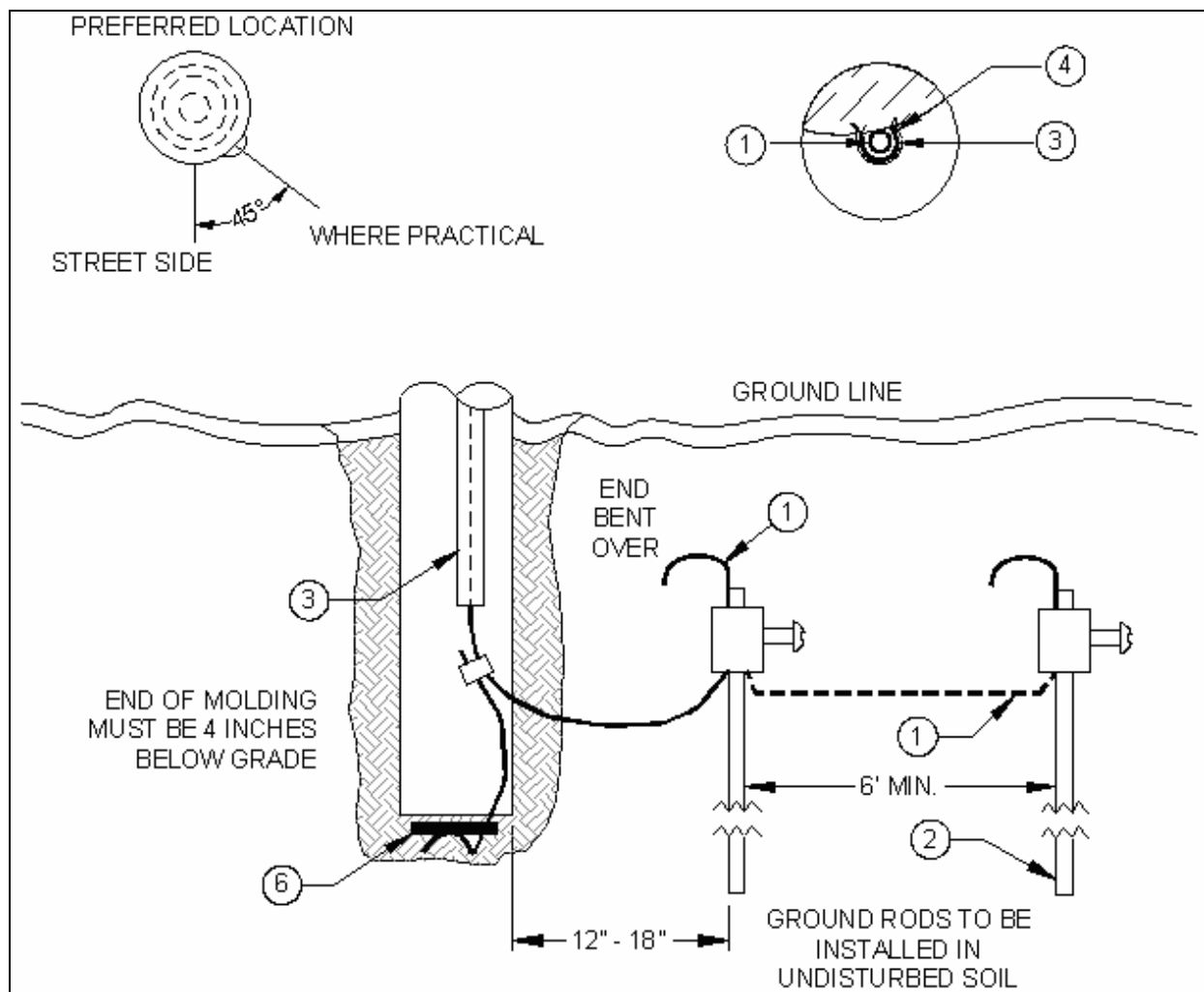


Figure 2 - Installations of Ground Rod and Butt Plate at Pole.

- Note:
1. Staple moulding to pole 12-inch spacing. Moulding must clear metal equipment by 1-1/2 inches (minimum).
 2. High vandalism (copper theft) areas require that fence staples spaced 12 inches apart be used on the 8ft. of wire in the pedestrian area. Over that install moulding with staples also spaced 12 inches apart, but staggered with the fence staples.

<p>Issued 30-May-02</p> <p>Revised 23-Oct-07</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C5000</p> <p>Revision #1 Page 7 of 11</p>
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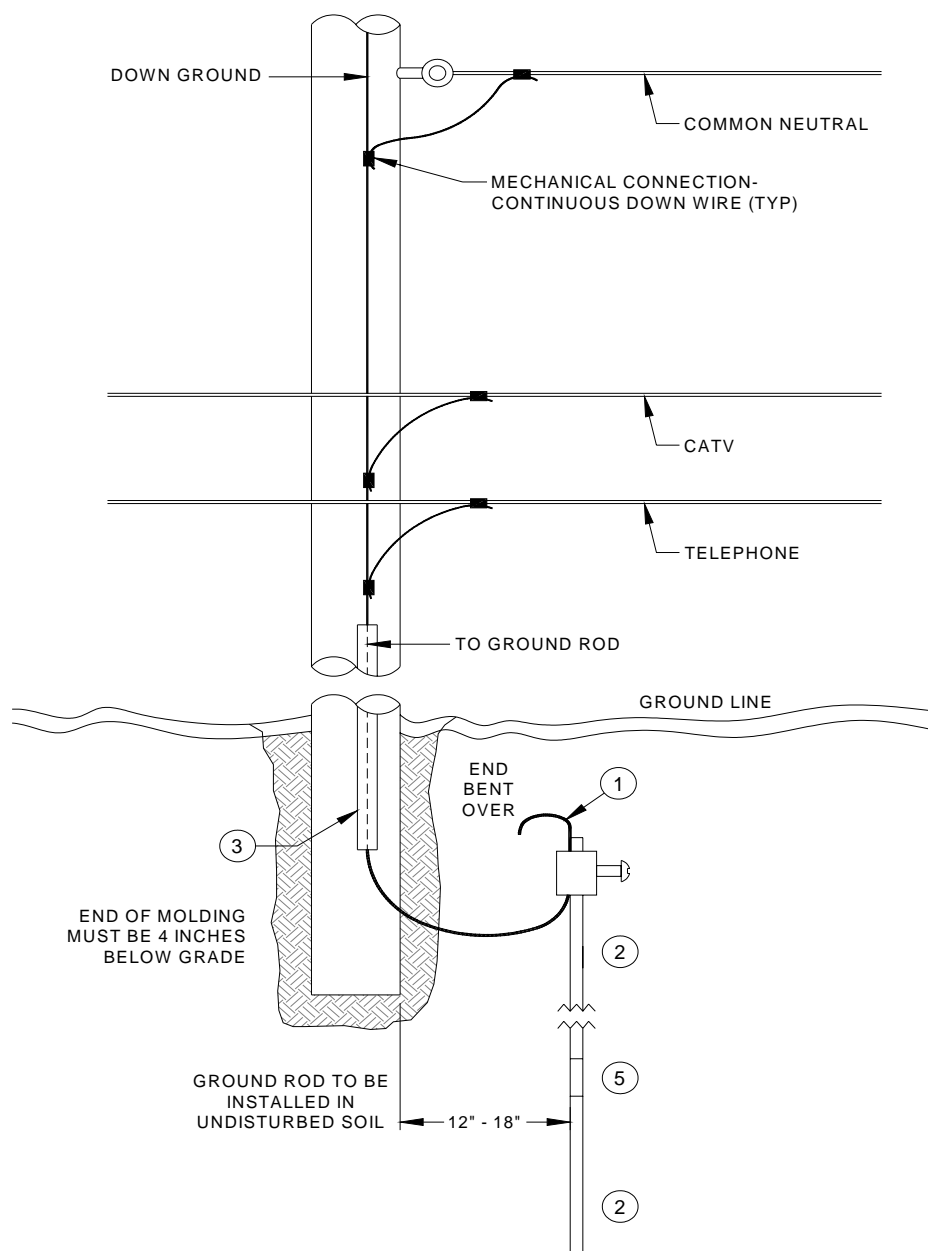


Figure 3 - Down Ground Connections.

Note: If pole mounted equipment must remain grounded (i.e., single bushing transformers and SCADA-MATE switches) make the equipment ground a permanent connection to the common neutral.

<p>Issued 30-May-02</p> <p>Revised 23-Oct-07</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C5000</p> <p>Revision #1 Page 8 of 11</p>
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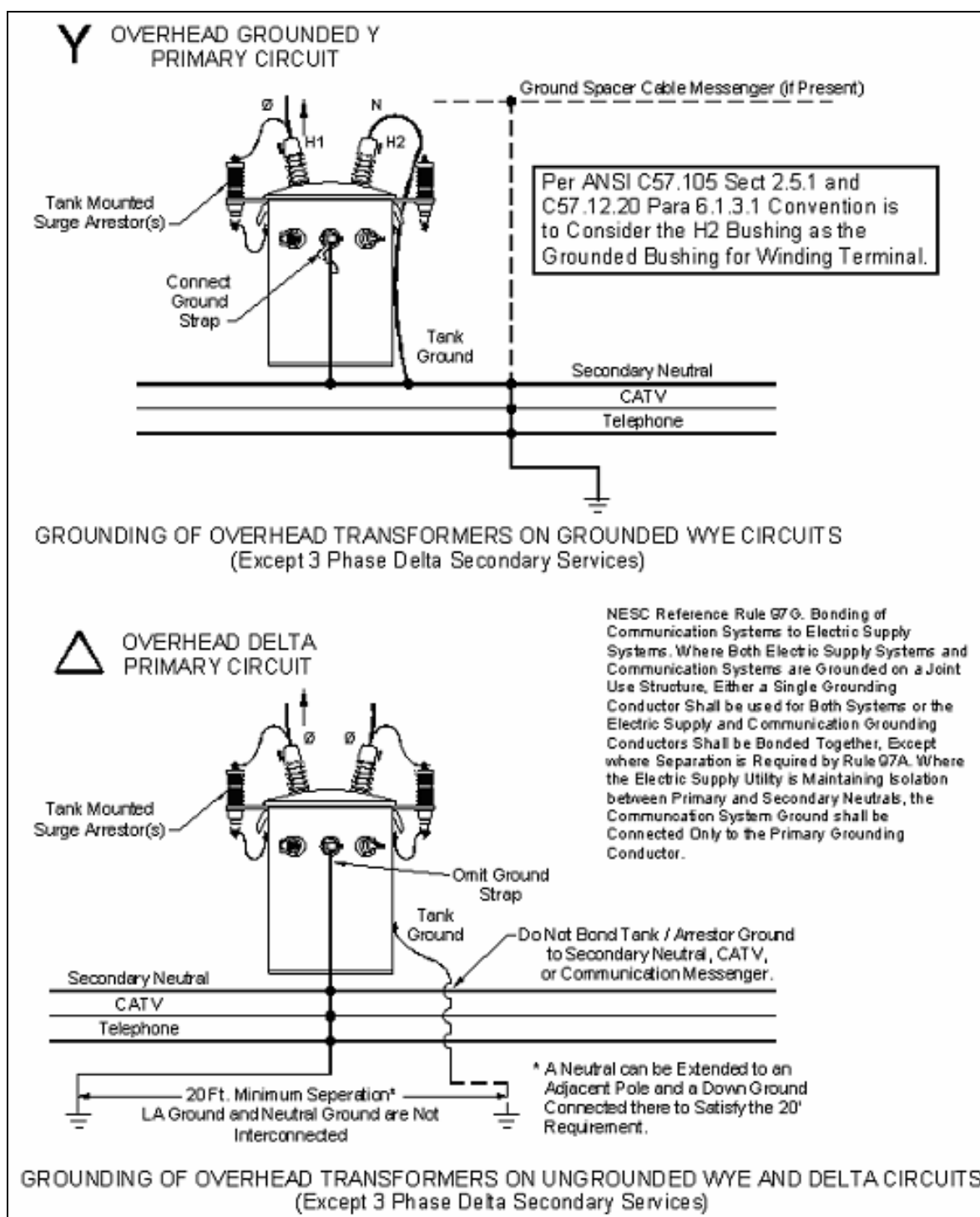


Figure 4 – Grounding of Overhead Transformers on Ungrounded WYE and Delta Circuits.

Issued 30-May-02	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C5000
Revised 23-Oct-07		Revision #1 Page 9 of 11

4.0 Grounding for Delta Primary System Transformers, NSTAR South Only

- 4.1 A delta primary system does not use a primary neutral wire, and is not considered a multigrounded system. Therefore, the grounding of pole-mounted equipment on delta systems requires special attention. Surge arresters must be grounded through a dedicated ground wire and rod located at the same pole. Transformer tank, frame or any bracket ground connections will be made to the arrester ground circuit. In delta circuits, the secondary neutral must not be interconnected with this arrester/equipment ground circuit.
- 4.2 To meet the National Electric Safety Code (Rule 97D), two ground rod assemblies separated by at least twenty (20) feet must be installed for each transformer/arrester location. This will reduce the chance of a surge passing through the arrester affecting the secondaries. Delta circuits do not have as many ground paths for lightning surges like in a grounded wye system.
- 4.3 To meet the NESC requirement, it is necessary to connect any arresters directly to a driven ground rod on the same pole. Separate the arrester/tank ground from the secondary neutral by removing the tank ground strap from the (Xo) bushing. Then, the secondary neutral wire (triplex or open wire) connected to that neutral bushing will be run to a pole ground and driven ground rod assembly at the next closest pole. There should be no arresters installed on this pole.
- 4.4 Ground rods in delta systems, where practical, will have a maximum earth ground resistance of 25 ohms (Ω). In high resistance areas, two (2) sixteen (2x8") foot rods are to be installed together in an inverted "V" arrangement, {see Figure 4}. This inverted "V" separates the ground rod points for maximum benefit
- 4.5 Guy Insulators: In delta systems, a guy insulator will be installed so that even if the guy wire breaks at the anchor attachment, the free-hanging insulator will stay at least eight (8) feet above the ground. Guy wires in delta systems do not need to be bonded to the neutral (grounded) because of the insulator.

<p>Issued 30-May-02</p> <p>Revised 23-Oct-07</p>	<p>CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>C5000</p> <p>Revision #1 Page 10 of 11</p>
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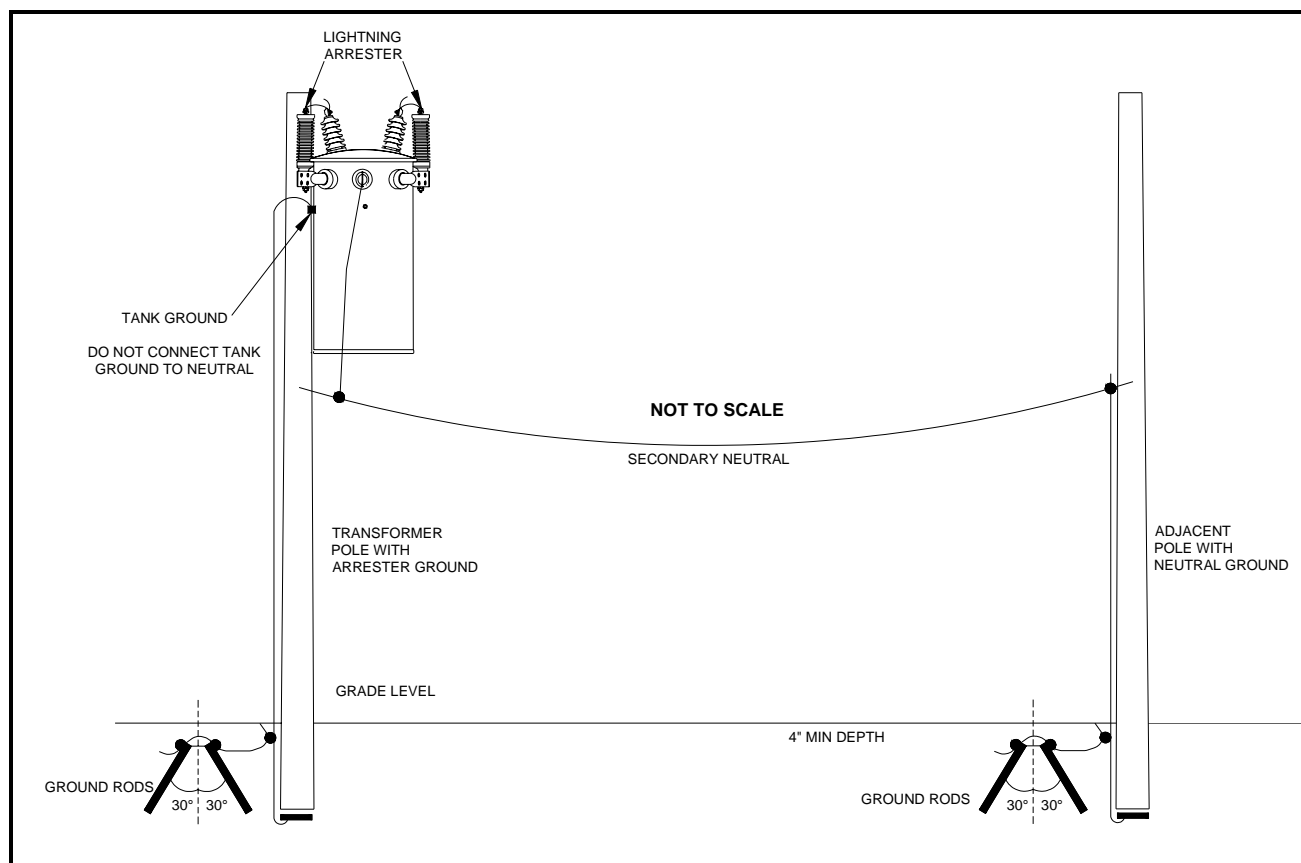


Figure 4 - NSTAR South Only - Transformer Grounding for Delta Primary with no Primary/System Neutral

NOTES:

- A. For areas that do not have a multigrounded primary system, the National Electric Safety Code (Rule 97D) requires that the arrester ground rod and neutral ground rod be separated by a minimum of twenty (20) feet. This standard drawing complies with that requirement.
- B. Dig-Safe must be notified before any ground rods are installed.
- C. Transformer mounted arresters are normally grounded to the tank. The pole ground wire of that pole must then be connected to that tank ground. Do not tie in to the neutral bushing or wire that will be grounded at the next pole.

Issued 30-May-02	CONSTRUCTION STANDARD ELECTRIC OPERATIONS ORGANIZATION	C5000
Revised 23-Oct-07		Revision #1 Page 11 of 11

- D. Remove the ground strap that normally would connect the X° (neutral) bushing of the transformer to the tank.
- E. A neutral wire is to be installed to (if none exists) and grounded at the next closest pole. This neutral may be open wire copper or triplex cable. The adjacent pole must not have any arrester grounding on it already.
- F. Any other equipment such as capacitor bank arresters, riser arresters, frames, brackets, and URD cable concentric ground wires will be connected to the ground wire/rod assembly of the pole they are mounted on.
- G. In delta circuit areas, a ground wire molding should be installed all the way up the pole to the transformer. Communication companies should bond to the neutral that is grounded at the adjacent pole.
- H. The ground rods are installed in an inverted "V" arrangement to maximize the separation of the rod tips. Install the rods opposite to each other at about a 30° angle off of a vertical line. Normal ground resistance areas require using only eight (8') foot rods, which will have tips about 8' apart at their deepest point. In high soil resistance areas, use two eight-foot ground rods installed the same way. Install the rods in the direction of the overhead wires.

Review by: _____ Approved by: Amin Jessa
 Director, Safety and Health Director, Distribution Engineering

Issued 16-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1204 Revision #0 Page 1 of 5
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M1204

****This standard supersedes BECo U/G Std. 2.10-6.25****

PRECAST CONCRETE MANHOLE
6'- 0"W x 10'- 0"L x 8'- 0"H INSIDE DIMENSIONS

1.0 Scope – This specification details the dimensions, strength, reinforcement, and appurtenances required for fabrication of precast, concrete manholes.

2.0 General – Vendor design and fabrication drawing shall conform to the minimum requirements of this specification and shall be signed and stamped by a Massachusetts registered professional engineer.

3.0 Design Notes

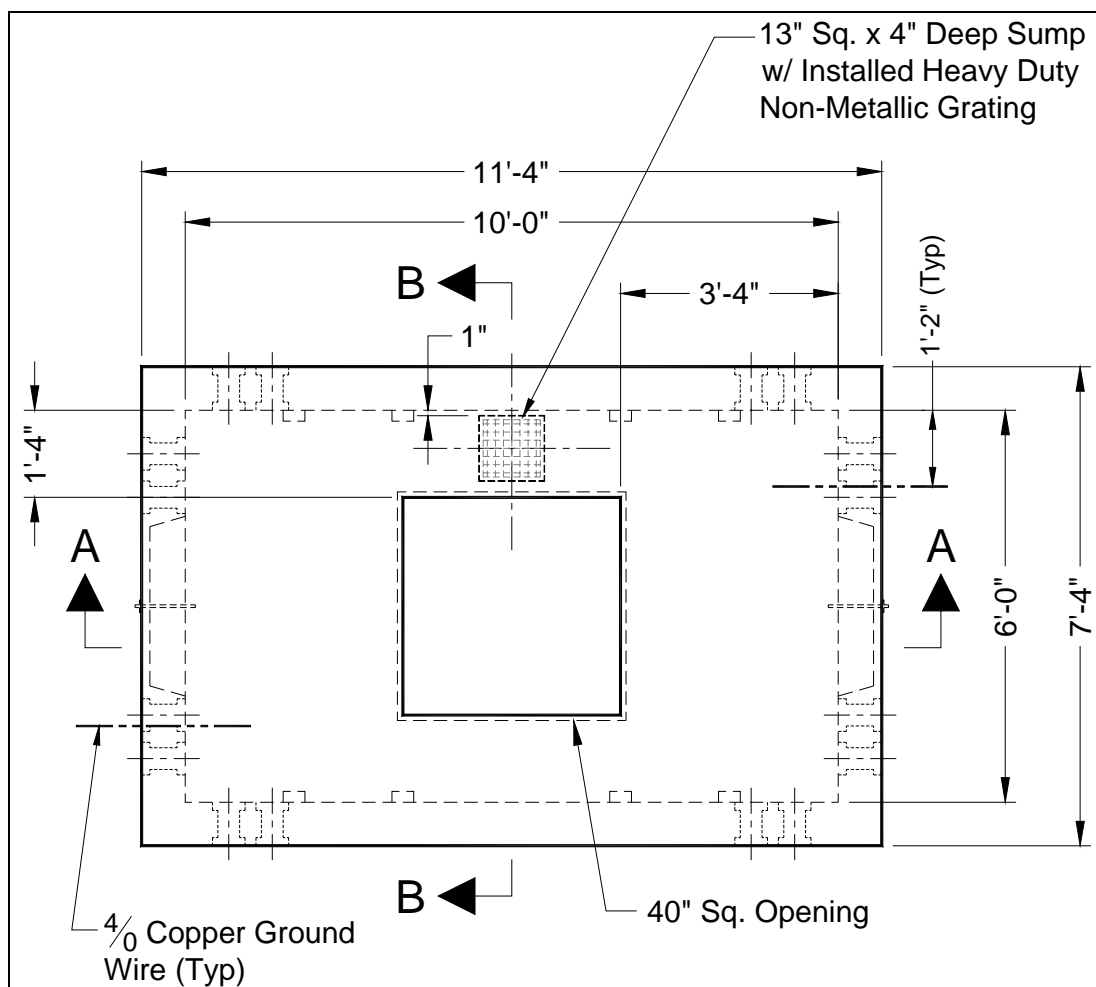
- 3.1 Concrete minimum strength - 5000 psi @ 28 days.
- 3.2 Steel reinforcement - ASTM A615, Grade 60.
- 3.3 Minimum Steel Cover – 1inch.
- 3.4 Design Loading - AASHTO HS20-44.
- 3.5 Design Specifications – ACI 318 & AASHTO Load Factor Design Method.
- 3.6 Manufacturer's name and year of fabrication shall be stenciled on vertical wall of access chimney.
- 3.7 All Termaducts to have bell ends flush with the inside wall.
- 3.8 Termaducts may be specified in lieu of knockouts at the direction of NSTAR.
- 3.9 Construction Joint – Sealed with 1" diameter Butyl Rubber or approved equal.

