

**MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY**

**FTA GRANT NO. MA-03-0292
FITCHBURG LINE**

**CONTRACT SPECIFICATIONS
for
MBTA Contract No. G67CN01**

**FITCHBURG COMMUTER RAIL LINE
IMPROVEMENTS PROJECT**

**SOUTH ACTON STATION
ACTON, MASSACHUSETTS**

**June, 2012
VOLUME 1 OF 2**

**HNTB CORPORATION
300 APOLLO DRIVE
CHELMSFORD, MA 01824**

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

Richard A. Davey

Secretary and Chief Executive Officer

BOARD OF DIRECTORS

John R. Jenkins, Chairman

Andrew Whittle

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ACTING GENERAL MANAGER OF THE MBTA &

RAIL & TRANSIT ADMINISTRATOR OF MassDOT

Jonathan R. Davis

ASSISTANT GENERAL MANAGER FOR DESIGN AND CONSTRUCTION

Edmond F. Hunter P.E.

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TO: ALL PROSPECTIVE BIDDERS

FROM: CONTRACT ADMINISTRATION DEPARTMENT
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

NOTE WELL:

PLEASE BE ADVISED THAT AN INFORMATIONAL BID FORM IS INCLUDED IN THE FRONT SECTION OF THE CONTRACT SPECIFICATIONS AND MUST NOT BE USED FOR BIDDING PURPOSES. BIDDERS MUST OBTAIN A PRE NUMBERED BID FORM.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

FTA Grant No. MA-03-0292

FITCHBURG LINE – SMALL STARTS

BID FORM

MBTA CONTRACT NO. G67CN01

FITCHBURG COMMUTER RAIL LINE IMPROVEMENT PROJECT

**SOUTH ACTON STATION
ACTON, MASSACHUSETTS**

June 2012

COPY NO. _____

**HNTB CORPORATION
300 APOLLO DRIVE
CHELMSFORD, MA 01824**

Bid Form For Informational Purposes Only

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

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**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
TRANSPORTATION BUILDING
10 PARK PLAZA
BOSTON, MASSACHUSETTS 02116-3975**

NOTICE TO BIDDERS

Sealed bids for MBTA Contract No. G67CN01, **FITCHBURG COMMUTER RAIL IMPROVEMENT PROJECT, SOUTH ACTON STATION, ACTON MASSACHUSETTS (CLASS 1- GENERAL TRANSIT CONSTRUCTION, PROJECT VALUE - \$9,622,000.00)** will be received by the Director of Contract Administration at the Contract Administration Office, 6th Floor, Room 6720, Transportation Building, 10 Park Plaza, Boston, Massachusetts, 02116-3975, until ten o'clock (10:00 a.m.) on **July 12, 2012**. Immediately thereafter, in a designated room, the Bids will be opened and read publicly.

Work at the new South Acton Commuter Rail Station will consist of improvements to the existing location to include construction of two 800 foot long, high level, side boarding platforms; two head houses each with lobby space, a stairway, and elevator, a platform canopies, a pedestrian bridge, platform access stairs and ramps; canopies over ramps and sections of the platform; a lighting system; a variable message sign system; signage; sidewalks, a new drop off area and plaza; parking lot drop off area site improvements; and other features and elements necessary to create a fully accessible and functional commuter rail station. These improvements will be made while the existing station continues to function.

This Contract is subject to a financial assistance Contract between the MBTA and the Federal Transit Administration of U.S. Department of Transportation. FTA Participation is 80 percent.

Each prospective bidder proposing to bid on this project must be pre-qualified in accordance with the Authority's "Procedures Governing Classification and Rating of Prospective Bidders." Copies may be obtained from the