4.0 Bill of Materials

- 4.1 The catalog ID for the precast manhole is "16240".
- 4.2 The catalog ID's for the "3" & "4" position stanchions are "1752" & "1753". Stanchions shall be manufactured by J. S. Products, Whitman, MA (or approved equal).
- 4.3 The catalog ID for the bonding frame is "1229". Bonding frame consist of 1 - #4/0 stainless steel ground clamp, 1 - #10 x 1-1/2" lg x 5/16" dia SS screw and 1- lead plug as supplied by Tools Unlimited Inc, Stoughton, MA (or approved equal).

Issued 16-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1204 Revision #0 Page 2 of 5
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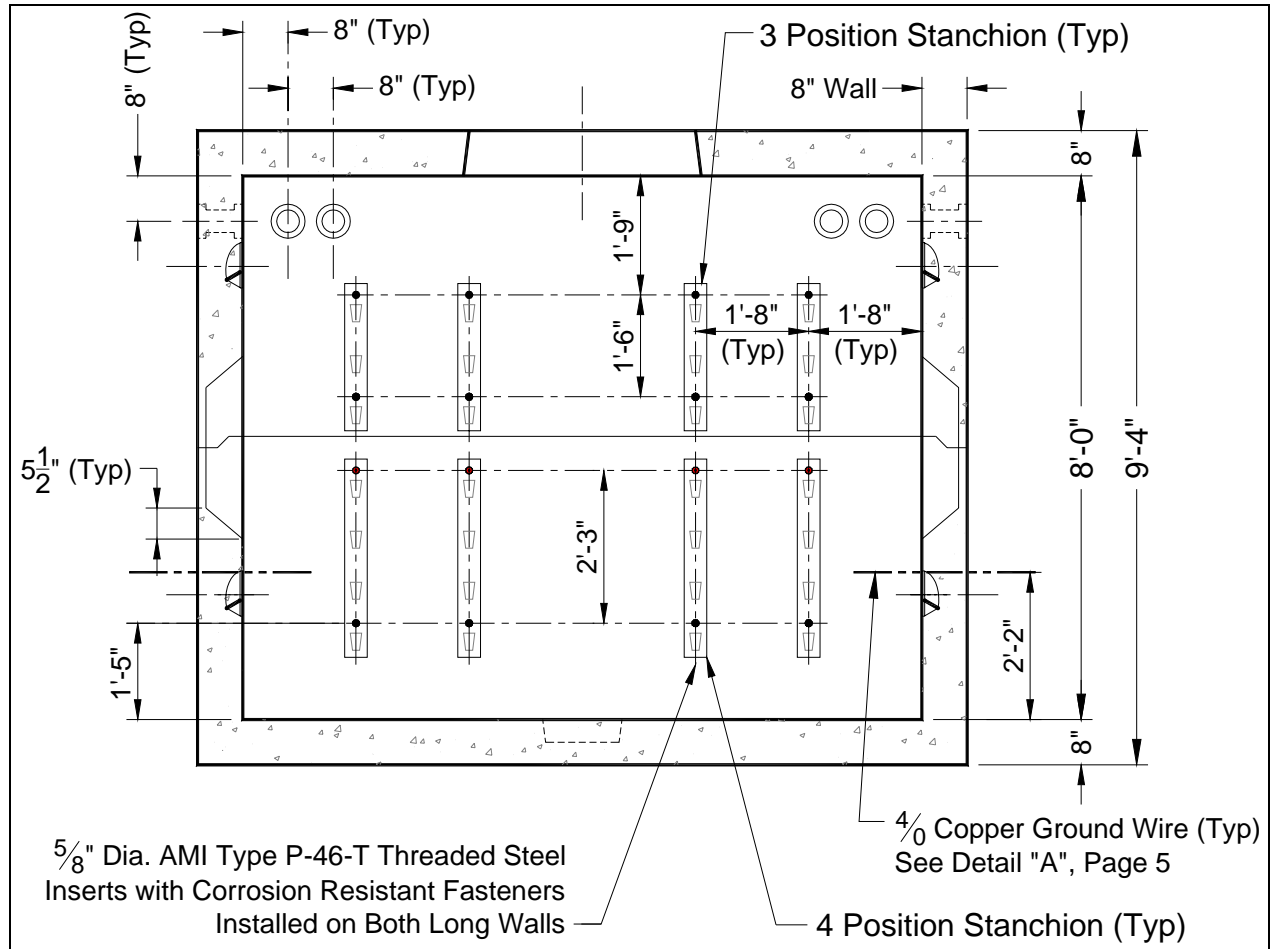
- 4.4 The recessed pulling eye, "New PI-2", shall be manufactured by Pennsylvania Insert Corp., Spring City, PA (or approved equal).
- 4.5 The sump grate shall be "Polylock Part No. 3037" as manufactured by Polylock Corp., Wallingford, CT (or approved equal).



PLAN

NOTE: DRAWING IS NOT TO SCALE

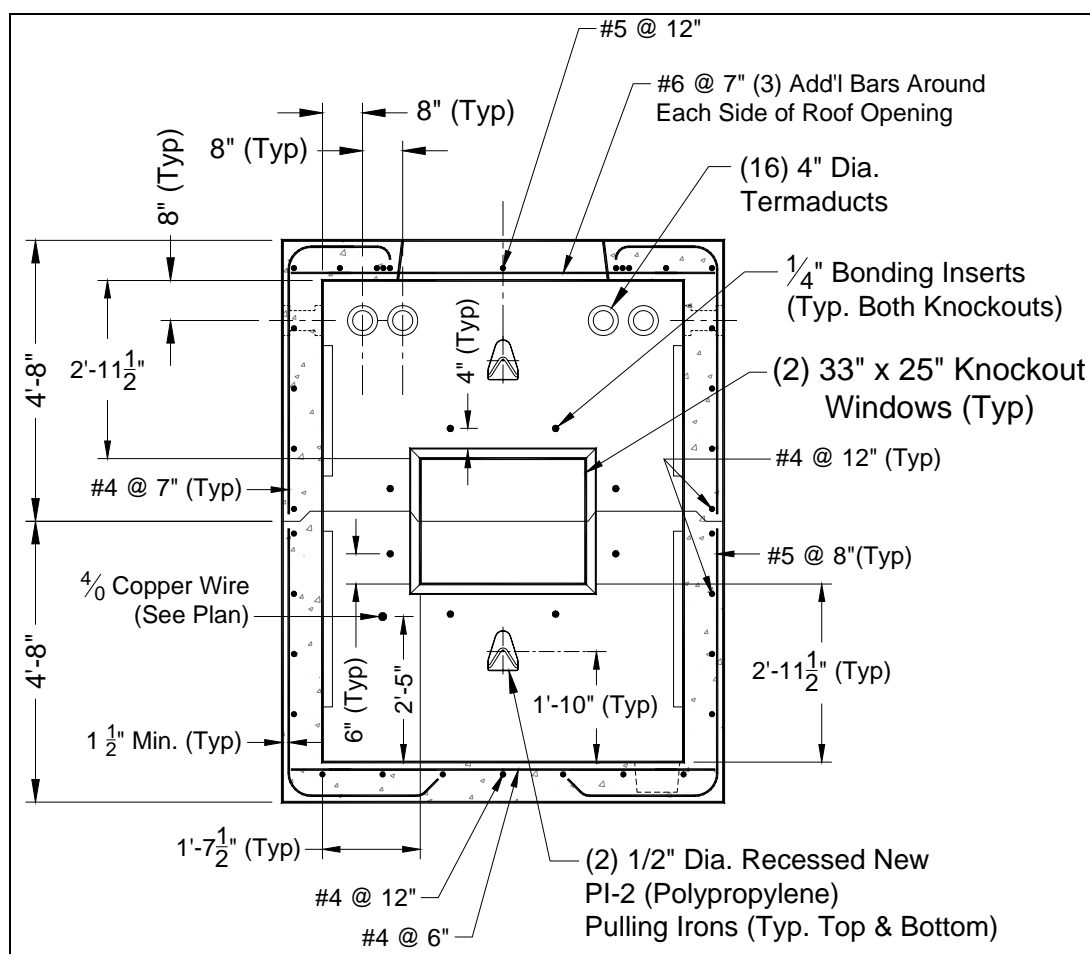
<p>Issued 16-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1204</p> <p>Revision #0 Page 3 of 5</p>
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SECTION A-A

NOTE: LONG WALLS ARE MIRROR IMAGES.
DRAWING IS NOT TO SCALE.

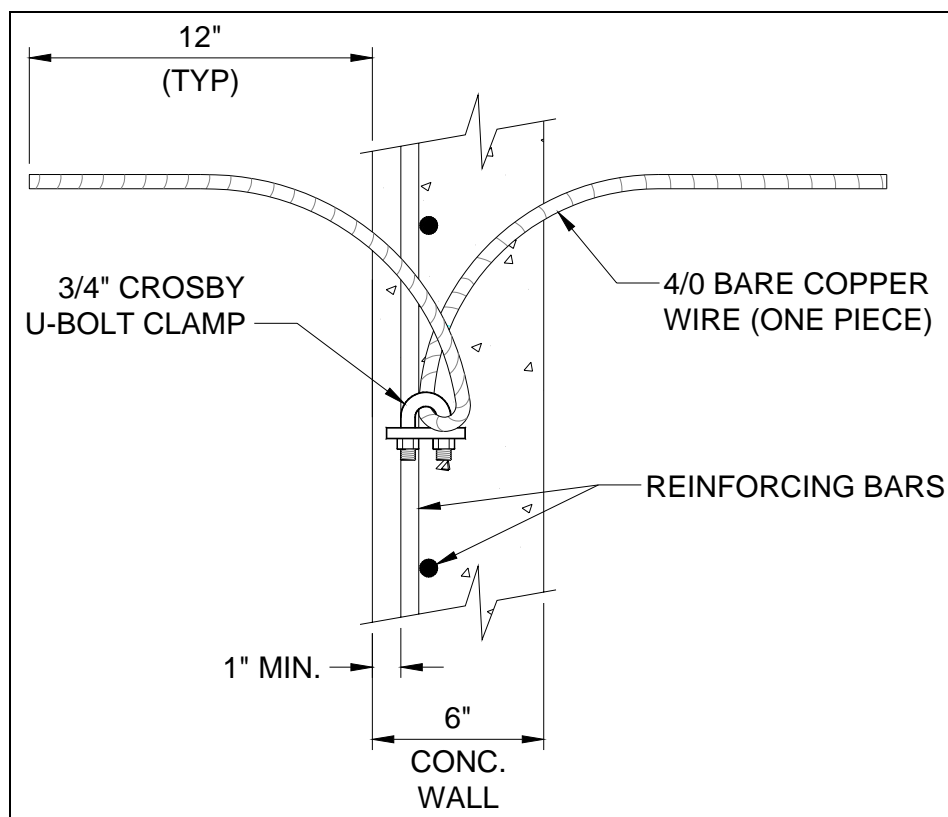
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SECTION B-B

NOTE: SHORT WALLS ARE MIRROR IMAGES.
DRAWING IS NOT TO SCALE

<p>Issued 16-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1204</p> <p>Revision #0 Page 5 of 5</p>
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DETAIL "A"

NOTE: DRAWING IS NOT TO SCALE.

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Manager, Distribution
Technical Engineering

Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1216 Revision 0 Page 1 of 4
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M1216

****This standard supersedes COM Electric Construction Standard NE-15B****

PRECAST CONCRETE – PRIMARY PULL BOX FOUNDATION
5'-0" x 5'-0" x 5'-0" H INSIDE DIMENSIONS

1.0 Scope – This specification details the dimensions, strength, reinforcement, and appurtenances required for fabrication of precast concrete foundation.

2.0 General – Vendor design and fabrication drawing shall conform to the minimum requirements of this specification and shall be signed and stamped by a Massachusetts registered professional engineer.

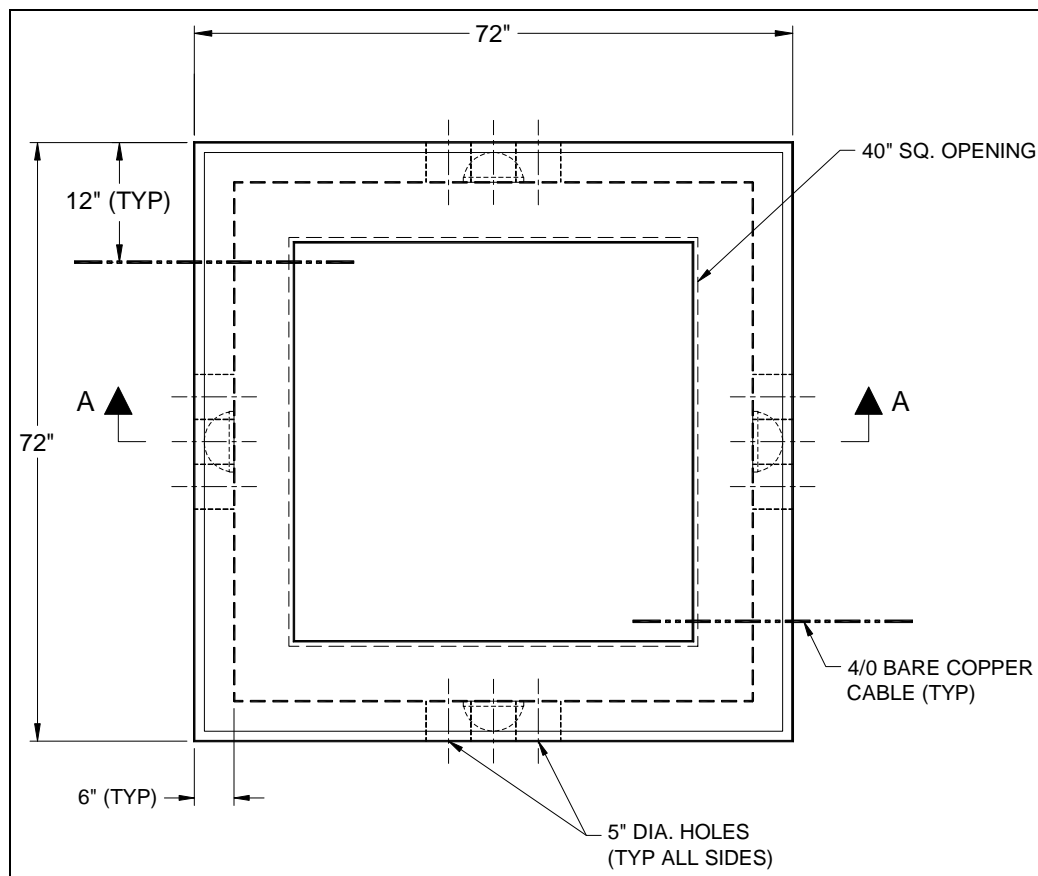
3.0 Design Notes

- 3.1 Concrete minimum strength - 5000 psi @ 28 days.
- 3.2 Steel reinforcement - ASTM A615, Grade 60.
- 3.3 Minimum Steel Cover – 1 inch.
- 3.4 Design Loading - AASHTO HS20-44.
- 3.5 Design Specifications – ACI 318 & AASHTO Load Factor Design Method.
- 3.6 Manufacturer's name and year of fabrication to be stenciled on vertical wall of access chimney.
- 3.7 All Termaducts to have bell ends flush with the inside wall.
- 3.8 Construction Joint – Sealed with 1" diameter Butyl Rubber or approved equal.

4.0 Bill of Materials

- 4.1 The catalog ID for the precast manhole is "9437".
- 4.2 The catalog ID for the bonding frame is "1229". Bonding frame consists of 1- #4/0 stainless steel ground clamp, 1 - #10 x 1-1/2" lg x 5/16" dia SS screw and 1- lead plug as supplied by Tools Unlimited Inc., Stoughton, MA (or approved equal).
- 4.3 The recessed pulling eye, "New PI-2", shall be manufactured by Pennsylvania Insert Corp., Spring City, PA (or approved equal).

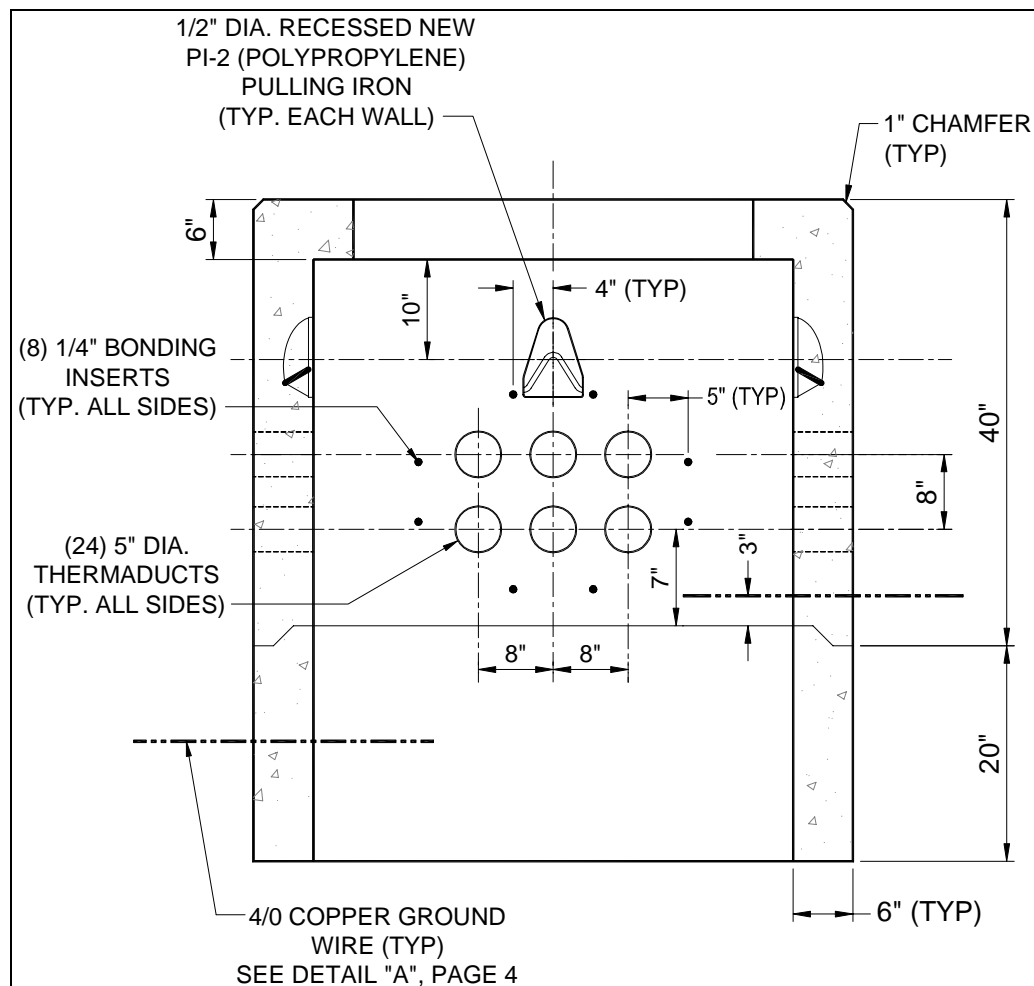
<p>Issued 13-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1216</p> <p>Revision 0 Page 2 of 4</p>
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PLAN

NOTE: DRAWING IS NOT TO SCALE

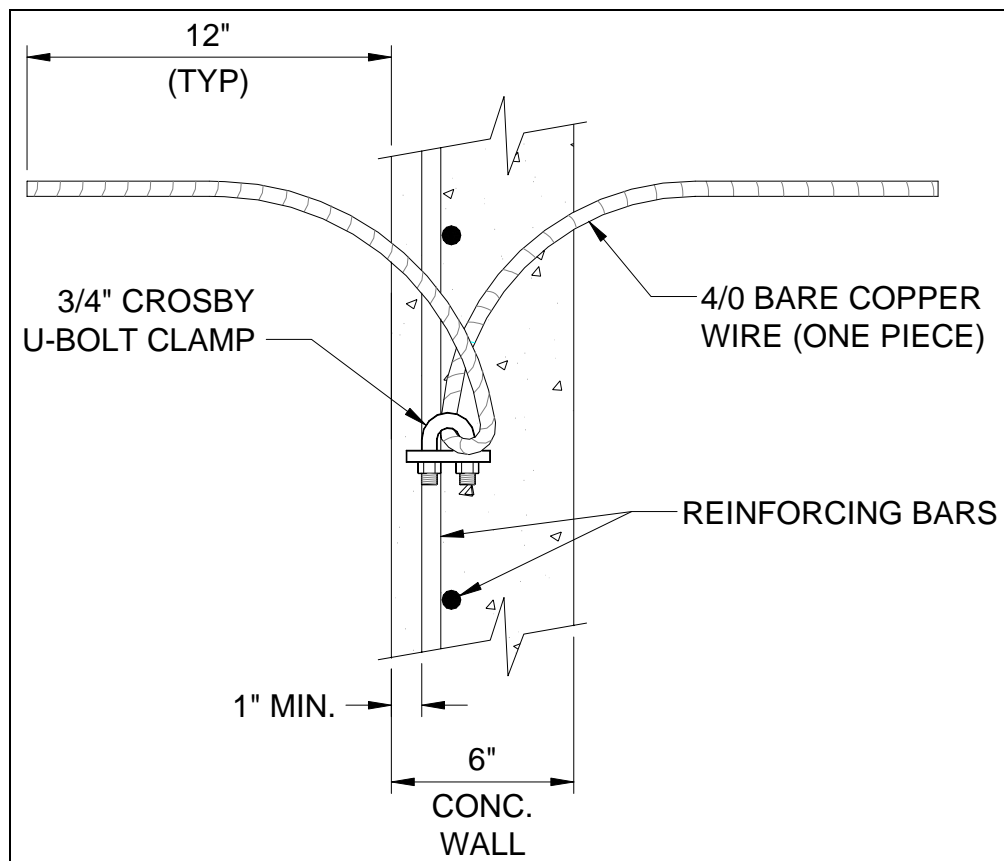
<p>Issued 13-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1216</p> <p>Revision 0 Page 3 of 4</p>
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SECTION A-A

NOTE: DRAWING IS NOT TO SCALE

<p>Issued 13-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1216</p> <p>Revision 0 Page 4 of 4</p>
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DETAIL "A"

NOTE: DRAWING IS NOT TO SCALE

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Manager, Distribution
Technical Engineering

Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1300 Revision #0 Page 1 of 3
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M1300

******This Standard Supersedes BECo Standard 2.10-6.17, page 4 of 19 and COM Electric Standard NE-10 (Cover Cat ID 577249)**

NSTAR No.1 Solid Cover

1.0 Scope

This material specification details the dimensions, materials and fabrication details including Foundries identifying markings.

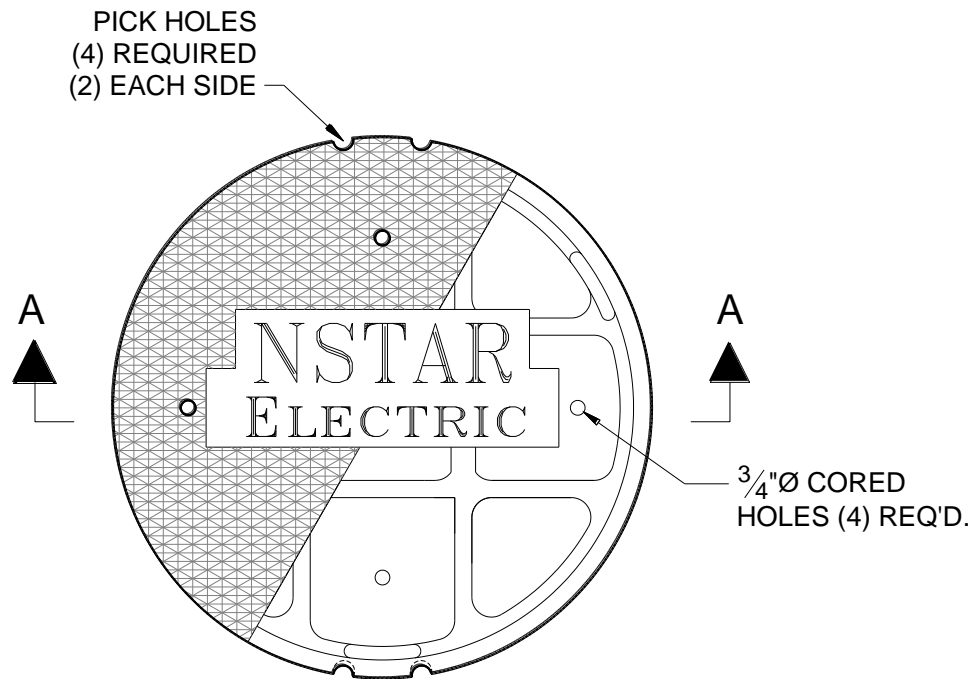
2.0 General

Cover loading capacity shall exceed AASHTO HS20-44.
Classification: A.S.TM. A-48
Class 30 Gray Iron

3.0 Notes

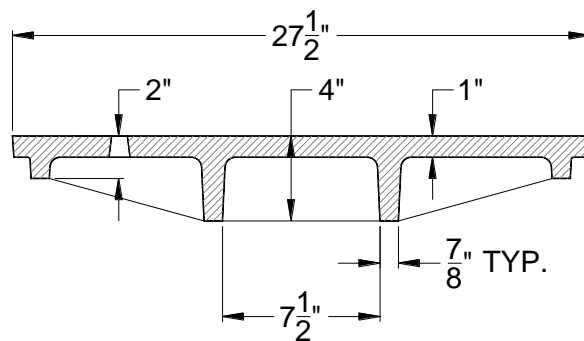
- 3.1 Foundry identifying marks shall appear on the under side of cover.
- 3.2 Estimated weight of cover is 200 lbs.
- 3.3 The catalog ID for this cover is "574631"

Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1300 Revision #0 Page 2 of 3
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NOTE: COVER RAISED DIAMOND DESIGN
"NSTAR" IN 3" LETTERS
"E" & "LECTRIC" IN 2" & 1-1/2" LETTERS

PLAN



SECTION A-A

Fig. 1 – No. 1 Manhole Cover

Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1300 Revision #0 Page 3 of 3
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Manager - Distribution
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Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1303 Revision #0 Page 1 of 3
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M1303

****This Standard Supersedes BECo Standard 2.10-6.17, page 1 of 19 and Com Standard NE - 10

NSTAR No.1 Manhole Frame

1.0 Scope

This material specification details the dimensions, materials and fabrication details including Foundries identifying markings.

2.0 General

Frame loading capacity shall exceed AASHTO HS20-44.
Classification: A.S.TM. A-48
Class 30 Gray Iron

3.0 Notes

- 3.1 Surfaces marked "✓" shall be machined to form good bearing surfaces.
- 3.2 Foundry identifying marks shall appear on the upper side of the bottom flange in raised letters.
- 3.3 Estimated weight of frame is 660 lbs.
- 3.4 The catalog ID for this frame is "1384".

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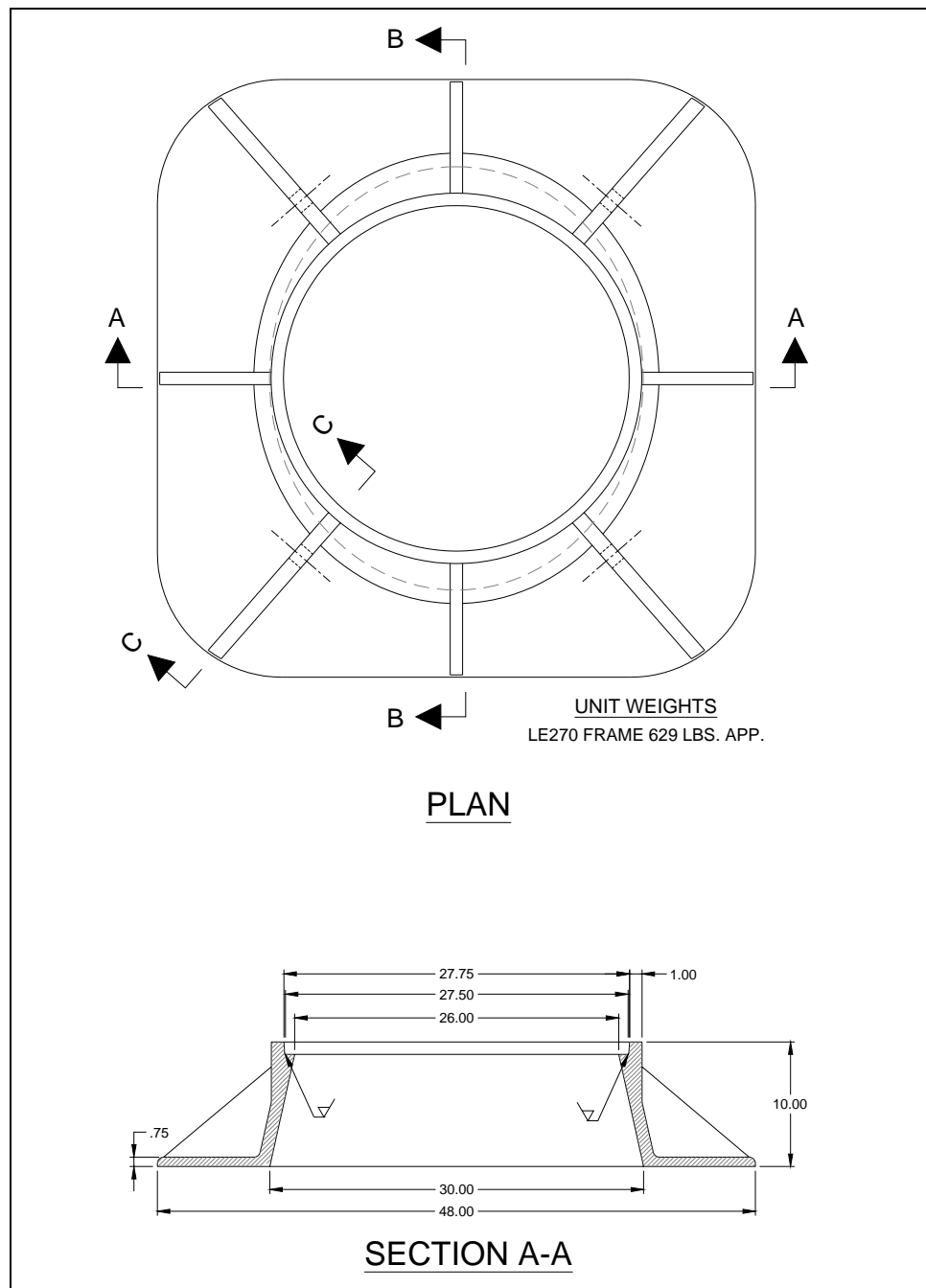


FIG. 1 – NO. 1 MANHOLE FRAME

<p>Issued 13-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1303 Revision #0 Page 3 of 3</p>
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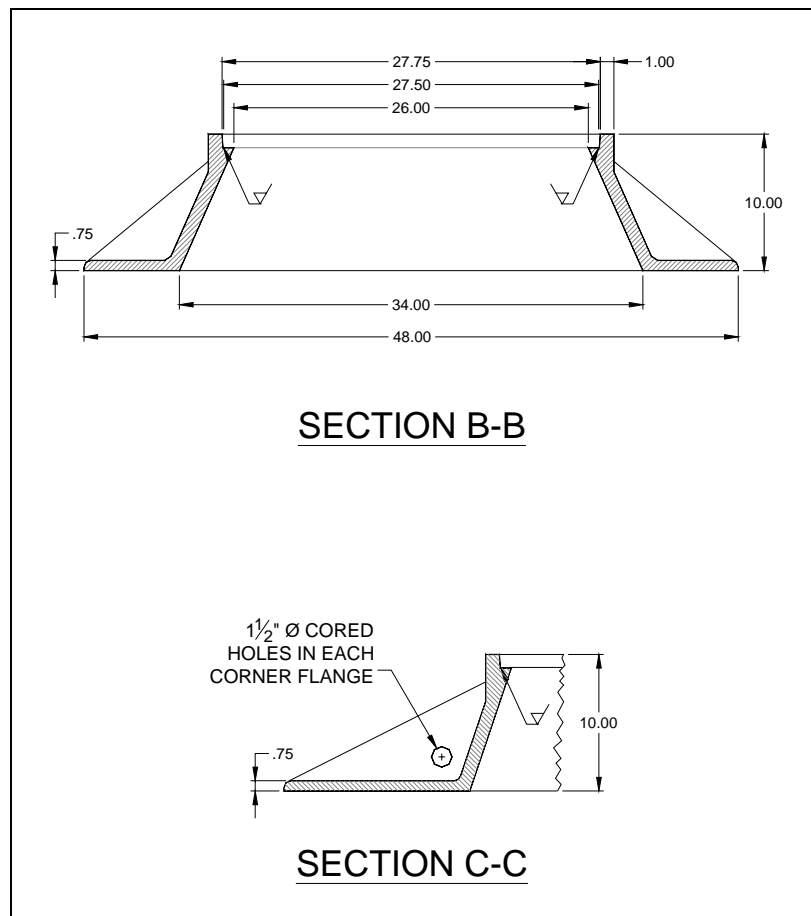


FIG. 2 – NO. 1 MANHOLE FRAME

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 Manager - Distribution
 Technical Engineering

Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1307 Revision #0 Page 1 of 2
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M1307

****This Standard Supersedes BECo Standard 2.10-6.17, page 9 of 19 and COM Electric Standard NE-10****

NSTAR No. 00 Manhole Frame

1.0 Scope

This material specification details the dimensions, materials and fabrication details including Foundries identifying markings.

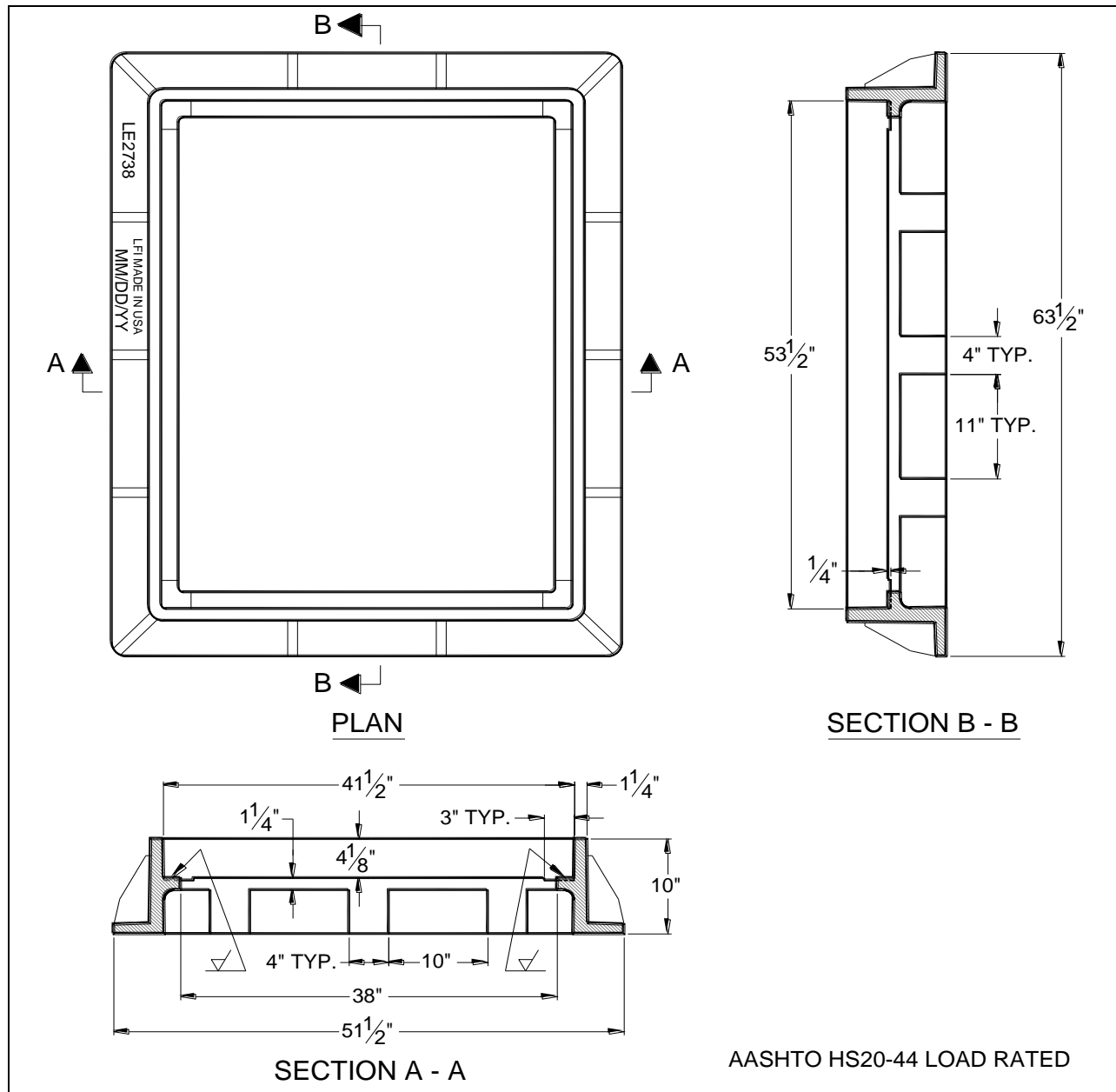
2.0 General

Frame loading capacity shall exceed AASHTO HS20-44.
Classification: A.S.TM. A-48
Class 30 Gray Iron.

3.0 Notes

- 3.1 Surfaces marked "✓" shall be machined to form good bearing surfaces.
- 3.2 Foundry identifying marks shall appear on the upper side of the bottom flange in raised letters.
- 3.3 Estimated weight of frame is 1375 lbs.
- 3.4 The catalog ID for this frame is "574595".

<p>Issued 13-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1307</p> <p>Revision #0 Page 2 of 2</p>
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Approved by: Elizabeth J. Leonard
 Manager - Distribution
 Technical Engineering

Issued 13-Aug-07	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION 	M1308 Revision #0 Page 1 of 2
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M1308

****This Standard Supersedes BECo Standard 2.10-6.17, page 12 of 19 and COM Electric Standard NE-10****

NSTAR Adapter for No. 00 Manhole Frame


1.0 Scope

This material specification details the dimensions, materials and fabrication details including Foundries identifying markings.

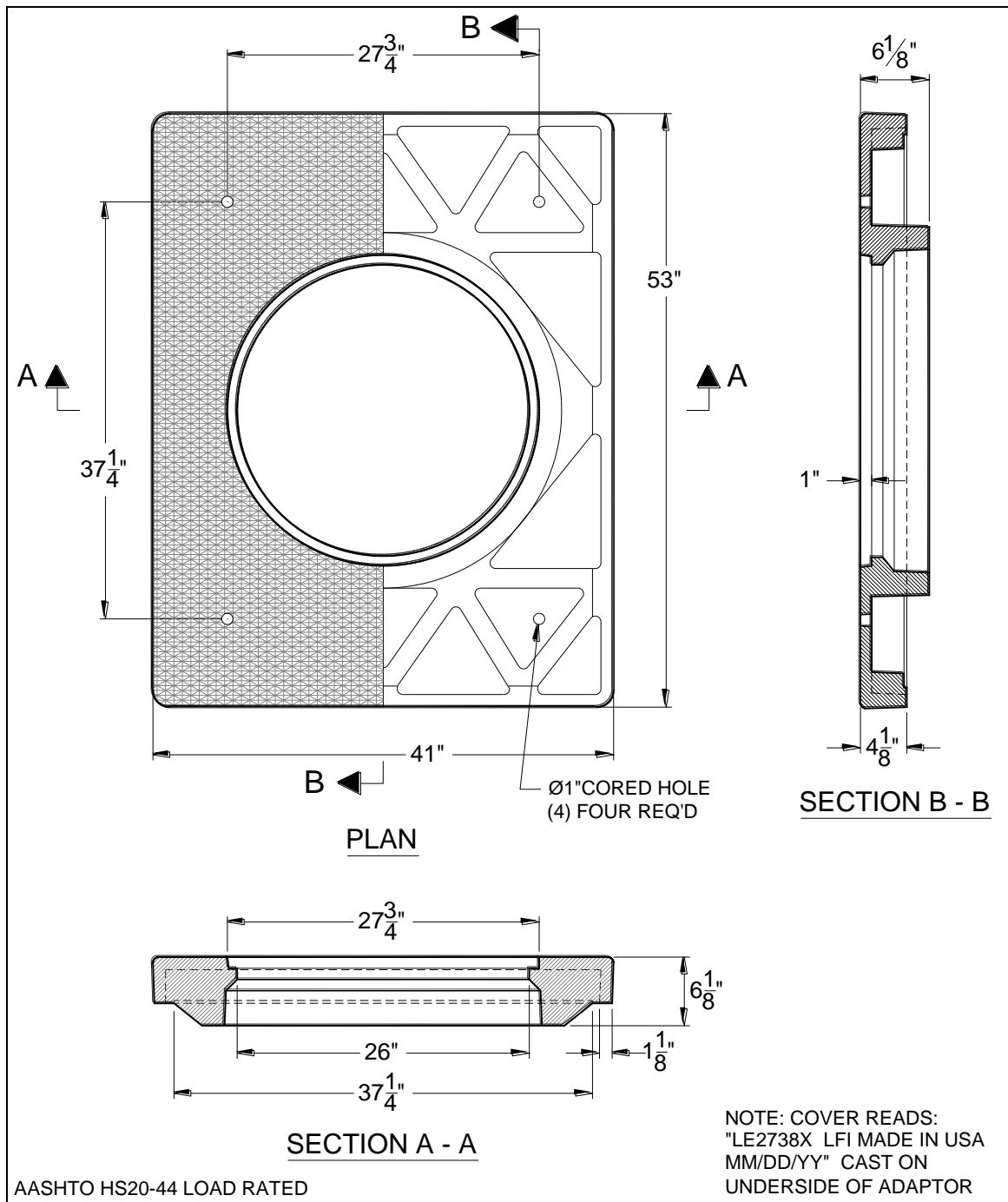
2.0 General

Frame loading capacity shall exceed AASHTO HS20-44.
Classification: A.S.TM. A-48
Class 30 Gray Iron

3.0 Notes

- 3.1 Surfaces marked “” shall be machined to form good bearing surfaces.
- 3.2 Foundry identifying marks shall appear on the underside of the adapter in raised letters.
- 3.3 Estimated weight of frame is 1271 lbs.
- 3.4 The catalog ID for this frame is “574108”.

<p>Issued 13-Aug-07</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M1308</p> <p>Revision #0 Page 2 of 2</p>
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NOTE: DRAWING IS NOT TO SCALE

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Manager - Distribution
Technical Engineering

Issued 14-Feb-01	MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION	M3801
Revised 02-Oct-09		Revision 2 Page 1 of 3

M3801R2

****Standard M3801 Supercedes ComElectric UDS & CUDS, Drgs. NE-12, NE-13 and NE-13A****

Precast Concrete Transformer Foundations
Up to 2500 kVA

1.0 Scope – This specification details the dimensions, strength, reinforcement, and appurtenances required for fabrication of precast transformer foundations.

2.0 General – Vendor design and fabrication drawing shall conform to the minimum requirements of this specification and shall be signed and stamped by a Massachusetts registered professional engineer.

3.0 Design Notes

3.1 Concrete minimum strength, 5000 psi @ 28 days.

3.2 Steel reinforcement - ASTM A615, Grade 60.

3.3 Minimum steel cover, 1-1/2 inches.

3.4 Design Loading – AASHTO HS20-44.

3.5 Design Specifications – ACI 318 & AASHTO Load Factor Design Method.

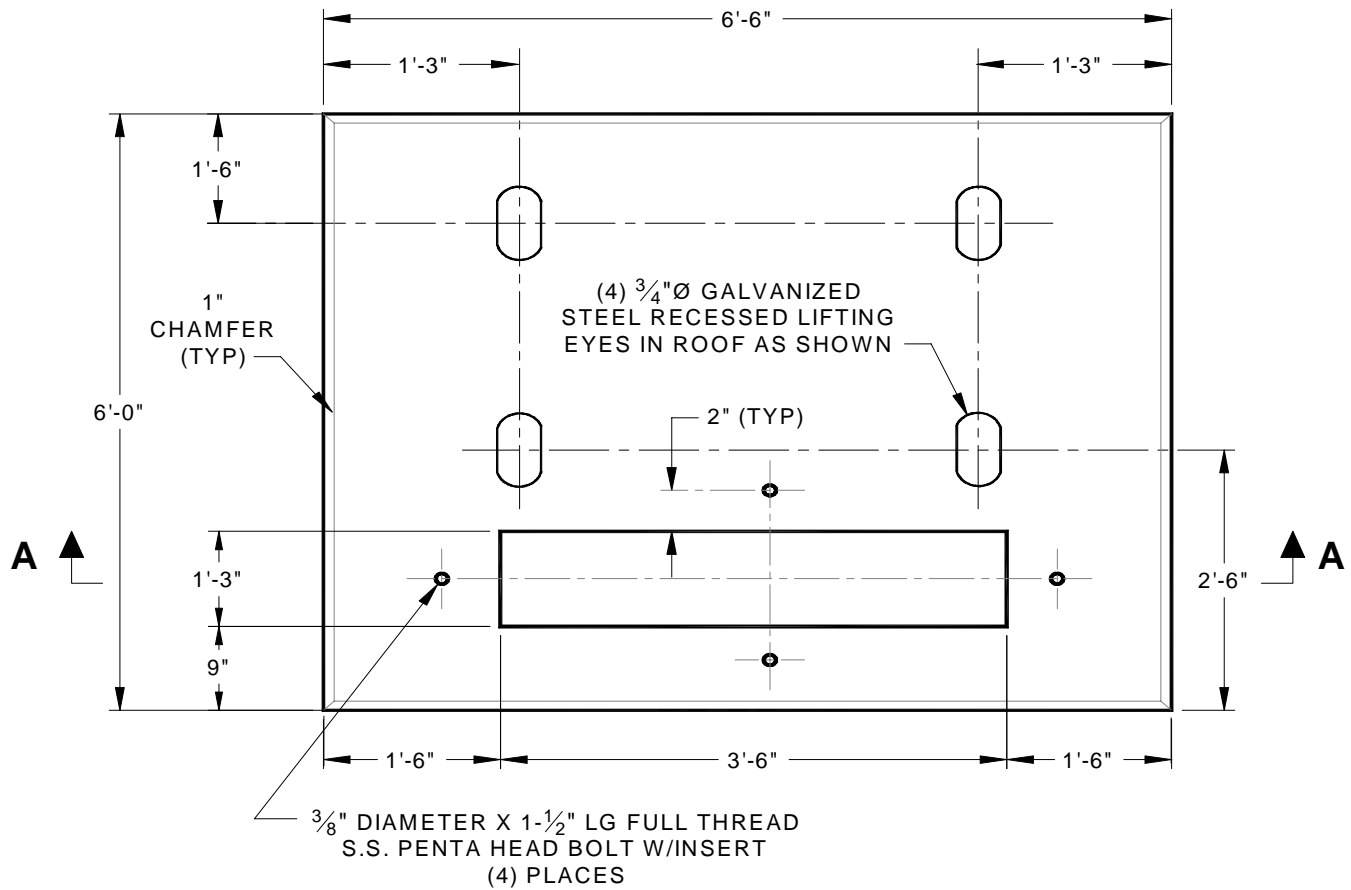
3.6 Reinforced to support H-20 wheel load.

3.7 Manufacturers name to be stenciled on vertical wall of cutout opening.

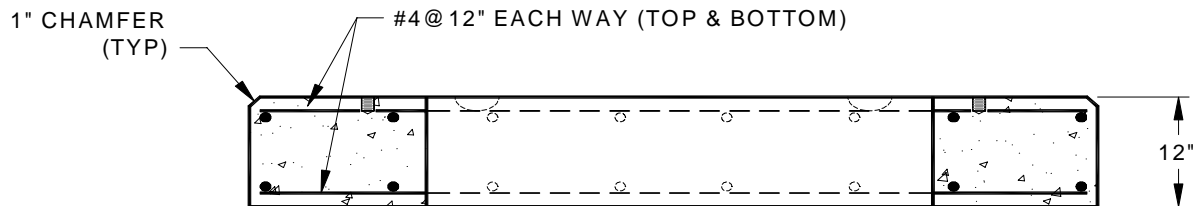
4.0 Bill of Materials

Material Description	Figure No.	Catalog ID
Precast Top Pad Foundations		
Plan Top #1 (Transformers up to 300kVA)	1	14706
Plan Top #2 (Transformers 500 to 2500kVA)	2	14715

<p>Issued 14-Feb-01</p> <p>Revised 02-Oct-09</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M3801</p> <p>Revision 2 Page 2 of 3</p>
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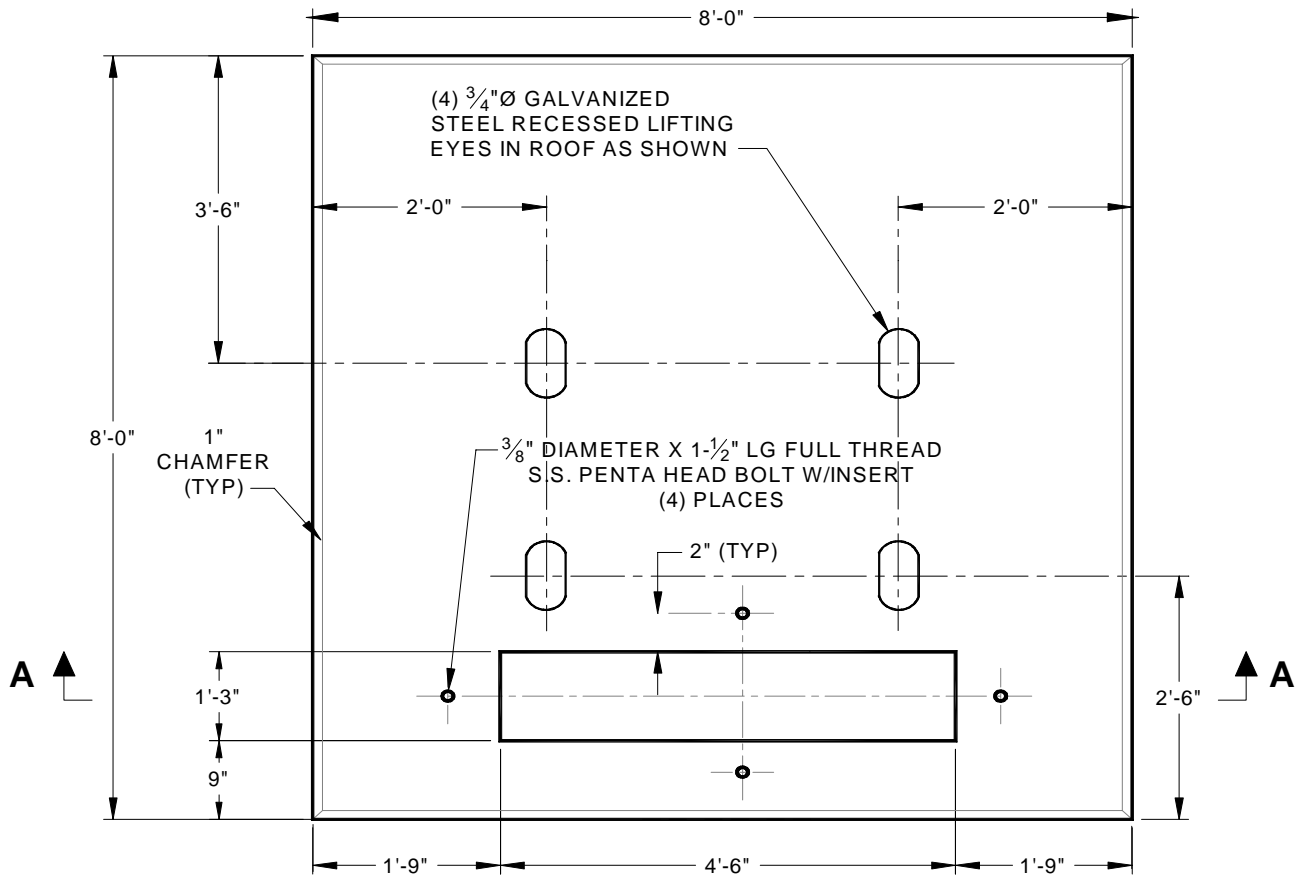
PLAN TOP NO. 1
(FOR TRANSFORMERS UP TO 300KVA)



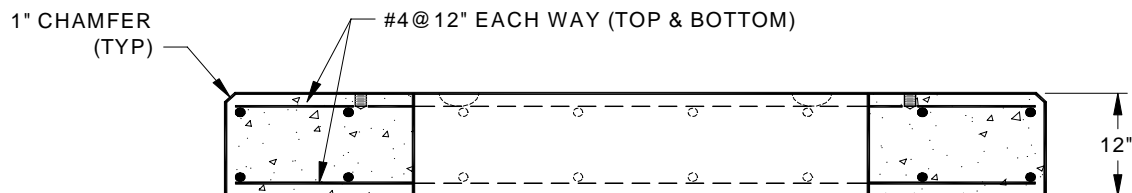
SECTION A-A

Figure 1 - Transformers up to 300kVA

<p>Issued 14-Feb-01</p> <p>Revised 02-Oct-09</p>	<p>MATERIAL STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> <p>NSTAR ELECTRIC</p>	<p>M3801</p> <p>Revision 2 Page 3 of 3</p>
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PLAN TOP NO. 2
(FOR TRANSFORMERS 500 TO 2500KVA)



SECTION A-A

Figure 2 - Transformers up to 2500kVA

Approved by: Amin Jessa
Director, Distribution Engineering

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 1 of 8

M3902

****Supersedes BECo Standard E2.12-2.12 and ComElectric Spec 6-0895****

SINGLE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS

1.0 General Requirements

- 1.1 These specifications cover single-phase deadfront pad-mounted transformers that shall be mineral oil filled, Class OA, 60 Hertz, 65°C average winding temperature rise.
- 1.2 Transformers furnished under these specifications shall conform to the applicable portions of the latest version of ANSI Standard C57.12.25, except where otherwise specified herein.
- 1.3 Sound levels for transformers shall meet NEMA TR1, latest revision.
- 1.4 No changes shall be made in any way that would affect agreement with these specifications after transformer designs have been approved by NSTAR Electric (the Company). No transformer shall be furnished or accepted unless the details of such proposed changes have first been submitted in writing and approved by the Company. Failure to comply with these terms may result in complete or partial removal from the approved supplier list.
- 1.5 Any exceptions to these specifications shall be clearly indicated with price quotations. Approval drawings shall be submitted upon request.
- 1.6 Unless otherwise specified on purchase order, transformer warranty must be for a minimum period of one year from date of installation or 18 months from the date of receipt, whichever occurs first. Written warranty policy must be on file with NSTAR Electric's Purchasing Department.
- 1.7 All units shall have the following additional information on their nameplate: year of manufacture, total weight with oil and volume of oil (in gallons).
- 1.8 All units shall meet the minimum efficiencies in Table 2 of NEMA Publication TP-1, latest revision, or DOE's final ruling of 10/12/07 as called for on the purchase order. Transformer test reports shall be provided upon request.
- 1.9 NSTAR North and NSTAR South designs may be distinguished by voltage or characteristic code. The primary voltage for NSTAR North units is either 13800GY/7970 (code 281) or 13800GY/7970 x 4160GY/2400 (code 282). All other voltages and characteristic codes are NSTAR South units.

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 2 of 8

2.0 Construction

2.1 **NSTAR North** units shall be Type 2 connector and terminal arrangement. **NSTAR South** units shall be Type 1 connector and terminal arrangement with 15.2 kV dimensions applying, regardless of primary voltage.

2.2 All high and low voltage bushings shall be field replaceable.

2.3 High Voltage Bushings:

- A. High voltage connectors shall be externally clamped bushing wells with replaceable stud.
- B. NSTAR North – 15 kV class bushing well inserts shall be installed and properly torqued into each bushing well.
NSTAR South – Units with a primary voltage of 13200GY/7620, either straight or dual voltage, shall be provided with 15 kV class bushing well inserts, installed and properly torqued.
- C. Inserts shall have grounding tabs bonded to tank ground connector using #14 AWG solid copper wire.
- D. All NSTAR North units shall be arranged for loop feed. All NSTAR South units shall be either loop or radial feed arrangement as detailed in the ordering specifications on the purchase order.
- E. For NSTAR South units: All HV bushings, regardless of primary voltage, shall be spaced for 15.2 kV.

2.4 Low voltage terminals:

- A. Low voltage terminals shall consist of a stud in accordance with Figure 4c of C57.12.25. Each stud will have a jamb nut except the neutral shall have tank ground strap secured between two nuts. Each stud will have a minimum of 1 ½" of available thread beyond the jamb nut(s).
- B. Company approved quick disconnect bus bar connectors with clear insulating cover will be provided – Utilco # PTF6-350CJNUP (thru 50 kVA), Utilco # PTF6-500-CJNUP (above 50 kVA) or approved equivalent.
- C. Low voltage neutral terminal shall be a fully insulated bushing.

2.5 Dimensional requirements for NSTAR North units: Dimension A in Figure 2a of C57.12.25 shall be a minimum of 16" and Dimension D in Figure 2a shall be a minimum of 4". The base dimensions, including sill, shall be restricted to the following ranges: 32"-37" (side to side) and 34"-42" (front to back).

2.6 The impedance, including manufacturing tolerance, shall be 1.6-2.6%.

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 3 of 8

- 2.7 Enclosure integrity shall meet or exceed requirements of the most current ANSI C57.12.28. Transformer doors are to be equipped with stainless steel hinges and pins that are not externally removable. A captive, recessed ½” stainless steel penta-head bolt shall be supplied that can be secured with a padlock. Threaded bolthole or captive nut shall be stainless steel.
- 2.8 Sill shall be stainless steel.
- 2.9 Tamperproof knockouts shall be provided in the sill. Design of the knockout shall be such that the knockout hole can be resealed after use.
- 2.10 All bolts, nuts, clamps and other hardware not exposed to the weather must have corrosion resistant electroplating.
- 2.11 Lifting bolts shall be installed by the manufacturer into recessed, stainless steel nuts welded to the tank.
- 2.12 The paint color shall be Green (Munsell Notation 7GY3.29/1.5). Final finish shall exceed the requirements of ANSI C57.12.28 with a minimum dry film thickness of 4 mils on all surfaces and seams. All compartment and transformer surfaces in contact with the pad shall be treated to minimize corrosion.
- 2.13 Coastal Zone Design transformers shall have tanks, sills, hinges, clamps and all other hardware fabricated of Type 304L stainless steel.

3.0 Accessories

- 3.1 Transformer taps, if required, will be detailed in the ordering specifications on the purchase order. An externally operated tap changer shall be provided.
- 3.2 An externally operated, series multiple switch shall be provided on dual voltage units.
- 3.3 NSTAR North units shall have two parking stands.
- 3.4 Under oil type heavy duty arresters shall be provided on all units. Dual voltage units shall have arresters sized for the higher primary voltage. See table 1 for arrester ratings.

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 4 of 8

Primary Voltage (Phase-Ground kV)	Arrester Class (kV)
2.4	3
4.8	6
7.62	10
7.97	12
13.2 & 14.4	18

Table 1 – Arrester Ratings

3.5 Single voltage unit fusing. See tables 2-6.

- A. For NSTAR North, fusing shall be provided on all units and consist of a hot stick operable Bay-O-Net dual element fuse in series with a partial range current limiting fuse.
- B. For NSTAR South, fusing, when specified, shall be detailed in the ordering specifications on the purchase order and consist of a hot stick operable Bay-O-Net fuse in series with either a partial range current limiting fuse or an isolating link.

3.6 Dual voltage unit fusing. See tables 2-6.

- A. For NSTAR North, fusing shall be provided on all units and consist of a hot stick operable Bay-O-Net fuse in series with a partial range current limiting fuse. The units shall be shipped fused for the higher voltage. For coordination purposes, Table 2 indicates Bay-O-Net fuse size that will be used at the lower voltage.
- B. For NSTAR South, fusing, when specified, shall be detailed in the ordering specifications on the purchase order and consist of a hot stick operable Bay-O-Net fuse in series with either a partial range current limiting fuse (voltages in tables 3&4) or an isolating link (voltages in table 5&6). Units shall not be shipped with fuse cartridge installed. Units shall be shipped with the fuse cartridges (not just the fuse links) for both voltage levels, secured in the primary compartment.

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 5 of 8

13,800 Grd Y/7,970 Volts or 4,160 GrdY/2,400 X 13,800 GrdY/7,970 Volts (NSTAR North)		
kVA SIZE	Phase-to-Grd Voltage	BAY-O-NET LINK
25	7970	6A (Cooper 108C04)
50		15A (Cooper 108C07)
100		25A (Cooper 108C09)
167		50A (Cooper 108C12)
25	2400	25A (Cooper 108C09)
50		50A (Cooper 108C12)
100		65A (Cooper 353C14)
167		140A (Cooper 353C17)

Table 2

22,860 GrdY /13,200 or 24,940 GrdY /14,400 Volts (NSTAR South)		
kVA Size	Phase-to-Grd Voltage	BAY-O-NET LINK
25	13,200V	3A (Cooper 358C03)
50		8A (Cooper 358C05)
75		12A (Cooper 108C07)
100		15A (Cooper 108C07)
167		25A (Cooper 108C09)

Table 3

13,200 GrdY /7,620 Volts (NSTAR South)		
kVA Size	Phase-to-Grd Voltage	BAY-O-NET LINK
25	7620	8A (Cooper 358C05)
50		15A (Cooper 108C07)
75		25A (Cooper 108C09)
100		25A (Cooper 108C09)
167		50A (Cooper 108C12)

Table 4

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 6 of 8

3.0 Accessories, cont'd

3740GrdY/2160 or 4,160GrdY/2400 or 7620GrdY/4400 or 8,320GrdY/4800 Volts (NSTAR South)		
kVA Size	Primary Voltage	BAY-O-NET LINK
25	2160 or 2,400 Ph – Grd	25A (Cooper 108C07)
50		50A (Cooper 108C09)
75		65A (Cooper 353C14)
100		65A (Cooper 353C14)
167		140A (Cooper 353C17)
25	4400 or 4,800 Ph – Grd	12A (Cooper 108C06)
50		25A (Cooper 108C09)
75		50A (Cooper 108C12)
100		50A (Cooper 108C12)
167		65A (Cooper 353C14)

Table 5

2,400 or 4,800 delta (NSTAR South)		
kVA Size	Primary Voltage	BAY-O-NET LINK
25	2400 Ph – Ph	15A (Cooper 108C07)
50		25A (Cooper 108C09)
75		50A (Cooper 108C12)
100		50A (Cooper 108C12)
167		65A (Cooper 353C14)
25	4800 Ph – Ph	8A (Cooper 358C05)
50		15A (Cooper 108C07)
75		25A (Cooper 108C09)
100		25A (Cooper 108C09)
167		50A (Cooper 108C12)

Table 6

3.7 An internal flapper valve shall be provided for all units with Bay-O-Net fuses. An external drip cup shall be provided to catch excess oil when fuses are removed.

3.8 All transformers must be supplied with two (2) case grounding lugs installed, Anderson #GTCS-34A or approved equivalent.

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 7 of 8

3.9 All units will have an automatic pressure relief device with a minimum flow rate of 50 SCFM at 15-psi pressure.

3.10 Hold down cleats shall be provided for anchoring the transformer to a pad.

4.0 Labeling/Marking

4.1 A PCB information statement will be placed either on the transformer's nameplate or on a separate distinct and equally durable label. In addition, a separate company approved, durable, weatherproof, UV resistant ,No-PCB label shall be affixed to the outside of the transformer on the right side of the tank. The label shall read "No-PCB Less than 2PPM" in large bold-type white lettering on a green background.

4.2 A permanent bar code label meeting the latest revision of ANSI C57.12.35 shall be provided.

4.3 Each transformer shall be stenciled with numbers that identify the "KVA-CODE" of the transformer. This is in lieu of the "KVA" only stencil. The "KVA-CODE" shall be designated on the purchase order. Flat black, UV light resistant paint shall be used. The lettering shall be approximately 2.5" high and will be located 3" from the top hinge, towards the handle, centered.

Stenciling Examples: 25-223, 50-213

4.4 Two approved warning decals advising field personnel to vent transformer prior to operating bayonet fuses shall be installed and located on each unit as follows:

- A. Directly to the right of the bayonet fuse location.
- B. Inside the cover, below captive bolt/latching area.

4.5 The manufacturer shall install an external warning label (Electromark # BOS044-W-PT-A72) and an internal danger label (Electromark # BOS045-W-PT-112). Outer label shall be located on the door, above the lock. Inner label shall be located on the tank wall adjacent to the low voltage bushings.

4.6 Each transformer shall be marked with the cat id using durable, weather proof, UV resistant labels or painted stencils. The lettering shall consist of 1 inch high bold black characters. Cat id shall be located above the No PCB label.

Issued 04-Apr-01	MATERIAL SPECIFICATION ELECTRIC OPERATIONS ORGANIZATION	M3902
Revised 10-Oct.-07		Revision #2 Page 8 of 8

5.0 Delivery

- 5.1 Unless otherwise specified on purchase order, all deliveries shall be made in an open top truck. Each unit shall be shipped on a wooden pallet. The stacking of transformers may be cause for rejecting an entire shipment, unless otherwise approved.
- 5.2 All transformers shall be secured to a wooden pallet for forklift unloading and shall be stored and shipped with the proper quantity of approved transformer oil. Paint finish shall be protected from damage due to any steel bands used for shipment.
- 5.3 Transformers are subject to inspection by the Company upon delivery.

Approved by: Amin Jessa
Director, Distribution Engineering

ISSUED 5 FEB 2010	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C1100 – Appendix Rev. 0 Page 1 of 6
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C1100 - Appendix

Distribution Conduit, Fittings, and Accessory Material Manufacturers and Part Numbers

Scope

This appendix is to be used in conjunction with:

C1100 – DISTRIBUTION DUCTBANK CONSTRUCTION AND MATERIALS and
D3820 - 15/25kV PRIMARY UNDERGROUND DISTRIBUTION SYSTEMS TO 200 AMPS.

The document lists the approved manufacturer names and part numbers of the equipment used in an underground distribution system that is intended to be inspected and transferred to NSTAR electric and Gas when construction is complete. Conduit must be installed per construction Standard C1100. Materials may be purchased from NSTAR approved distributor/supplier or local supply houses.

The NSTAR Catalog Identification (cat ID) number is an internal reference for NSTAR, but they can be used at NSTAR approved suppliers to make sure the manufacturer and part number are exactly to NSTAR specs. NSTAR designers may use cat IDs in drawings to identify specific materials.

NSTAR Material Standards (such as M1310) may provide specific dimensional information needed for manufacturers; they may detail one or several similar catalog ID items.

All conduits, cable, fittings, manholes, pull boxes and transformer pads must be installed to NSTAR standards to ensure proper installation and acceptance by NSTAR.

Approved NSTAR Supplier (not limited to):

WESCO Distribution Co. Inc.
Manchester 1120
117 Londonderry Turnpike
Hooksett, NH 03106
603-391-3118 Tel
603-391-3126 Fax

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Bill of Materials– Conduit, Fittings & Accessories –

1.0 Conduit

Material	Size (inside diam. – in.)	Wall Thickn ess (Type/ Sch)	Unit Length (Ft)	NSTAR Catalog ID	Manufacturer Name	Mfr. Part #
PVC – rigid	2	40	10	1197	American Pipe	TC6410252
				“	Cantex	2" SCH 40
				“	Carlson	49011-010
				“	Ipex	2" SCH 40
	3	40	10	1198	American Pipe	TC6415252
				“	Cantex	3" SCH 40
				“	Carlson	49013-010
				“	Ipex	3" SCH 40
	4	40	10	1195	American Pipe	TC6420252
				“	Cantex	4" SCH 40
				“	Carlson	49015-010
				“	Ipex	4" SCH 40
	4	EB	20	1362	American Pipe	TC7420752
				“	Cantex	4" TYPE EB
				“	Carlson	48715-020
				“	Ipex	4" EB PVC
	5	40	10	1196	American Pipe	TC6425252
				“	Cantex	5" SCH 40
				“	Carlson	49016-010
				“	Ipex	5" SCH 40
	5	EB	20	1363	American Pipe	TC7425752
				“	Cantex	5"EB PVC
				“	Carlson	48716-020
				“	Ipex	5" EB PVC
	6	40	10	15174	Carlson	49017
	6	EB	20	16047	Carlson	48717-020
PVC – flexible	1-1/2	40 flex	1	15968	Carlson	11810
	2	40 flex	1	9480	Carlson	11811
	2-1/2	40 flex	1	15969	Carlson	11812
	3	40 flex	1	9481	Carlson	11813-250
	4	40 flex	1	9482	Carlson	11815

ISSUED 5 FEB 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C1100 – Appendix Rev. 0 Page 3 of 6
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H.D. Galv. Steel	2	40	10	9474	LTVSteel Wheatland	00106
	3	40	10	1246	“	
	4	40	10	1248	“	
	5	40	10	1249	“	
	6	40	10	15177	“	

2.0 Straight Couplings, Split Duct and Reducers (PVC to PVC Only)

Material	Type	Size (inside diam - in.)	App- lication	NSTAR Catalog ID	Manufacturer Name	Mfr. Part #
PVC	Straight Coupling	2	Joining	1208	American Pipe	NS400
				“	Cantex	6141628
				“	Carlton	E940J
				“	Ipex	EC35
		3	Joining	1209	American Pipe	NS500
				“	Cantex	6141630
				“	Carlton	E940L-CAR
				“	Ipex	EC45
		4	Joining	1210	American Pipe	N505
				“	Cantex	6141632
				“	Carlton	E940N
				“	Ipex	770101/EC55
		5	Joining	16375	Carlton	E940P
		6	Joining	16355	Carlton	E940R
PVC	Split Duct	2	Repair	16873	Carlton	49011SD-010
		3	Repair	16874	Carlton	49012SD-010
		4	Repair	16875	Carlton	49013SD-010
		5	Repair	16876	Carlton	49014SD-010
		6	Repair	16831	Cablelan Products Inc.	F-ADLD4580-12- ES-024-S3
PVC	Reducer	3 to 2- 1/2	change diam.	13661	Carlton	E952LK
		3 to 2	“	13639	Carlton	E952LJ
		4 to 3	“	16043	Carlton	E952NL
		5 to 4	“	16044	Carlton	E952PN
		6 to 5	“	16045	Carlton	E952RP

ISSUED 5 FEB 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C1100 – Appendix Rev. 0 Page 4 of 6
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3.0 Sweeps - Elbow Fittings

Material	Angle - degrees	Size (Inside diam-in.)	Radius (in)	NSTAR Catalog ID	Manufacturer Name	Mfr. Part #
PVC	5	4	N/A	1357	American Pipe	FT518
				"	Carlton	E2440NF
		5	N/A	1358	American Pipe	FT548
				"	Carlton	E2440PF
PVC	22.5	6	N/A	16354	Carlton	E2440RF
				"	Carlton	E2440PF
		3	13	15319	Carlton	UA5AL
				1169	American Pipe	BSTC64425045
PVC	45	5	36	"	Cantex	5233888
				"	Carlton	UA5FPB
		6	48	"	Ipex	69171
				"	Carlton	UA7HR
PVC	90	2	18	1170	American Pipe	BSTC64625045
				"	Cantex	5233780
		3	24	"	Carlton	UA7FPB
				"	Ipex	68871
PVC	90	4	36	16358	Carlton	UA7HR
				"	Carlton	UA7HR
		5	36	1158	American Pipe	BSTC64710023
				"	Cantex	5133844
PVC	90	6	60	"	Carlton	UA9CJ
				"	Ipex	N/A
		4	24	1159	American Pipe	BSTC64715030
				"	Cantex	5133837
PVC	90	4	36	"	Carlton	UA9DL
				"	Ipex	N/A
		5	36	1167	American Pipe	BSTC64720045
				"	Cantex	5233842
PVC	90	6	60	"	Carlton	UA9FNB
				"	Ipex	68769
		4	24	16374	Carlton	UA9DNB
				"	Carlton	UA9AN
PVC	90	4	48	16385	Carlton	UA9HNB
				"	Carlton	UA9HNB
		5	36	1171	American Pipe	BSTC64725045
				"	Cantex	5233841
PVC	90	6	60	"	Carlton	UA9FPB
				"	Ipex	68767
		5	60	16361	Carlton	UA9IPB
				"	Carlton	UA9FRB
PVC	90	6	60	16363	Carlton	UA9FRB
				16364	Carlton	UA9IRB

ISSUED 5 FEB 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C1100 – Appendix Rev. 0 Page 5 of 6
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H.D. Galv. Steel	90	2	30	16854	LTVSteel Wheatland	
		3	30	1173	“	
		4	36	9898	“	
		5	36	9899	“	
		6	36	15176	“	

4.0 Duct Plugs and Caps

Material	Description	Size ID (in.)	NSTAR Catalog ID	Manufacturer Name	Mfr. Part #
PVC/ Rubber	Duct Plug	2	1634	Any	
		3	1635	Jack Moon	30D346U
PVC/ Rubber	Duct Plug	4	1636	Jack Moon	40D402U
		5	1637	Jack Moon	50D535U
		6	16869	Kinco	1938KW-X-LARGE
PVC	Sched 40 End Bell	2	9423	Carlton	E997J
		3	9424	Carlton	E997L
		4	9425	Carlton	E997N
			“	Ipex	EB-55
		5	16428	Carlton	E997P
		6	16367	Carlton	E997R
PVC	Type EB End Bell	2	16365	Carlton	E297J
		3	16366	Carlton	E297L
		4	1156	American Pipe	NS548
			“	Carlton	
			“	Cantex	E297N
			“	Ipex	
		5	1157	American Pipe	NS544
			“	Carlton	
			“	Cantex	E297P
			“	Ipex	
		6	16429	Carlton	E297RR

ISSUED 5 FEB 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C1100 – Appendix Rev. 0 Page 6 of 6
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5.0 Accessories

Material	Description	Size	NSTAR Catalog ID	MFG Name	MFG Part #
PVC Cement	All season, quick setting cement	Quart	1213	American Pipe	NS1200
			“	Carlson	VC9982
			“	JC Whitlam	PR-32
Marker Tape	Caution Tape to install over buried electric lines	1000 ft roll	9913	Harris Ind	UT-8 (4MIL)
Fish Line	Pull line, with footage, 2500lb strength	3000 ft	16860	ARNCO	BLWP25-3000
Duct Foam	Expands and seals around cables at duct mouths	13 oz can	1380	Todol Prod	DF01
Dux Seal	Plug compound, nonhardening	Large, 5lb	1239	Blackburn	DC-50
		Small, 1lb	9469	OZ/Gedney	DC10
Cold patch	Temporary Pavement	60 lb	1628	LIKARR Maintenance	UPM-KOLD PATCH
			“	Package Pavement	102200
			“	Waldo Bros	1023-06
Fairleader	For all duct mouths to protect cable	3-5	1371	Electric Materials	27-1
			“	Virginia Plast	LG-345

ISSUED 5-Feb-2010	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	C3813 – Appendix Rev. 0 Page 1 of 4
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C3813 - Appendix

NSTAR Precast Concrete Manholes, Covers, and Accessory Material Supplier Part Numbers

Scope

This appendix is to be used in conjunction with other NSTAR construction standards including:

C3813 - Installation of Precast Concrete Manholes

D3820- 15/25kV PRIMARY UNDERGROUND DISTRIBUTION SYSTEMS TO 200 AMPS

The document lists the approved vendor names and part/drawing numbers for the commonly used NSTAR standard precast manholes, manhole covers, frames and adapters. Grounding materials are also included. Construction standard C3813 provides installation details.

The NSTAR Catalog Identification number is an internal reference for NSTAR, but it can be used at approved suppliers to make sure the manufacturer and part number are exactly to NSTAR specs. NSTAR designers may use cat IDs in drawings to identify specific materials.

NSTAR Material Standards (such as M1310) may provide specific dimensional and design information needed for manufacturers; they may detail one or several similar catalog ID items.

All conduits, cable, fittings, manholes, pull boxes and transformer pads must be installed to NSTAR specifications.

Approved NSTAR Supplier (not limited to):

WESCO Distribution Co. Inc.
Manchester 1120
117 Londonderry Turnpike
Hooksett, NH 03106
603-391-3118 Tel
603-391-3126 Fax

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1.0. Precast Manholes – Common Designs

DESCRIPTION	NSTAR Catalog ID	Manufacturer	Drawing/ Part #
M1201 - 4'x4'x4' ht - secondary, split fiber w/bottom	16246	Old Castle Precast	OM-1148R2
	“	Utility Precast	M1201
M1202 - 4'x6'x6' ht - primary splicing (URD)	16238	Old Castle Precast	OM-1149R
	“	Utility Precast	M1202
	“	E.F.Shea Concrete	M1202
M1203 - 6'x 0'x6' ht - primary splicing	16239	Old Castle Precast	OM-1150R
	“	Utility Precast	M1203
M1204 - 6'x10'x8' ht - primary splicing	16240	Old Castle Precast	OM-1151R
M1205 - 6'-6"x12'-6"x7'-10" HA- 300	16241	Old Castle Precast	OM-1152
M1206 - 6'-6"x 7'-6"x 7'-10"	16326	Old Castle Precast	OM-1153
M1207 - 3'x3x4' ht - primary junction box	9436	Old Castle Precast	OM-1154
	“	Utility Precast	M1207
M1208 - 4'x4'x4' ht - secondary (URD, open bottom)	9435	Old Castle Precast	OM-1155
	“	Utility Precast	M1208
M1209 - 5'x7'x6'-6" ht	16237	Old Castle Precast	OM-1156
	“	Utility Precast	M1209
M1209 - 5'x7'x6'-8" ht		Acme Precast	

2.0 Precast Manholes – Less Common Designs

Description	NSTAR Catalog ID	Manufacturer	Drawing/ Part #
M1210 - 5'x10'x7' ht - 3-way station get-a-way	9441	Old Castle Precast	OM-1157
	“	Utility Precast	M1210
	“	Acme Precast	M1210

ISSUED 5-Feb-2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C3813 – Appendix Rev. 0 Page 3 of 4
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M1211 - 10'x13'x6'-6" ht - 3-way station get-a-way	16242	Old Castle Precast	OM-1158
M1212 - 10'x13'x8' ht - 3-way station get-a-way	16243	Old Castle Precast	OM-1159
M1213 - 6'x14'x8' ht - 3-way station get-a-way	16244	Old Castle Precast	OM-1160R
M1214 - 8'x14'x8' ht - 3-way station get-a-way	16245	Old Castle Precast	OM-1161
M1215 - 6'x-13'x6'-6"	15170	Old Castle Precast	OM-1162
	"	Utility Precast	M1215
M1216 - 5'x-5'x5' ht - primary splice (URD)	9437	Old Castle Precast	OM-1163
		Utility Precast	M1216
M1217 - 13'x-13'x8' ht - 4-way station get-a-way	18090	Old Castle Precast	n/a

3.0 Precast Transformer Pads

DESCRIPTION	NSTAR Catalog ID	Manufacturer	Drawing/ Part #
M3801 - Three Phase Transformer Pad Foundations, up to 300kVA	14706	Old Castle Precast	
	"	Utility Precast	
M3801 - Three Phase Transformer Pad Foundations, up to 2500kVA	14715	Old Castle Precast	
	"	Utility Precast	


ISSUED 5-Feb-2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	C3813 – Appendix Rev. 0 Page 4 of 4
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4.0 Manhole Frames and Covers

DESCRIPTION	NSTAR Catalog ID	Manufacturer	Drawing/ Part #
Standard Cover & Frame Assembly: No.1 MH Frame & Solid Cover	1384 & 1347	East Jordan Iron Works (fmrly LeBaron)	LE270NSTARALT
M1303 - No. 1 MH Frame only (standard size)	1384		959B
M1304 - No. 1-L Frame only (low profile)	1385		967A
M1305 - No. 0 MH Frame (large round opening) and M1306 Reducing Adapter	1382 & 1097		2884 & 3180
M1307 - No. 00 MH Frame only (square opening) & M1308 - Square to Round Adapter for No. 00 Frame	1383 & 1098		961 & 962
M1308 - No. 1 Solid Cover	1347		960C
M1308 - No.-V Solid Cover	1348		2888A
M1308 - No.1-B Vented Cover	16296		3947

6.0 Manhole Grounding Accessories

DESCRIPTION	NSTAR Catalog ID	Manufacturer	Drawing/ Part #
5/8" x 8' L Coprweld Grnd Rod	9229	Blackburn	6258S
	"	Erico	635880
Mechanical Connector, 4/0 Cu - Ground Rod	597	Blackburn	GUV5825
	"	Burndy	GAR6429
Mechanical Connector, 1/0 Cu - Ground Rod	9009	Anderson	GC-103-01
	"	Blackburn	JAB-58H
		Erico	NDCR58R
Mechanical Connector, 4/0 Cu - 4/0 Cu wire	608	Blackburn	2B40W
	"	Burndy	KVS-W28
Manhole ID Tag Holder	366	Tech Products	PH109

ISSUED 5-FEB- 2010	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 – Appendix Rev. 0 Page 1 of 7
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D3820 - Appendix

200 Amp Underground Electric Distribution Material Manufacturers and Part Numbers

Scope

This appendix is to be used in conjunction with several NSTAR standards including:

D3820- 15/25kV PRIMARY UNDERGROUND DISTRIBUTION SYSTEMS TO 200 AMPS.

C1100 Appendix Standard for all conduit, fittings, risers, accessories

C3813 Appendix Standard for all common manholes, frames and covers, accessories

The document lists the approved manufacturer names and part numbers for most key equipment used in an underground distribution system. Most of these parts may be purchased at local supply houses or NSTAR's approved distributor/supplier.

Catalog ID numbers are intended for use internally at NSTAR to reference materials. They are typically referred to by NSTAR designers and can also be used in requests to NSTAR's approved suppliers to ensure parts meet NSTAR requirements.

NSTAR Material Standards (such as M1310) may provide specific dimensional and design information needed for manufacturers; they may detail one or several similar catalog ID items.

Approved NSTAR Supplier (not limited to):

WESCO Distribution Co. Inc.
Manchester 1120
117 Londonderry Turnpike
Hooksett, NH 3106
603-391-3118
603-391-3126 fax

ISSUED 5-FEB- 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	D3820 – Appendix Rev. 0 Page 2 of 7
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1.0 15kV Primary Cable and Accessories

DESCRIPTION	NSTAR CATALOG ID	MANU- FACTURER	PART #
PRIMARY CABLE			
15KV #1 SOL AL, 1/C SINGLE, EPR CABLE	92	OKONITE	CS-10334
15KV #1 SOL AL, 3x1/C TRIPLEX, EPR CABLE	93	OKONITE	CS-10329
15KV 4/0 AL, 3x1/C TRIPLEX, EPR CABLE	16332	OKONITE	CS-12181
JOINTS AND TERMINATIONS			
JOINT, 15KV PREMOLDED KIT, #2 STR / #1 SOL	1454	COOPER	SP15A002
JOINT, 15KV PREMOLDED KIT, 4/0	16334	COOPER	SP15B007
TERMINATION, 15/25KV 1PH, COLD SHRINK, 1/0 AL, #1 SOL or #2 STR	9937	3M	7652-S-4-2
TERMINATION 15KV HEAT SHRINK, 4/0 AL,	1423	RAYCHEM	HVT-152-BECO
200 AMP ACCESSORIES			
FEEDTHROUGH BUSHING, 15KV	516	HUBBELL	9U07AKF200
		COOPER	LPF215H
BUSHING WELL INSERT, 15KV	515	COOPER	ISB215S
		ELASTIMOLD	164OSP
INSULATING CAP, 15KV	1119	COOPER	DPC625UT
ELBOW, 15 kV LOADBREAK, 4/0 STR	16333	COOPER	LE215C09T
ELBOW, 15 kV LOADBREAK, #1 SOL AL, #2 STR CU	517	COOPER	LE215B04T
	"	ELASTIMOLD	166LR-B-5220
INSULATED STANDOFF BUSHING, 15 kV	515	COOPER	ISB215S
	"	ELASTIMOLD	164OSP
MULTI-TAP, 15KV, 3 WAY	806	ELASTIMOLD	164J3

ISSUED 5-FEB- 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	D3820 – Appendix Rev. 0 Page 3 of 7
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	“	ELASTIMOLD	164FT
MULTI-TAP, 15KV, 4 WAY	1486	HUBBELL	9U07AGD4201
	“	COOPER	LJ215C4B
	“	ELASTIMOLD	164J4
1 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE (TURTLE), 15KV, 4 POSITION	9533	HIGH LINE	FSC3248GA41-NS
	“	NORDIC	ND-155-MG- 102A4152W1A-CWE
3 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE (TURTLE), 15KV, 3 x 4 POSITION	2590	POWER DESIGN	CJP30-56-WG-L2- 2415-BECO

2.0 25kV Primary Cable and Accessories

DESCRIPTION	NSTAR CATALOG ID	MANU- FACTURER	Approved PART #
PRIMARY CABLE			
25KV 1/0 SOL AL, 1/C SINGLE, EPR CABLE	8714	OKONITE	CS-10335
25KV 1/0 SOL AL, 3x1/C TRIPLEX, EPR CABLE	8716	OKONITE	CS-10326
JOINTS AND TERMINATIONS			
JOINT, 25KV PREMOLDED KIT, 1/0 SOL AL	9864	3M	5451-C1-1A
	“	HUBBELL	9U06AFE100
	“	COOPER	SP25B003
	“	ELASTIMOLD	25PCJ1G1230
JOINT, 25KV PREMOLDED KIT, TRANSITION, 1/0 SOL TO #2 STR	9865	COOPER	SP25BT03
	“	ELASTIMOLD	25PCJ1G1-230
TERMINATION, 15/25KV 1PH, COLD SHRINK, 1/0 SOL AL,#1 SOL or #2 STR	9937	3M	7652-S-4-2

ISSUED 5-FEB- 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	D3820 – Appendix Rev. 0 Page 4 of 7
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200 AMP ACCESSORIES			
FEEDTHROUGH BUSHING, 25KV	9540	RAYCHEM	EPPA-121-HESP-100-FILLED
	“	COOPER	LPF225H
	“	ELASTIMOLD	274FT
	“	HUBBELL	9U07BCF200
BUSHING WELL INSERT, 25KV	9756	COOPER	LBI225
	“	ELASTIMOLD	2701A4
	“	HUBBELL	9U02BAB001
INSULATING CAP, 25KV	9457	HUBBELL	9U01BEW500
	“	COOPER	LPC225
	“	ELASTIMOLD	273DRG
ELBOW, 25 kV LOADBREAK, 1/0 SOL AL	9754	HUBBELL	9U01BBD634
	“	COOPER	LE225MC05
	“	ELASTIMOLD	275LR-CC5230
MULTI-TAP, 25KV, 4 WAY	9772	COOPER	LJ226C4B
	“	ELASTIMOLD	274J4
	“	HUBBELL	9U07BED4201
1 PHASE CABLE SWITCHING STATION MULTITAP ENCLOSURE (TURTLE), 25KV, 4 POSITION	9534	HIGH LINE	FSC3248GA42-NS
	“	NORDIC	ND-155-MG-102A-4252-W1A-C
	“	POWER DESIGN	CJP-10-54-L2-MG-2425-GB2S-1519
3 PHASE CABLE SWITCHING STATION MULTI-TAP ENCLOSURE (TURTLE), 25KV, 3x4 POSITION	9536	HIGH LINE	FSC6860GA42-NS
	“	NORDIC	ND-450-MG-101-4252-W3A-*
	“	POWER DESIGN	CJP-41-56-L2-MG-2425-GB2S-1799

ISSUED 5-FEB- 2010	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 – Appendix Rev. 0 Page 5 of 7
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3.0 Secondary Cable and Connectors

DESCRIPTION	NSTAR CATALOG ID	MANUFACTURER	Approved PART #
600 VOLT CABLE			
600V 4/0 AL, 3x1/C TRIPLEX, XLPE INSUL CABLE	87	ALCAN	SWEETBRIAR XLP
600V 4/0 CU, 3x1/C TRIPLEX, EPR/HYP CABLE	8746	HENDRIX	EH043
600V 500 CU, 3x1/C TRIPLEX, EPR/HYP CABLE	16016	OKONITE	3-500EP HYP
HANDHOLE CONNECTORS, 600 Volt Insulated			
MOLE BUS, 4 POS, 1 WAY, #12 - 350 KCMIL	9761	BLACKBURN	USB43
	"	CONNECTOR MFG	U227000001
	"	UTILICO	PED4-350-SSP
MOLE BUS, 4 POS, 1 WAY, #2 - 750 KCMIL	9764	UTILCO	PED4-750-SSP
MOLE BUS, 6 POS, 1 WAY, #10 - 500 KCMIL	9763	BLACKBURN	USB65
	"	UTILCO	PED6-500-SSP
MOLE BUS, 6 POS, 1 WAY, #2 - 750 KCMIL	9762	UTILCO	PED6-750SSP
MOLE BUS, 8 POS, 2 WAY, #2 - 750 KCMIL	15981	UTILCO	PSA8-750SSP

4.0 Miscellaneous Accessories

DESCRIPTION	NSTAR CATALOG ID	MANUFACTURER	Approved PART #
FAULT INDICATORS			
FCI, 25kV or 15kV Cable, auto range trip, current reset	9660	FISHER PIERCE	1547-A-38728
FCI, 15 kV Elbow Test Point Mount, 800 Amp trip, volt reset	692	EOSCHWEITZER	1TPR10800K
GROUNDING MATERIALS			
5/8" Dia. Ground Rod	9229	BLACKBURN	6258S
		ERICO INC	635880

ISSUED 5-FEB- 2010	DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION 	D3820 – Appendix Rev. 0 Page 6 of 7
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1/0 Copper Ground Wire, bare tinned, 7 strand	115	NEHRING	BS017WTIN
Ground Wire Connector 1/0-1/0 Cu Wire	608	BLACKBURN	2B40W
	“	BURNDY	KVS-W28
Ground Rod Connector to 1/0 Cu Wire	9009	ANDERSON	GC-103-01
	“	BLACKBURN	JAB-58H
	“	ERICO INC	NDC58R

5.0 Conduit, Riser Stand Pipes, and Manholes

DESCRIPTION	NSTAR CATALOG ID	MANUFACTURER	Approved PART #
See C1100 Appendix Standard for all conduit, fittings, risers, accessories			
See C3813 Appendix Standard for all common manholes, frames and covers, accessories			

6.0 Equipment Box Pads and Handholes

DESCRIPTION	NSTAR CATALOG ID	MANUFACTURER	Approved PART #
(Dimension included are top surface x height)			
Handholes			
Fiberglass handhole: 15"x10"x12" –lighting only	840	ASSOCIATED PLASTICS	SGA132415C000
	“	CARSON	1419-12PB
	“	FARGO	B-112A-G
	“	NEWBASIS	SGA141912Y000
	“	PENCELL	PE-14HDX-EWB
Fiberglass handhole: 23"x14"x15" -single residence	9571	CARSON	1324-15-PB
	“	FARGO	B-125A-G
	“	HIGH LINE	HL-41A
	“	NEWBASIS	SGA132415C000
Fiberglass handhole: 30"x17"x18" – <u>standard use</u>	841	ASSOCIATED PLASTICS	SEA173015C000

ISSUED 5-FEB- 2010	<p style="text-align: center;">DESIGN STANDARD ELECTRIC OPERATIONS ORGANIZATION</p> 	D3820 – Appendix Rev. 0 Page 7 of 7
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	“	CARSON	1730-18-PB
	“	FARGO	B-138A-G
	“	NEWBASIS	SGA173015C000
	“	PENCELL	PE-30HDX-2-EWB
Composite handhole: 30"x17"x18", H20 rated	9572	CDR	PA12-1730-18
	“	HIGH LINE	CH173018H
	“	SYNERTECH	*

Box Pads – Transformers and Splices			
Fiberglass box pad/splice box: 43"x37.5"x32" For NSTAR North Transformers (single phase) or splice box (top opening = 26"w x 32"d)	1622	HIGH LINE	HL-48M-DS
Fiberglass box pad/splice box (ledge areas only): 43"x37.5"x15" For NSTAR North Transformers (single phase) – shallow depth or splice box (top opening = 26"w x 32"d)	7747	NORDIC	CBP-37-43-15F
Fiberglass Cover (Use with Cat. IDs 1622, 7747, 16955)	1349	HIGH LINE	HL-45-2EP
Fiberglass box pad/splice box: 43"x37"x32" For NSTAR South Transformers (single phase; top opening = 26"w x 26"d)	16955	HIGH LINE	HL374332-2626DS
Large Box Pads – Switchgear			
Fiberglass box pad for 15kV PME-9 Switches (and 3 phase primary splice box) 75"x72"x36"	14024	HIGH LINE	FSG757236XYNS
	“	NORDIC	GS-75-72-36
Fiberglass cover for use with Cat. ID 14024	14078	HIGH LINE	FBP757300AAC
	“	NORDIC	GSC-75-72
Fiberglass box pad for use with 25kV PME-9 Switchgear: 86"x84"x36"	14556	NORDIC	GS-86-84-36
Fiberglass base cover for use with Cat. ID 14556	14557	NORDIC	GSC-86-84

APPENDIX C
TOWN OF BARNSTABLE MUNICIPAL SEWER SPECIFICATIONS

TOWN OF BARNSTABLE
MUNICIPAL SEWER SPECIFICATIONS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
IYANNOUGH RD (RTE 28) AND YARMOUTH ROAD PROJECT

Division 33

<u>Section No.</u>	<u>Subject</u>
33 31 13	Sanitary Sewer System
33 39 10	Precast Sanitary Sewer Manholes, Frames and Covers
33 40 00	Sewer Testing
33 41 00	Town of Barnstable Required Conditions to Acceptance of Proposed Gravity Sewer

SECTION 33 31 13

SANITARY SEWER SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sanitary sewer piping and fittings
 - 2. Valves
 - 3. Underground pipe markers.
 - 4. Connection to existing concrete structures.
 - 5. Bedding and cover materials
- B. Related Sections:
 - 1. Section 333910 – Precast Sanitary Sewer Manholes, Frames and Covers
 - 2. Section 334000 – Sewer Testing.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
 - 4. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 5. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - 6. ASTM A536 - Standard Specification for Ductile Iron Castings.
 - 7. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - 8. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 - 9. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
 - 10. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - 11. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

12. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
13. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
14. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
15. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
16. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
17. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
18. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
19. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
20. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
21. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
22. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association:

1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1,219 mm), for Water.
4. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
7. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
8. AWWA C500 - Gate Valves for Water and Sewage Systems.
9. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
10. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
11. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings. Standard pipe outside diameters (ODs) conform to the ductile iron and cast iron sizing system

- D. Ductile Iron Pipe Research Association:
 - 1. DIPRA Section 1X, Thrust Restraint.
- E. National Fire Protection Association:
 - 1. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

1.3 SUBMITTALS

- A. Refer to MassDOT specifications.
- B. Shop Drawings: Indicate piping layout, including piping specialties.
- C. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
- D. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with local and state standards and plumbing codes, latest edition.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum of five years' experience.
- B. Installer: Company specializing in performing work of this section with minimum of five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.
 - 1. Under no circumstances shall the pipe be dropped from trucks or into the trench.
- B. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.
- C. Block individual and stockpiled pipe lengths to prevent moving.
- D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

A. PVC Sewer Pipe and Fittings:

1. Polyvinyl Chloride Pipe, couplings and fittings used for non-pressure uses shall be SDR 35. Low pressure pipe shall be Schedule 80 or SDR 21, unless otherwise shown on the plans. PVC pipe shall conform to the ASTM D3034 or ASTM F789. Joints for PVC pipe shall be push-on joints using permanently bonded elastomeric ring joints. Such joints shall be installed in accordance with the pipe manufacturer's written instructions. Any joint which is not properly made, shows signs of leakage or is in the opinion of the Engineer, defective in any way shall be redone to the satisfaction of the Engineer.
2. Wye Branches or Tees shall be of the same material and of the same class and type so as to be compatible with the pipe they are used.
3. Pipe utilized for service connections and chimneys shall be 6 inches in diameter and be manufactured of PVC. PVC pipe shall be Schedule 40 or SDR 35 and shall conform to ASTM D3034, with an SDR of 35 or ASTM F789. Joints for PVC pipe shall be push-on using elastomeric ring gaskets.
4. Minimum pipe stiffness (F/delta Y) at 5 percent deflection shall be 46 psi for all sizes when tested in accordance with ASTM Method of Test D2412, "External Loading Properties of Plastic Pipe by Parallel-Plate Loading".
5. Pipe (6" long section) shall be subjected to impact from a free falling tup (20-lb. Tup A.) in accordance with ASTM Method of Test D2444.
6. The bell end of the pipe shall consist of an integral wall section with a solid cross-sectional rubber ring, factory assembled, securely locked in place to prevent displacement during field assembly.\
7. Each length of pipe shall be marked with the nominal pipe size, manufacturer's name or trademark, and the PVC cell classification. All fittings shall be marked also.
8. Gravity sewer pipe shall be furnished in the longest laying length manufactured.
9. Pipe exterior barrel sections shall be smooth wall. Ribbed profile is not acceptable.
10. Fittings: Shall be as manufactured by the pipe supplier.
 - a. Have bell and spigot configurations compatible with that of the pipe supplier.
 - b. Locked in rubber ring.
11. Joints: Conform to ASTM D-3212 – "Joints for Drain and Sewer Plastic Pipe using Flexible Electrometric Seals".
 - a. Shall be bell and spigot type (push-on) with electrometric gasket seal.
 - b. Shall be manufactured of a continuous electrometric ring which is oil resistant (Neoprene compound). Shall be tested by the manufacturer at his expense as specified in ASTM'17 477. Test shall results shall be furnished to the Owner and Engineer for at least two specimens of each size selected at random from the lot to be furnished for this Contract.
 - c. The electrometric gaskets shall be factory installed and securely locked in place with each length of pipe furnished.

B. Rubber Gaskets, Lubricants, Glands, Bolts, and Nuts: AWWA C111'

C. Fusible Polyvinylchloride Pipe

1. All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784
2. Fusion Technician shall be fully qualified by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.
3. The pipe shall be warranted for one year per the pipe supplier's standard terms
4. Pre-Construction Submittals- The following PRODUCT DATA is required from the pipe supplier and/or fusion provider (Pipe Size, Dimensionality, Pressure Class per applicable standard, Color, Recommended Minimum Bending Radius, Recommended Maximum Safe Pull Force, Fusion technician qualification indicating conformance with this specification
5. Post-Construction Submittals- The following AS-RECORDED DATA is required from the contractor and/or fusion provider to the owner or pipe supplier upon request ,Approved data logger device reports, Fusion joint documentation containing the following information (Pipe Size and Thickness, Machine Size, Fusion Technician Identification, Job Identification, Fusion Joint Number, Fusion, Heating, and Drag Pressure Settings, Heat Plate Temperature, Time Stamp, Heating and Cool Down Time of Fusion, Ambient Temperature
6. Fusible polyvinylchloride pipe shall conform to AWWA C900, AWWA C905, ASTM D2241 or ASTM D1785 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA standards for all pipe types.
7. Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
8. Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.
9. Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as described in this specification.
10. Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.
11. Ductile Iron Mechanical and Flanged Fittings- Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.
12. Connections to fusible polyvinylchloride pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.
13. Bends, tees and other ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
14. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.
15. If required, linings for Ductile Iron fittings shall meet the following requirements for the following service environments:- Wasterwater
 - a) Ceramic Epoxy Lining PROTECTO 401 by USPipe
 - b) Ceramic Epoxy shall be Tnemec Perma-Shield 431
 - c) Polyurethane shall be DuraShield 210 or 310.
16. Delivery and Off-Loading- All pipe shall be bundled or packaged in such a

manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer

17. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
18. Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed.
19. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
20. Handling and Storage- Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.
21. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.
22. Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.
23. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
24. Fusion Process will be handled in accordance with manufacturer's specification and pipe supplier's guidelines.

2.2 UNDERGROUND PIPE MARKERS

- A. Provide marking tape acceptable to Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify pipe size, location, and inverts are as indicated on Drawings.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION – BURIED PIPING SYSTEMS

- A. Excavate pipe trench in accordance with MassDOT specifications. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.
- B. As soon as the excavation is completed to the normal grade of the bottom of the trench, pipe bedding, shall be placed immediately in the trench and compacted.
- C. The compacted bedding shall be shaped so that the bottom quadrant of the pipe shall rest firmly for the full length of the barrel. Suitable holes for bells or couplings shall be dug around the pipe joints to provide ample space for making tight joints. The pipe shall be firmly bedded and covered to conform accurately to the lines and grades.
- D. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.
- E. It shall be the Contractor's responsibility to control any water in the trench below the pipe invert and he shall place clay or other impermeable material in the bedding at intervals to prevent horizontal movement of the groundwater which might induce settling of the bed, or make it difficult to handle water in the trench.
- F. Install pipe on prepared bedding.
- G. Route pipe in straight line. Laser aligning shall not be used to establish a continuous line in excess of 600 feet.
- H. Backfill trench in accordance with MassDOT specifications. Do not use wheeled or tracked vehicles for tamping.
- I. See construction details for piping/valve construction at proposed structures.

3.4 CONNECTIONS TO EXISTING CONCRETE STRUCTURES

- A. Core drill existing manhole to clean opening.
- B. Install watertight Link-Seal® connection or approved equal.
- C. Carefully chisel out existing brick wall and shelf as necessary to create new channel. Special attention shall be made to protect existing sewers and structures.
- D. New brick lined invert to be inverted arch with bricks laid as stretchers and on edge.
- E. Prevent construction debris from entering existing and new sewer line when making connection.
- F. Seal cracks in disturbed shelf with non-shrink grout.
- G. Special attention shall be made to protect existing sewers and structures

H. See detail on construction drawings

3.5 CLEANING

- A. At the conclusion of the Work, the Contractor shall thoroughly clean all of the new pipelines by flushing with high pressure water or other means to remove all dirt, stones, and pieces of wood or other material which may have entered during the construction period. Debris, cleaned from the lines, shall be removed from the lowest manhole.
- B. After the pipelines are cleaned, and if the groundwater level is above the-pipe the Engineer will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired at the Contractor's expense.

3.6 TESTING OF SEWERS

- A. Testing of the pressure pipe and gravity pipe shall comply with Section 334000 and 334100 of these specifications.

END OF SECTION

33 31 13

SECTION 33 39 10

PRECAST SANITARY SEWER MANHOLES, FRAMES AND COVERS

PART 1 - GENERAL1.1 DESCRIPTION

- A. Work Included: Construct manholes, covers, frames, brick masonry, inverts and apply waterproofing in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.
- B. Work Included: Furnish and install air release valve structure of the size (s) and in the location (s) shown on the Drawings.
- C. Related Work Specified Elsewhere (when applicable):
 - 1. Final sewer testing is specified within the project specifications, plans, and final Town acceptance.
 - 2. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.

1.2 QUALITY ASSURANCE

- A. Precast Manhole Base, Barrel and Top Sections:
 - 1. Conform to ASTM C478-84 (AASHTO M199-82) except as modified herein, and on the Drawings.
 - 2. Average strength of 4,000 psi at 28 days.
 - 3. Testing:
 - a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
 - b. Have tests conducted at the manufactures plant or at a testing laboratory approved by the Engineer.
 - c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.
- B. Manhole Steps
 - 1. Acceptable Manufacturers:
 - a. Aluminum Company of America.
 - b. Reliance Steel Products, Inc.
 - c. M. A. Industries, Inc.
 - d. Or equivalent.
- C. Frames and Covers:
 - 1. Acceptable Manufacturers:
 - a. Etheridge Foundry Co.
 - b. Neenah Foundry Co.
 - c. E. L. LeBaron Foundry Company.
 - d. Or equivalent.
- D. Masonry:
 - 1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick. (AASHTO M91-78).
 - 2. Cement: ASTM C-ISO (AASHTO M85-791).

3. Hydrated Lime: ASTM C-207
4. Sand: ASTM C33 (AASHTO M6-65 (1974)).
- E. Waterproofing:
 1. Acceptable Manufacturers:
 - a. Minwax Fibrous Brush Coat, Minwax Co., N.Y., N.Y.
 - b. Tremco 121 Foundation Coating, Tremco Mfg. Co., Newark, N.J.
 - c. Or approved equal.

1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings and manufacturer's literature in conformance with MassDOT specifications.
- B. Precast Manhole Sections: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2- PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

- A. Dimensions, shall be as shown on the Drawings. The precast manufactures shall design and construction all structures to withstand H20 loading and the heights and bury depths of the structures. The manufacturer shall verify all concrete thicknesses and steel requirements needed.
 1. Base & Riser Sections:
 - a. Diameter: As shown on the Drawings.
 - b. Length: As required.
 - e. Wall Thickness: Not less than 5 inches.
 - d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
 2. Tops:
 - a. Diameter: Eccentric cone type, 24 inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
 - b. Length: 4 feet.
 - c. Base Section: 6-inch minimum thickness for floor slab.
 - d. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
 - e. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
 - f. Exterior face of cone sections shall not flare out beyond the vertical.
 3. Flat Slab Tops:
 - a. Location: Where shallow installations do not permit the use of a cone-type top and where indicated on the Drawings.
 - b. Slab thickness: Not less than 8 inches.
 - c. Constructed to support an HS-20 wheel loading.
- B. Openings:
 1. Provide openings in the risers to receive pipes entering the manhole.
 2. Make openings at the manufacturing plant.
 3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
 4. Location: To permit setting of the entering pipes at the correct elevations.
 5. Openings shall have a flexible watertight union between pipe and the manhole base.
 - a. Cast into the manhole base and sized to the type of pipe being used.

- b. Type of flexible joint being used shall be approved by the Engineer.
Install materials according to the Manufacturer's instructions.
 - 1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
 - 2. Kor N Seal made by National Pollution Control System. Inc.
 - 3. Press Wedge II made by Press-Seal Gasket Corporation.
 - 4. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
 - 5. Or equivalent.
- C. Joints:
 - 1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer. Acceptable Materials:
 - a. Kent-Seal No. 2
 - b. Ram-Nek
 - c. Or equivalent.
 - 2. Joints between precast sections shall conform to related standards and manufacturer's instructions.
 - 3. All manholes greater than 6 ft. diameter and all manholes used as wet wells, valve pits and other dry-pit type structures shall be installed with exterior joint collars. The joint collar shall be installed according to the manufacturer's instructions. Acceptable materials:
 - a. Mac Wrap exterior joint sealer as manufactured by Mar-Mac Manufacturing Company.
 - b. Or equivalent.
- D. Waterproofing:
 - 1. The exterior surface of all manholes shall be given two coats of bituminous waterproofing material at an application rate of 75 to 100 square feet per gallon, per coat.
 - 2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
 - 3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.
- E. Frost Protective Wrapping:
 - I. The frost protective wrap shall be constructed of an ultraviolet resistant polyethylene material and shall be a minimum thickness of 6 mils.

2.2 FRAMES AND COVERS

- A. Standard Units:
 - 1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
 - 2. Have machined bearing surfaces to prevent rocking.
 - 3. Castings shall be smooth with no sharp edges.
 - 4. Constructed to support an HS-20-wheel loading.
 - 5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:
 - a. Covers - solid with sewer in 3-inch letters diamond pattern, and concealed pick holes.
 - b. Frame - 24-inch diameter clear opening, with flange bracing ribs, unless otherwise shown on the drawings.
 - 6. Frames cast-in-place in concrete covers shall provide top flange, 24 inch diameter clear opening, frame height as required by slab thickness.

- a. Acceptable Units: LeBaron Type SF, Neenah R-1960-A or approved equal.
- 7. Minimum weight of frame and cover shall be 430 lbs.
- 8. Covers to be Marked "SEWER".

B. Water Tight Units:

- 1. Same features as above for Standard Units, with 24-inch diameter minimum clear opening.
- 2. Sealing features:
 - a. Inner lid held by a bronze tightening bolt in a locking bar.
 - b. Neoprene gasket
 - c. Water tight pick hole.
- 3. Minimum weight of frame and cover shall be 510 lbs.

2.3 MANHOLE STEPS

- A. Aluminum or polyethylene coated steel safety type desired with a minimum concentrated live load of 300 pounds.
- B. Thoroughly clean all surfaces to be embedded with a suitable cleaning agent to ensure that the surfaces are free from all foreign matter such as dirt, oil and grease.
- C. Aluminum surfaces to be embedded shall be given a protective coating of an approved heavy-bodied bituminous material. The steps shall become thoroughly dry before being placed into the concrete.
- D. All steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12-inches between steps.
- E. All steps shall be embedded a minimum of 3" into concrete.

2.4 MASONRY

- A. Brick:
 - 1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
 - 2. Immediately remove rejected brick from the work.
- B. Mortar:
 - 1. Composition (by volume):
 - a. 1 part portland cement.
 - b. 1/2 part hydrated lime.
 - c. 4-1/2 parts sand.
 - 2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.
- C. Cement shall be Type II portland cement.
- D. Hydrated lime shall be Type S
- E. Sand:
 - 1. Shall consist of inert natural sand.
 - 2. Grading:

<u>Sieve</u>	<u>Percent Passing</u>
#3/8	100
4	95-100
8	80-100

16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 -3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Precast Manhole Sections:
 - 1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
 - 2. Install riser sections and tops level and plumb.
 - 3. Make all joints watertight.
 - 4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Solidly fill annular spaces around pipes entering the manholes with non-shrink grout or sealant approved by the Engineer. Replace damaged manhole sections and tops at no additional cost to the Owner.
 - 5. When manhole steps are included in the Work, install barrel sections and tops so that steps are in alignment.
- B. Drop Manholes:
 - 1. The difference in elevation between the invert of the inlet pipe to the invert of the outlet pipe shall not exceed 24 inches without use of a drop structure.
 - 2. Where difference in elevation exceeds 24 inches, construct a drop manhole as shown on the Drawings or as directed by the Engineer.
- C. Adjust to Grade:
 - 1. Adjust tops of manholes to grade with brick masonry.
 - 2. Concrete rings are not acceptable for adjusting to grade.
- D. Pipe Connections to Manholes: Connect pipes to manholes with joint design and materials approved by the Engineer.
- E. Invert Channels:
 - 1. Smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
 - 2. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole
 - 3. Stop the pipes at the inside face of the manhole where changes of direction occur.
 - 4. Form invert channels with brick.
 - 5. Shape invert to make smooth transition in vertical grade.
 - 6. Slope the floor of the manhole to the flow channel, as shown on the Drawings.
- F. Masonry:
 - 1. Laying Brick:
 - a. Use only clean bricks in brickwork for manholes.
 - b. Moisten the brick by suitable means until they are neither so dry as to

- absorb water from the mortar nor so wet as to be slippery when laid.
 - c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
 - d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
 - e. Outside faces of brick masonry shall be plastered with mortar from 1/4-inch to 3/8-inch thick.
 - f. Completed brickwork shall be watertight.
- 2. Curing:
 - a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
 - b. Protect brick masonry from the weather and frost as required.
- G. Frames and Covers:
 - 1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
 - 2. Completely fill all voids beneath the bottom flange to make a watertight fit.
 - 3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
 - 4. Clean the frame seats before setting the covers in place.
- H. Plugging and Patching:
 - 1. Fill all exterior cavities with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
 - 2. Touch up damaged water proofing.
- I. Cleaning:
 - 1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.
- J. Bedding and Backfilling:
 - 1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
 - 2. Backfill a minimum of 18 inches all around manhole with gravel borrow.
- K. Frost Protective Wrap:
 - 1. The Contractor shall comply with the manufacturer's instructions for the particular conditions of installations in each case.
 - 2. Clean each manhole exterior of all dirt and remove any sharp protrusions.
 - 3. Apply two (2) 6-inch wide vertical strips of bituminous waterproofing material and/or duct tape from the top to bottom of the manhole per layer.
 - 4. Prior to installing pipe through each manhole, wrap each manhole to the maximum depth of frost penetration, but not less than 5 feet below grade, with four (4) layers of the polyethylene material by beginning the wrap at the adhesive strip and proceeding around the manhole, continuously by overlapping the adhesive strip by 24 inches on the final layer. Cut the polyethylene wrap in areas where piping exits the manhole. The size of the cut is to be equivalent to the pipe's outside diameter.
 - 5. Tuck and pleat the polyethylene wrap at the top of each manhole in a continuous manner,

- minimizing the size of each fold. Extend the polyethylene wrap past the top of the manhole frame and temporarily tuck the remainder inside the frame, until final backfill and paving.
6. In paved areas, cut the polyethylene wrap flush with the manhole rim after the pavement is in place.
 7. In unpaved areas, pull the polyethylene wrap together, and tie around frame with galvanized wire.
 8. Protect the installed frost barrier from harmful weather exposures and from possible physical abuses, where possible by prompt installation of concealing work or, where that is not possible, by temporary covering or enclosure.
 9. Backfill around the manhole/frost barrier with material as outlined in Section 02200 - Earthwork.

3.2 TESTING

A. Perform ALL Testing in accordance with the following Sections herein:

1. Section 33 40 00 Sewer Testing
2. Section 33 41 00 Town of Barnstable Required Conditions to Accept Operations

END OF SECTION
33 39 10

SECTION 33 40 00

SEWER TESTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Testing Gravity Sewer Piping:
 - a. Low-pressure Air Test.
 - b. Infiltration Test.
 - 2. Deflection Testing Plastic Piping.
 - 3. Sealing and Testing Precast Sanitary Sewer Manholes, Frames and Covers
- B. Related Sections:
 - 1. Section 33 31 13 - Sanitary Sewer Systems
 - 2. Section 33 39 10 - Precast Sanitary Sewer Manholes, Frames and Covers
 - 3. Section 33 41 00 – Town of Barnstable Required Conditions to Accept Operations
 - a. If any discrepancies in testing requirements exists, the Town of Barnstable Acceptance criteria shall be the required standard.
- C. The Contractor shall perform and be responsible for all elements and costs to properly perform all testing requirements for acceptance of the complete sewer system(s).
 - 1. The contractor shall coordinate and provide one week's advance notice to the Engineer and Town for all required testing.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
 - 2. ASTM D2122 - Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.3 SUBMITTALS

- A. Refer to MassDOT specifications.
- B. Submit the following prior to start of testing:
 - 1. Testing procedures.
 - 2. List of test equipment.
 - 3. Testing sequence schedule.
 - 4. Provisions for disposal of flushing and test water.
 - 5. Certification of test gauge calibration.
 - 6. Deflection mandrel drawings and calculations.
- C. Test Reports: Indicate results of manhole and piping tests.

PART 2 PRODUCTS

2.1 AIR TEST EQUIPMENT

- A. Air compressor.
- B. Air supply line.
- C. Shut-off valves.
- D. Pressure regulator.
- E. Pressure relief valve.
- F. Stop watch.
- G. Plugs.
- H. Pressure gauge, calibrated to 0.1 psi

2.2 INFILTRATION TEST EQUIPMENT

- A. Weirs.

2.3 DEFLECTION TEST EQUIPMENT

- A. Go, No-Go mandrels.
- B. Pull/retrieval ropes.

PART 3 EXECUTION

3.1 PIPING PREPARATION

- A. Lamping:
 - 1. Lamp gravity piping after flushing and cleaning.
 - 2. Perform lamping operation by shining light at one end of each pipe section between manholes; observe light at other end; reject pipe not installed with uniform line and grade; remove and reinstall rejected pipe sections; re-clean and lamp until pipe section achieves uniform line and grade.

3.2 PERFORMANCE

- A. General:
 - 1. All sewers and appurtenant work, in order to be eligible for acceptance by the Engineer, shall be subjected to tests that will determine the degree of water tightness and horizontal and vertical alignment.
 - 2. Thoroughly clean and/or flush all sewer lines to be tested, in a manner and to the

- 3. extent acceptable to the Engineer, prior to initiating test procedures.
- 4. Perform all tests and inspections in the presence of the Engineer and the plumbing or building inspector or other Town Official in accordance with the requirements of the local and state codes.
- 5. Perform testing by test patterns determined by or acceptable to the Engineer.
- 5. Remedial Work:
 - a. Perform all work necessary to correct deficiencies discovered as a result of testing and/or inspections.
 - b. Completely retest all portions of the original construction on which remedial work has been performed.
 - c. Perform all remedial work and retesting in a manner and at a time acceptable to the Engineer at no additional cost to the Owner.

B. Testing Gravity Sewer Piping:

See Section 33 41 00 Town of Barnstable Required Conditions to Accept Operations for additional information.

- 1. Low-pressure Air Test:
 - a. Test each section of gravity sewer piping.
 - b. Introduce air pressure slowly to approximately 4 psig.
 - 1) Determine ground water elevation above spring line of pipe for every foot of ground water above spring line of pipe, increase starting air test pressure by 0.43 psig; do not increase pressure above 10 psig.
 - c. Allow pressure to stabilize for at least five minutes. Adjust pressure to 3.5 psig or increased test pressure as determined above when ground water is present. Start test.
 - d. Test:
 - 1) Determine test duration for sewer section with single pipe size from the following table. Do not make allowance for laterals.

Nominal Pipe Size, Inches (mm)	Minimum Test Time, min/ 100 feet
3	0.2
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8

33	5.4
36	6.0

- 2) Record drop in pressure during test period; when air pressure has dropped more than 1.0 psig during test period, piping has failed; when 1.0 psig air pressure drop has not occurred during test period, discontinue test and piping is accepted.
- 3) When piping fails, determine source of air leakage, make corrections and retest; test section in incremental stages until leaks are isolated; after leaks are repaired, retest entire section between manholes.
2. Test pipe larger than 36 inches diameter with exfiltration test not exceeding 100 gallons for each inch of pipe diameter for each mile per day for each section under test. Perform test with minimum positive head of 2 feet.
3. Infiltration Test:
 - a. Use only when gravity piping is submerged in ground water minimum of 4 feet above crown of pipe for entire length being tested.
 - b. Maximum Allowable Infiltration: 100 gallons per inch of pipe diameter for each mile per day for section under test, include allowances for leakage from manholes. Perform test with minimum positive head of 2 feet.

C. Deflection Testing of Plastic Sewer Pipe:

See Section 33 41 00 Town of Barnstable Required Conditions to Acceptance of Proposed Gravity Sewer for additional information.

1. Perform vertical ring deflection testing on PVC and ABS sewer piping, after backfilling has been in place for at least 30 days but not longer than 12 months.
2. Allowable maximum deflection for installed plastic sewer pipe limited to 5 percent of original vertical internal diameter.
3. Perform deflection testing using properly sized rigid ball or 'Go, No-Go' mandrel.
4. Furnish rigid ball or mandrel with diameter not less than 95 percent of base or average inside diameter of pipe as determined by ASTM standard to which pipe is manufactured. Measure pipe in compliance with ASTM D2122.
5. Perform test without mechanical pulling devices.
6. Locate, excavate, replace and retest pipe exceeding allowable deflection.

D. Television inspection Tests (Gravity Sewers):

1. No standing water shall be allowed. The presence of standing water may be cause for rejection of that pipe.
2. Any standing water, detectable leaks, improper joints or any other unacceptable feature detected by the television inspection will be corrected by re-excavation and resetting pipe at no additional cost to the Owner.

END OF SECTION
33 40 00

SECTION 33 41 00

TOWN OF BARNSTABLE
REQUIRED CONDITIONS TO ACCEPTANCE OF PROPOSED GRAVITY SEWER AND FORCE
MAIN

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Work in this Section is part of what is required for the Town to accept ownership and operations of the proposed gravity sewer.
2. Work shall include the following: sewer pipe testing, Sealing and Testing Precast Sanitary Sewer Manholes, Frames and Covers.

B. General Definitions:

1. Gravity sewer and force main testing shall be generally defined as the performance testing and inspecting each and every length of sewer pipe, force main, and associated appurtenances (including manholes).

C. Submittals:

1. A minimum of ten working days prior to the Pre-Startup Meeting, Contractor shall provide a preliminary equipment start-up schedule and plan for the Certified Equipment Testing and the Operator Training for each piece of equipment to the Town for review. This preliminary plan will include a written outline description of the means and methods to be employed during the certified equipment test of each piece of equipment. The schedule and means and methods of testing will be discussed with the Town at the pre-startup meeting for acceptance.

D. Schedules:

PART 2 PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 GRAVITY SEWER AND FORCE MAIN TESTING

A. General:

1. All sewers, force mains, manholes, and appurtenant work, in order to be accepted by the Town, shall be subjected to tests that will determine the degree of water tightness and horizontal and vertical alignment.
2. Thoroughly clean and/or flush all sewer and force main lines to be tested, in a manner and to the extent acceptable to the Town, prior to initiating test procedures.
3. Perform all tests and inspections in the presence of the Town engineers and others as in accordance with the requirements of the local and state codes.

B. Line Acceptance Tests (Gravity sewers with no active service connections):

1. Test all gravity sewer lines with no active service connections for leakage by conducting a low pressure air test.
2. Equipment:
 - a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

- b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
- c. All air used shall pass through a single central panel.
- d. Connect 3 individual hoses:
 - (1) From the control panel to the pneumatic plugs for inflation,
 - (2) From the control panel to the sealed sewer line for introducing the low pressure air,
 - (3) From the sealed sewer line to the control panel for continually monitoring the air pressure rise in the sealed line.
- 3. Testing Pneumatic Plugs:
 - a. Seal test all pneumatic plugs prior to using them in the actual test.
 - b. Lay one length of pipe on the ground and seal both ends with the pneumatic plugs to be tested.
 - c. Pressurize the sealed pipe to 5 psig.
 - d. The pneumatic plugs are acceptable if they remain in place without bracing.
- 4. Testing Sewer Pipeline:
 - a. After the sewer pipe has been cleaned and the pneumatic plugs checked, place the plugs in the sewer line at each manhole and inflate them.
 - b. Introduce low pressure air into the sealed sewer pipeline until the air pressure reaches 4 psig greater than the average groundwater pressure.
 - c. Allow a minimum of 2 minutes for the air pressure to stabilize to a minimum of 3.5 psig greater than the groundwater pressure. Groundwater is assumed to be at ground surface unless the Contractor can prove otherwise by test pitting.
 - d. After the stabilization period, disconnect the air hose from the control panel to the air supply.
 - e. The pipeline will be acceptable if the pressure decrease is not greater than 1/2 psig in the time stated in the following table for the length of pipe being tested:

<u>Pipe Diameter (inches)</u>	<u>Time (Min.) for Length of Pipe</u>			
	<u>0-100 ft</u>	<u>101-200 ft</u>	<u>201-300 ft</u>	<u>301-400 ft</u>
4.....	2.0	2.0	2.0	2.0
6.....	3.0	3.0	3.0	3.0
8.....	4.0	4.0	4.0	5.0
10.....	5.0	5.0	6.0	8.0
12.....	5.5	5.5	8.5	11.5

- 6. Test Results:
 - a. If the installation fails the low pressure air test, determine the source of leakage.
 - b. Repair or replace all defective materials and/or workmanship and repeat low pressure air test at no additional cost to the Owner.
- C. Line Acceptance Tests (Gravity sewers with active services):
 - 1. Test all new gravity sewer lines with active services by conducting a low-pressure air test on all joints using a packer after all services have been connected or capped at the property line and all trenches backfilled but before the surface course of permanent pavement is installed.
 - 2. Equipment:
 - a. Closed-circuit television system.
 - b. Testing devices (packer):

- (1) Capable of isolating individual joints by creating a sealed void space around the joint being tested.
 - (2) Constructed such that low pressure air can be admitted into the void area.
 - (3) Shall contain a pressure gauge accurate to one tenth (0.1) psi in-line with the feed line to monitor the void pressure.
 - (4) Capable of performing in sewer lines where flows do not exceed 1/4 of the pipe diameter without resorting to any method of flow control.
3. Testing Sewer Pipeline Joints:
 - a. Test all joints except those with visible infiltration.
 - b. Procedure:
 - (1) Pull television camera through sewer line in front of the packer.
 - (2) Position the packer on each joint to be tested.
 - (3) Inflate the sleeves on each end of the packer.
 - (4) Apply four (4.0) psi pressure above the existing hydrostatic pressure on the outside of the joint to the void area created around the inside perimeter of the joint.
 - (5) Shut off the supply of air once the pressure has stabilized at the required amount.
 - (6) Monitor the void pressure for thirty (30) seconds.
 - (7) Repair the joint if the pressure drops more than one half (1/2) psi in the thirty (30) seconds.
 - c. Water pressure testing may be used in lieu of air testing subject to review and approval by the Town.
 - d. Re-clean and re-inspect all lines not approved by the Town at no additional cost to the Owner.
 - e. Repairing of Joints:
 1. When a joint fails the pressure test, excavate and repair the failed joint. Repairing joints with chemical grout will not be permitted.
 - f. The Engineer may request checking of the testing equipment for accuracy.
 1. Perform standard air test on a clean continuous section of pipe.
 2. Repair the equipment if the void pressure drops.
 - g. Testing Operation Inspection:
 1. Reset each joint, as specified herein, prior to acceptance and final payment for joint testing. Retest all joints that fail until the test requirements are met.
 - h. The contractor will supply a black and white photograph of every joint that fails the pressure test.
- D. Alignment Tests (Gravity Sewers):
 1. Perform tests for the correctness of horizontal and vertical alignment on each and every length of gravity sewer pipeline between manholes.
 2. Alignment tests to be conducted after all pipe has been installed and backfilled.
 3. The observation test shall be conducted after all upstream work has been completed and the pipeline cleaned of debris.
 4. Notify the Town at least 72 hours in advance of the proposed observation testing.
 5. Introduce water into the sewer lines to be tested from the upstream manhole prior to the observation test but no more than 24 hours in advance of the test.
 6. Beam a source of light, acceptable to the Town, through the pipeline from both ends and the Town will directly observe the light in the downstream, and/or upstream manhole of each test section.
 7. The length of pipe between manholes, diameter of pipe and amount of light observed in the manhole at the end of each pipe section will determine acceptance of the

- alignment test by the Town.
8. The amount of vertical and horizontal deflection shall not be greater than the ASTM allowance and (manufacturer's recommendations) for the pipe being tested.
 9. No standing water shall be allowed. The presence of standing water shall be cause for rejection of that pipe (including manhole) section.
 10. Improper alignment will be corrected by re-excavation and resetting of pipe at no additional cost to the Owner.
- E. Pipe Deflection: (Gravity Sewers)
1. Pipe provided under this specification shall be installed so there is no more than a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (normal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
 2. The Contractor shall wait a minimum of 30 days after completion of a section of sewer, including placement and compaction of backfill, before measuring the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer and be acceptable to the Town.
 3. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the Town may require without additional compensation.
- F. Television Inspection Tests (Gravity Sewers)
1. Where television inspection testing is required, test procedures shall be in compliance with the requirements.
 2. No standing water shall be allowed. The presence of standing water may be cause for rejection of that pipe.
 3. Any standing water, detectable leaks, improper joints or any other unacceptable feature detected by the television inspection will be corrected by re-excavation and resetting pipe at no additional cost to the Owner.
- G. Inspection of Appurtenant Installations:
1. Completely inspect, at a time determined by the Town, all manholes and inlets to ascertain their compliance with the Drawings and Specifications.
 2. Provide access to each manhole and inlet and check the following characteristics:
 - a. Shape and finish of invert channels,
 - b. Water tightness and finish of masonry structures,
 - c. Location, type, and attachment of stops,
 - d. Elevation and attachment of frames, covers, and openings,
 - e. Pattern and machining of covers, and
 - f. Drop connection arrangements.
- H. Testing Pressure Sewers:
1. The section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blowoffs are not available at high points for releasing air, the Contractor shall make the necessary excavations backfilling and taps at such points and shall plug said holes after completion of the test.
 2. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
 3. Perform pressure and leakage test at 1-½ times the maximum system pressure or 100 psi whichever is greater (based on the elevation of the lowest point of the section under test and corrected to the gage location).
 4. The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation.

5. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline the section shall be considered as having failed the test. All joints within chambers and all flanged joints shall have no visible leakage.
 6. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- I. Manhole Leakage Testing:
1. Perform a vacuum test on all manholes.
 2. All testing must be performed in the presence of a Town engineer.
 3. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.
 4. The manhole shall be tested by a vacuum test after assembly of the manhole, connection piping and backfilling. Vacuum testing to be conducted prior to construction of invert channels.
 5. Plug all lifting holes completely with non-shrink grout.
 6. Properly tighten all boot clamps and brace all plugs to prevent them from being sucked into the manhole.
 7. Install the testing equipment according to the manufacturer's instructions.
 8. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is:
 - a. Not less than 2 minutes for manholes less than 10-feet deep.
 - b. Not less than 2.5 minutes for manholes 10 to 15-feet deep.
 - c. Not less than 3 minutes for manholes more than 15-feet deep.
 9. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.
 10. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

DOCUMENT B00420

PROPOSAL

BARNSTABLE

For: **Intersection Improvements and Related Work (Including Signals) at Iyannough Road (Route 28) and Yarmouth Road**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the Town of Barnstable in Barnstable County, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

Iyannough Road (Route 28)**Beginning: Station 101+20.10****Ending: Station 119+60.00****Yarmouth Road****Beginning: Station 300+00.00****Ending: Station 214+45.00**

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 **1043 CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the completion date falls between December 1 and March 15 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.

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Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
100.	1	SCHEDULE OF OPERATIONS - FIXED PRICE \$90000 AT Ninety Thousand Dollars LUMP SUM	\$90,000.00	\$90,000.00
101.	0.1	CLEARING AND GRUBBING AT _____ PER ACRE		
102.1	110	TREE TRIMMING AT _____ PER FOOT		
103.	8	TREE REMOVED - DIAMETER UNDER 24 INCHES AT _____ EACH		
104.	2	TREE REMOVED - DIAMETER 24 INCHES AND OVER AT _____ EACH		
112.1	1	DEMOLITION OF BUILDING NO. 1 AT _____ LUMP SUM		
119.	1	RODENT CONTROL AT _____ LUMP SUM		
120.1	17,800	UNCLASSIFIED EXCAVATION AT _____ PER CUBIC YARD		
129.5	150	TRACK EXCAVATION AT _____ PER FOOT		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
141.1	30	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
142.	7,310	CLASS B TRENCH EXCAVATION AT _____ PER CUBIC YARD		
144.	50	CLASS B ROCK EXCAVATION AT _____ PER CUBIC YARD		
146.	27	DRAINAGE STRUCTURE REMOVED AT _____ EACH		
150.1	130	SPECIAL BORROW AT _____ PER CUBIC YARD		
151.	7,240	GRAVEL BORROW AT _____ PER CUBIC YARD		
151.2	640	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES AT _____ PER CUBIC YARD		
153.	20	CONTROLLED DENSITY FILL - EXCAVATABLE AT _____ PER CUBIC YARD		
154.	90	SAND BORROW AT _____ PER CUBIC YARD		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
156.	203	CRUSHED STONE AT _____ PER TON		
170.	27,270	FINE GRADING AND COMPACTING - SUBGRADE AREA AT _____ PER SQUARE YARD		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		
180.02	40	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	40	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		
181.11	10	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	10	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	10	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		
181.14	10	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
182.1	1	INSPECTION AND TESTING FOR ASBESTOS AT _____ LUMP SUM		
182.2	100	REMOVAL OF ASBESTOS AT _____ PER FOOT		
182.3	1	ASBESTOS ABATEMENT FOR BUILDING DEMOLITION AT _____ LUMP SUM		
184.1	1	DISPOSAL OF TREATED WOOD PRODUCTS AT _____ PER TON		
186.1	7,860	DISPOSAL OF RECLAIMABLE - RECYCLABLE WASTE LIQUID AT _____ PER GALLON		
201.	62	CATCH BASIN AT _____ EACH		
202.	16	MANHOLE AT _____ EACH		
202.1	14	MANHOLE - 5 FOOT DIAMETER AT _____ EACH		
202.2	4	MANHOLE (9 TO 14 FOOT DEPTH) AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
204.	2	GUTTER INLET AT _____ EACH		
205.01	3	LEACHING BASIN - PRECAST STRUCTURE AT _____ EACH		
205.1	2	LEACHING BASIN - 8 FOOT DIAMETER AT _____ EACH		
210.02	1	SANITARY SEWER MANHOLE REMOVED AT _____ EACH		
210.1	1	SANITARY SEWER MANHOLE MUNICIPAL STANDARD AT _____ EACH		
210.2	5	SANITARY SEWER MANHOLE (9 TO 14 FOOT DEPTH) AT _____ EACH		
210.3	1	SANITARY SEWER MANHOLE (14 TO 18 FOOT DEPTH) AT _____ EACH		
211.	1	SPECIAL SANITARY SEWER MANHOLE AT _____ EACH		
211.1	1	SANITARY SEWER FORCEMAIN CLEANOUT MANHOLE AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
211.2	1	SANITARY SEWER FORCEMAIN AIR RELEASE STRUCTURE AT _____ EACH		
220.	64	DRAINAGE STRUCTURE ADJUSTED AT _____ EACH		
220.3	3	DRAINAGE STRUCTURE CHANGE IN TYPE AT _____ EACH		
220.6	10	SANITARY STRUCTURE REBUILT AT _____ PER FOOT		
220.7	3	SANITARY STRUCTURE ADJUSTED AT _____ EACH		
221.	31	FRAME AND COVER AT _____ EACH		
222.1	40	FRAME AND GRATE - MASSDOT CASCADE TYPE AT _____ EACH		
222.3	30	FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD AT _____ EACH		
223.2	32	FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
224.12	2	12 INCH HOOD AT _____ EACH		
227.3	84	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT AT _____ PER CUBIC YARD		
227.31	147	REMOVAL OF DRAINAGE PIPE SEDIMENT AT _____ PER FOOT		
227.4	2	MASONRY PLUG AT _____ PER SQUARE FOOT		
238.10	66	10 INCH DUCTILE IRON PIPE AT _____ PER FOOT		
241.12	1,400	12 INCH REINFORCED CONCRETE PIPE AT _____ PER FOOT		
241.15	240	15 INCH REINFORCED CONCRETE PIPE AT _____ PER FOOT		
241.18	120	18 INCH REINFORCED CONCRETE PIPE AT _____ PER FOOT		
241.24	580	24 INCH REINFORCED CONCRETE PIPE AT _____ PER FOOT		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
241.36	680	36 INCH REINFORCED CONCRETE PIPE AT _____ PER FOOT		
242.15	1	15 INCH REINFORCED CONCRETE PIPE FLARED END AT _____ EACH		
242.36	1	36 INCH REINFORCED CONCRETE PIPE FLARED END AT _____ EACH		
244.12	360	12 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
244.15	32	15 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
244.24	4	24 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
244.30	26	30 INCH REINFORCED CONCRETE PIPE CLASS V AT _____ PER FOOT		
250.06	280	6 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE AT _____ PER FOOT		
250.08	850	8 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE AT _____ PER FOOT		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
251.04	1,180	4 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE - FORCEMAIN AT _____ PER FOOT		
251.06	1,180	6 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE - FORCEMAIN AT _____ PER FOOT		
271.121	463	12 INCH AND UNDER PIPE REMOVED AND DISCARDED AT _____ PER FOOT		
271.241	1,110	24 INCH PIPE REMOVED AND DISCARDED AT _____ PER FOOT		
303.06	10	6 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) AT _____ PER FOOT		
303.08	1,440	8 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) AT _____ PER FOOT		
303.12	510	12 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) AT _____ PER FOOT		
309.	7,520	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ PER POUND		
315.02	40	2 INCH WATER MAIN REMOVED AND STACKED AT _____ PER FOOT		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
315.06	170	6 INCH WATER MAIN REMOVED AND STACKED AT _____ PER FOOT		
315.08	20	8 INCH WATER MAIN REMOVED AND STACKED AT _____ PER FOOT		
315.16	130	16 INCH WATER MAIN REMOVED AND STACKED AT _____ PER FOOT		
336.1	366	1 INCH PLASTIC WATER PIPE AT _____ PER FOOT		
336.20	468	2 INCH PLASTIC WATER PIPE AT _____ PER FOOT		
345.1	10	1 INCH TEMPORARY SERVICE PIPE AT _____ PER FOOT		
350.06	6	6 INCH GATE AND GATE BOX AT _____ EACH		
350.08	2	8 INCH GATE AND GATE BOX AT _____ EACH		
350.12	2	12 INCH GATE AND GATE BOX AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
355.06	2	6 INCH GATE AND GATE BOX REMOVED AND STACKED AT _____ EACH		
355.08	2	8 INCH GATE AND GATE BOX REMOVED AND STACKED AT _____ EACH		
357.06	2	6 INCH GATE BOX AT _____ EACH		
357.08	2	8 INCH GATE BOX AT _____ EACH		
357.12	2	12 INCH GATE BOX AT _____ EACH		
357.16	2	16 INCH GATE BOX AT _____ EACH		
358.	7	GATE BOX ADJUSTED AT _____ EACH		
358.1	6	GATE BOX REMOVED AND STACKED AT _____ EACH		
363.1	2	1 INCH CORPORATION COCK AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
363.2	1	2 INCH CORPORATION COCK AT _____ EACH		
367.0151	3	1.5 INCH CAST IRON PLUG AT _____ EACH		
367.021	6	2 INCH CAST IRON PLUG AT _____ EACH		
367.06	8	6 INCH CAST IRON PLUG AT _____ EACH		
367.08	6	8 INCH CAST IRON PLUG AT _____ EACH		
370.5	1	12 X 8 INCH TAPPING SLEEVE, VALVE AND BOX AT _____ EACH		
370.71	1	16X8 INCH TAPPING SLEEVE, VALVE AND BOX AT _____ EACH		
371.06	2	6 INCH COUPLING AT _____ EACH		
371.08	3	8 INCH COUPLING AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
371.12	6	12 INCH COUPLING AT _____ EACH		
374.08	29	8 INCH POLYETHYLENE CASING FOR WATER PIPE AT _____ PER FOOT		
374.12	147	12 INCH POLYETHYLENE CASING FOR WATER PIPE AT _____ PER FOOT		
376.1	1	HYDRANT - EXCLUDING COST OF HYDRANT AT _____ EACH		
376.2	3	HYDRANT - REMOVED AND RESET AT _____ EACH		
376.3	1	HYDRANT - REMOVED AND STACKED AT _____ EACH		
381.	8	SERVICE BOX AT _____ EACH		
381.1	5	SERVICE BOX REMOVED AND RESET AT _____ EACH		
381.2	3	SERVICE BOX REMOVED AND STACKED AT _____ EACH		

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ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
384.	9	CURB STOP AT _____ EACH		
384.1	2	CURB STOP REMOVED AND RESET AT _____ EACH		
402.	1,850	DENSE GRADED CRUSHED STONE FOR SUB-BASE AT _____ PER CUBIC YARD		
415.3	10,190	PAVEMENT MICRO MILLING AT _____ PER SQUARE YARD		
431.	50	HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE AT _____ PER SQUARE YARD		
440.	13,330	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL AT _____ PER POUND		
443.	80	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
450.22	2,630	SUPERPAVE SURFACE COURSE – 9.5 (SSC – 9.5) AT _____ PER TON		
450.32	2,325	SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) AT _____ PER TON		

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Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
450.42	4,180	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) AT _____ PER TON		
450.52	13	SUPERPAVE LEVELING COURSE - 9.5 (SLC - 9.5) AT _____ PER TON		
451.	300	HMA FOR PATCHING AT _____ PER TON		
452.	3,120	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON		
453.	16,400	HMA JOINT SEALANT AT _____ PER FOOT		
470.	1	HOT MIX ASPHALT BERM AT _____ PER TON		
470.21	110	HOT MIX ASPHALT BERM, TYPE A - MODIFIED AT _____ PER FOOT		
472.	790	TEMPORARY ASPHALT PATCHING AT _____ PER TON		
476.11	1,090	CEMENT CONCRETE PAVEMENT -STAMPED AND COLORED AT _____ PER SQUARE YARD		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
482.5	1,370	SAWCUTTING ASPHALT PAVEMENT FOR BOX WIDENING AT _____ PER FOOT		
506.	4,950	GRANITE CURB TYPE VB - STRAIGHT AT _____ PER FOOT		
506.1	775	GRANITE CURB TYPE VB - CURVED AT _____ PER FOOT		
509.	470	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT AT _____ PER FOOT		
509.1	270	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - CURVED AT _____ PER FOOT		
511.2	140	GRANITE EDGING TYPE SB - FOREBAY AT _____ PER SQUARE FOOT		
514.	40	GRANITE CURB INLET - STRAIGHT AT _____ EACH		
515.	7	GRANITE CURB INLET - CURVED AT _____ EACH		
570.3	120	HOT MIX ASPHALT CURB TYPE 3 AT _____ PER FOOT		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
580.	880	CURB REMOVED AND RESET AT _____ PER FOOT		
581.	6	CURB INLET REMOVED AND RESET AT _____ EACH		
594.	720	CURB REMOVED AND DISCARDED AT _____ PER FOOT		
595.	1	CURB INLET REMOVED AND DISCARDED AT _____ EACH		
597.	620	EDGING REMOVED AND DISCARDED AT _____ PER FOOT		
645.172	933	72 INCH CHAIN LINK FENCE (PIPE TOP RAIL) VINYL COATED (LINE POST OPTION) AT _____ PER FOOT		
650.072	20	72 INCH CHAIN LINK GATE WITH GATE POSTS AT _____ PER FOOT		
651.072	20	72 INCH CHAIN LINK GATE WITH GATE POSTS AND BARBED WIRE AT _____ PER FOOT		
653.072	5	72 INCH CHAIN LINK FENCE CORNER OR INTERMEDIATE BRACE POST AT _____ EACH		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
666.	150	CHAIN LINK FENCE REMOVED AND RESET AT _____ PER FOOT		
669.	150	FENCE REMOVED AND STACKED AT _____ PER FOOT		
669.1	320	FENCE REMOVED AND DISPOSED AT _____ PER FOOT		
697.1	58	SILT SACK AT _____ EACH		
698.3	110	GEOTEXTILE FABRIC FOR SEPARATION AT _____ PER SQUARE YARD		
701.	10	CEMENT CONCRETE SIDEWALK AT _____ PER SQUARE YARD		
701.2	420	CEMENT CONCRETE PEDESTRIAN CURB RAMP AT _____ PER SQUARE YARD		
701.21	1	CEMENT CONCRETE SPECIAL PEDESTRIAN CURB RAMP AT _____ LUMP SUM		
702.	1,300	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY AT _____ PER TON		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
703.1	6	CONCRETE WHEEL STOP AT _____ EACH		
707.8	27	STEEL BOLLARD AT _____ EACH		
707.81	1	STEEL BOLLARD REMOVED AND RESET AT _____ EACH		
708.1	1	RECONSTRUCT PLANTER AT _____ LUMP SUM		
710.3	5	BOUND - LETTERED GRANITE AT _____ EACH		
710.4	33	BOUND - PLAIN GRANITE AT _____ EACH		
714.	1	MONUMENT REMOVED AND RESET AT _____ EACH		
715.	2	RURAL MAIL BOX REMOVED AND RESET AT _____ EACH		
718.12	1	FLAGPOLE REMOVED AND DISCARDED AT _____ LUMP SUM		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
734.52	2	SIGN POST REMOVED AND STACKED AT _____ EACH		
740.	35	ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	1,000	LOAM BORROW AT _____ PER CUBIC YARD		
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN AT _____ LUMP SUM		
765.	7,020	SEEDING AT _____ PER SQUARE YARD		
765.457	1,960	SEEDING - INFILTRATION BASIN MIX AT _____ PER SQUARE YARD		
767.121	490	SEDIMENT CONTROL BARRIER AT _____ PER FOOT		
767.21	6	AGED PINE BARK MULCH AT _____ PER SQUARE YARD		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
767.31	1,960	STRAW MULCH AT _____ PER SQUARE YARD		
783.044	13	SERVICEBERRY - SHADBLOW 5-6 FEET AT _____ EACH		
801.32	1,200	3 INCH ELECTRICAL CONDUIT - TYPE NM (DOUBLE) AT _____ PER FOOT		
801.42	710	4 INCH ELECTRICAL CONDUIT - TYPE NM (DOUBLE) AT _____ PER FOOT		
801.44	630	4 INCH ELECTRICAL CONDUIT - TYPE NM (4 BANK) AT _____ PER FOOT		
801.62	80	6 INCH ELECTRICAL CONDUIT - TYPE NM (DOUBLE) AT _____ PER FOOT		
801.64	1,400	6 INCH ELECTRICAL CONDUIT - TYPE NM (4 BANK) AT _____ PER FOOT		
801.69	1,890	6 INCH ELECTRICAL CONDUIT - TYPE NM (9 BANK) AT _____ PER FOOT		
802.42	3,450	4 INCH CATV CONDUIT - TYPE NM (DOUBLE) AT _____ PER FOOT		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
803.42	130	4 INCH TELEPHONE CONDUIT - TYPE NM (DOUBLE) AT _____ PER FOOT		
803.43	80	4 INCH TELEPHONE CONDUIT - TYPE NM (3 BANK) AT _____ PER FOOT		
803.44	1,500	4 INCH TELEPHONE CONDUIT - TYPE NM (4 BANK) AT _____ PER FOOT		
803.46	880	4 INCH TELEPHONE CONDUIT - TYPE NM (6 BANK) AT _____ PER FOOT		
804.2	3,210	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) AT _____ PER FOOT		
804.3	3,830	3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) AT _____ PER FOOT		
804.4	120	4 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) AT _____ PER FOOT		
805.402	180	4 INCH CATV CONDUIT TYPE NM - PLASTIC -(UL) AT _____ PER FOOT		
805.403	680	4 INCH TELEPHONE CONDUIT TYPE NM - PLASTIC -(UL) AT _____ PER FOOT		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
806.6	60	6 INCH ELECTRICAL CONDUIT TYPE RM - GALVANIZED STEEL AT _____ PER FOOT		
807.181	1	WORK INSIDE 18 INCH STEEL PIPE CASING FOR TELEPHONE & CATV AT _____ LUMP SUM		
807.361	1	WORK INSIDE 36 INCH STEEL PIPE CASING FOR ELECTRIC AT _____ LUMP SUM		
811.121	11	ELECTRIC MANHOLE AT _____ EACH		
811.122	7	TELEPHONE MANHOLE AT _____ EACH		
811.123	4	ELECTRIC SWITCHING ENCLOSURE AT _____ EACH		
811.201	4	ELECTRIC HANDHOLE AT _____ EACH		
811.202	10	CATV HANDHOLE AT _____ EACH		
811.203	1	TELEPHONE HANDHOLE AT _____ EACH		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
811.22	60	ELECTRIC HANDHOLE - SD2.022 AT _____ EACH		
811.31	12	PULL BOX 12 X 12 INCHES - SD2.031 AT _____ EACH		
812.10	4	LIGHT STANDARD FOUNDATION SD3.010 AT _____ EACH		
812.13	31	LIGHT STANDARD FOUNDATION SD3.013 AT _____ EACH		
812.20	3	LIGHTING LOAD CENTER FOUNDATION AT _____ EACH		
812.21	2	1 PHASE TRANSFORMER FOUNDATION AT _____ EACH		
812.23	2	3 PHASE TRANSFORMER FOUNDATION AT _____ EACH		
813.40	2,460	WIRE TYPE 8 NO. 10 DIRECT BURIAL AT _____ PER FOOT		
813.42	13,170	WIRE TYPE 8 NO. 6 DIRECT BURIAL AT _____ PER FOOT		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
813.46	60	WIRE TYPE 8 NO. 1/0 DIRECT BURIAL AT _____ PER FOOT		
813.52	4,610	WIRE TYPE 10 - #8 GROUNDING AND BONDING AT _____ PER FOOT		
813.72	99	GROUND ROD 10 FEET LONG AT _____ EACH		
816.01	1	TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO. 1 AT _____ LUMP SUM		
816.80	1	TRAFFIC CONTROL SIGNAL REMOVED AND STACKED AT _____ LUMP SUM		
816.81	1	TEMPORARY TRAFFIC CONTROL SIGNAL AT _____ LUMP SUM		
821.111	4	HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET (18 FOOT POLE) AT _____ EACH		
821.112	7	HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET (25 FOOT POLE) AT _____ EACH		
821.113	15	HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET (30 FOOT POLE) AT _____ EACH		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
821.114	6	HIGHWAY LIGHTING POLE (ANCHOR BASE) 6 FOOT BRACKET (25 FOOT POLE - DECORATIVE) AT _____ EACH		
821.21	3	HIGHWAY LIGHTING POLE (ANCHOR BASE) TWIN 6 FOOT BRACKET AT _____ EACH		
823.01	5	HIGHWAY LIGHTING LUMINAIRE - LED - 7,633 INITIAL LUMENS, TYPE III AT _____ EACH		
823.02	27	HIGHWAY LIGHTING LUMINAIRE - LED - 16,903 INITIAL LUMENS, TYPE IV AT _____ EACH		
823.03	6	HIGHWAY LIGHTING LUMINAIRE - LED - 9,994 INITIAL LUMENS, TYPE III AT _____ EACH		
823.61	1	HIGHWAY LIGHTING LOAD CENTER NO.1 AT _____ LUMP SUM		
823.62	1	HIGHWAY LIGHTING LOAD CENTER NO.2 AT _____ LUMP SUM		
823.63	1	HIGHWAY LIGHTING LOAD CENTER NO. 3 AT _____ LUMP SUM		
824.221	1	RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOCATION NO. 1 AT _____ LUMP SUM		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
824.62	3	INTERNALLY ILLUMINATED BLANK OUT SIGN AT _____ EACH		
826.70	8	ELECTRIC SERVICE RISER RELOCATION AT _____ EACH		
826.71	13	ELECTRIC SERVICE RELOCATION AT _____ EACH		
829.	110	ROADSIDE GUIDE SIGN (G) - ALUMINUM PANEL (TYPE B) AT _____ PER SQUARE FOOT		
832.	370	WARNING-REGULATORY AND ROUTE MARKER - ALUM. PANEL (TYPE A) AT _____ PER SQUARE FOOT		
841.7	6	SUPPORTS FOR GUIDE SIGN (D6 WITH D8 - SPECIAL DESIGN) STEEL AT _____ EACH		
847.1	56	SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL AT _____ EACH		
848.1	3	SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL AT _____ EACH		
850.41	170	ROADWAY FLAGGER AT _____ PER HOUR		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
851.1	590	TRAFFIC CONES FOR TRAFFIC MANAGEMENT AT _____ PER DAY		
852.	1,800	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
852.11	1,640	TEMPORARY PEDESTRIAN BARRICADE AT _____ PER FOOT		
852.12	2	TEMPORARY PEDESTRIAN CURB RAMP AT _____ EACH		
853.1	16	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		
853.21	4,140	TEMPORARY BARRIER REMOVED AND RESET AT _____ PER FOOT		
853.32	2,070	TEMPORARY BARRIER - LIMITED DEFLECTION (TL-2) AT _____ PER FOOT		
853.421	11	TEMPORARY IMPACT ATTENUATOR FOR SHOULDER, CAPABLE OF REDIRECTION, REMOVED AND RESET AT _____ EACH		
853.62	4	TEMPORARY IMPACT ATTENUATOR UNIDIRECTIONAL, REDIRECTIVE (TL-2) AT _____ EACH		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
853.8	526	TEMPORARY ILLUMINATION FOR WORK ZONE AT _____ PER DAY		
854.016	95,400	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) AT _____ PER FOOT		
854.036	4,800	TEMPORARY PAVING MARKINGS - 6 INCH (TAPE) AT _____ PER FOOT		
854.1	8,210	PAVEMENT MARKING REMOVAL AT _____ PER SQUARE FOOT		
854.5	110	RAISED PAVEMENT MARKER REMOVAL AT _____ EACH		
856.	370	ARROW BOARD AT _____ PER DAY		
856.12	190	PORTABLE CHANGEABLE MESSAGE SIGN AT _____ PER DAY		
859.	132,000	REFLECTORIZED DRUM AT _____ PER DAY		
859.1	2,220	REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS AT _____ PER DAY		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
860.106	89,100	6 INCH REFLECTORIZED WHITE LINE (PAINTED) AT _____ PER FOOT		
861.106	67,900	6 INCH REFLECTORIZED YELLOW LINE (PAINTED) AT _____ PER FOOT		
864.02	540	PAVEMENT ARROW AND LEGENDS - TAPE AT _____ PER SQUARE FOOT		
864.04	1,210	PAVEMENT ARROWS AND LEGENDS REFL. WHITE (THERMOPLASTIC) AT _____ PER SQUARE FOOT		
864.061	510	6 INCH REFLECTORIZED WHITE LINE (PREFORMED THERMOPLASTIC) AT _____ PER FOOT		
864.062	170	6 INCH REFLECTORIZED YELLOW LINE (PREFORMED THERMOPLASTIC) AT _____ PER FOOT		
864.31	5	SLOTTED PAVEMENT MARKER ONE-WAY WHITE AT _____ EACH		
864.32	32	SLOTTED PAVEMENT MARKER ONE-WAY YELLOW AT _____ EACH		
864.35	94	SLOTTED PAVEMENT MARKER TWO-WAY YELLOW/YELLOW AT _____ EACH		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
866.104	180	4 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
866.106	10,580	6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
866.112	3,460	12 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.104	200	4 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.106	9,730	6 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.112	350	12 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
874.	8	STREET NAME SIGN AT _____ EACH		
874.4	38	TRAFFIC SIGN REMOVED AND STACKED AT _____ EACH		
877.1	22	SIGN POST REMOVED AND DISCARDED AT _____ EACH		

Project # 606272		Contract # 114724		
Location : BARNSTABLE				
Description : Intersection Improvements and Related Work (Including Signals) at Iyannough (Route 28) and Yarmouth Roads (Re-Advertised Project)				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
903.	30	3000 PSI, 1.5 IN., 470 CEMENT CONCRETE AT _____ PER CUBIC YARD		
904.01	1	CONCRETE OUTLET CONTROL STRUCTURE AT _____ EACH		
971.01	170	ASPHALTIC PLUG JOINT AT _____ PER CUBIC FOOT		
986.	63	MODIFIED ROCKFILL AT _____ PER TON		
Total Qty: 652,051.1				

DOCUMENT B00853

SCHEDULE OF PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES (DBES)

PRIME BIDDER: _____

DATE OF BID OPENING: _____ PROJECT NO: 606272FEDERAL AID PROJECT NO: CMQ-0035(043), HSI-0035(043), NFP(N/I)-0035(043),
STP-0035(043) & TAP-0035(043)PROJECT LOCATION: BARNSTABLE

Name, Address, and Phone Number(s) of DBE	Name of Activity	(a) [†] DBE Contractor Activity Amount <i>Construction Work</i>	(b) DBE Other Business Amount <i>Services, Supplies, Material</i>	(c) Total amount eligible for credit under rules in Section 6 of Document 00719 - DBE Special Provisions
Total Bid Amount	TOTALS:	\$	\$	\$
\$	DBE Percentage of Total Bid:	%	%	%

[†]Column (a) must be at least one-half of the DBE participation goal. Attach additional sheets as necessary.Is MassDOT Document B00855 (Joint Check Approval) being submitted for any of the above? ☐ Yes ☐ No☐ Not Known at This TimeWill any of the contractors listed above be using a third party (i.e. manufacturer) to deliver materials or perform any portion of work by a third party? ☐ Yes ☐ No

CERTIFICATION: I HEREBY DECLARE, TO THE BEST OF MY KNOWLEDGE, THAT **I HAVE READ THE SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES - DOCUMENT 00719.** BOTH THIS SCHEDULE AND THE RELEVANT AND ACCOMPANYING LETTER(S) OF INTENT ARE IN FULL COMPLIANCE WITH THE PROVISIONS OF, AND IN ACCORDANCE WITH, TITLE 49 CODE OF FEDERAL REGULATIONS, PART 26 (49 CFR Part 26).

SIGNATURE: _____ DATE: _____

NAME AND TITLE (PRINT): _____

EMAIL ADDRESS: _____ TEL NO: _____

*** END OF DOCUMENT ***

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DOCUMENT B00854

DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT

(To be completed by the DBE – Page 1 of 2)

TO: _____ (Prime Bidder)

FROM: _____ (DBE Firm)

RE: PROJECT NO: 606272 FEDERAL AID PROJECT NO: CMQ-0035(043), HIS 0035(043),PROJECT LOCATION: BARNSTABLE NFP(N/I)-0035(043), STP-
0035(043) & TAP-0035(043)

DATE OF BID OPENING: _____

I, _____, *Print Name* authorized signatory of the above-referenced DBE firm hereby declare:

1. My company is currently certified as a Disadvantaged Business Enterprise (DBE) by the Massachusetts Supplier Diversity Office (“SDO”), formerly known as the State Office of Minority and Women Business Assistance (SOMWBA), as a: (check all applicable, see Section 1 of the Special Provisions For Participation By Disadvantaged Business Enterprises, MassDOT Document 00719 additional guidance is available at Title 49, Code of Federal Regulations, Part 26.55 (49 CFR Part 26.55)):
☐ CONTRACTOR ☐ REGULAR DEALER ☐ BROKER
☐ MANUFACTURER ☐ TRUCKING OPERATIONS ☐ PROFESSIONAL SERVICES
2. My firm has the ability to manage, supervise and perform the activity described on page 2 of this Letter of Intent. If you are awarded the contract, my company intends to enter into a contract with your firm to perform the items of work or other activity described on the following sheet for the prices indicated.
3. There have been no changes affecting the ownership, control or independence of my company since my last certification review on _____, 20____. If any such change is planned or occurs prior to my company's completion of this proposed work, I will give prior written notification to your firm and to the Massachusetts Department of Transportation (“MassDOT”) Office of Civil Rights and SDO.
4. I have read the MassDOT proposal for the Project which may be entitled “Project Contract Documents and Special Provisions” or the draft “Contract” which includes MassDOT Document 00719, and acknowledge that my company will comply with that document and the requirements of 49 CFR Part 26.
5. For the purpose of obtaining subcontractor approval from MassDOT, my firm will provide to you:
 - A. **The following construction work:**
 - (i) a resume, stating the qualifications and experience, of the superintendent or foreperson who will supervise on site-work;
 - (ii) a list of equipment owned or leased by my firm for use on this project; and
 - (iii) a list of all projects (public or private) upon which my firm is currently performing, is committed to perform, or intends to make a commitment to perform. I shall also include, for each project: the name and telephone number of a contact person for the contracting authority, person, or organization; the dollar value of the work; a description of the work; and my firm's work schedule for the project.
 - B. **The following services, materials or supplies:**
 - (i) a written agreement and invoices for the materials or supplies, and any other documents evidencing the terms of providing such items;
 - (ii) information concerning brokers fees and commissions for providing services or materials; and
 - (iii) a statement concerning whether my firm intends or will be required to use a joint check arrangement; and any other documents that may be required by MassDOT.

DBE Company Authorized Signature

Date _____

DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT
(To be completed by the DBE – Page 2 of 2)

DATE OF BID OPENING: _____

PROJECT NUMBER: 606272FEDERAL AID PROJECT NUMBER: CMQ-0035(043), HIS 0035(043),
NFP(N/I)-0035(043), STP-0035(043) & TAP-0035(043)PROJECT LOCATION: BARNSTABLE

PRIME BIDDER: _____

DBE COMPANY NAME: _____

<u>Item number</u> if applicable	<u>NAICS</u> <u>Code</u>	<u>Description of Activity</u> with notations such as Services, or Brokerage, Installation Only, Material Only, or Complete	<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
				TOTAL AMOUNT:	

Please give full explanations, attach additional sheets if necessary.

I HEREBY VERIFY THAT _____ WILL SOLELY
(DBE company name)
PERFORM THE WORK, OR PROVIDE THE SERVICES OR MATERIALS, AS DESCRIBED ABOVE.

DBE AUTHORIZED SIGNATURE: _____

NAME AND TITLE (PRINT): _____

TELEPHONE NUMBER: _____ FAX NUMBER: _____

EMAIL ADDRESS: _____

*** END OF DOCUMENT ***

Rev'd 9/20/19

DOCUMENT B00855

DBE JOINT CHECK ARRANGEMENT APPROVAL FORM

(to be submitted by Prime Contractor)

Contract No: 114724 Project No: 606272 Federal Aid No: CMQ-0035(043), HIS 0035(043),
NFP(N/I)-0035(043), STP-0035(043) &
Location: Barnstable TAP-0035(043)

Project Description: Intersection Improvements and Related Work (Including Signals) at Iyannough Road
(Route 28) and Yarmouth Road

We have received the attached request for the use of a joint check arrangement from
_____, a DBE on the above- referenced Contract and
_____, a Material Supplier/Vendor for the subject Contract.
The DBE has complied with the requirements of 49 CFR Part 26.55(c)(1). In particular, the DBE 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 DBE) for payment of sums due pursuant to invoices from the Supplier/Vendor and DBE.

Contractor:_____
Company Name_____
Signature
Duly Authorized_____
Printed Name_____
Date_____
Title**Subcontractor:**_____
Company Name_____
Signature
Duly Authorized_____
Printed Name_____
Date_____
Title

*** END OF DOCUMENT ***

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DOCUMENT B00856

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 DBE, 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 DBE Venturer; (4) the commitment of management, supervisory and operative personnel employed by the DBE 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, DBE 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 ***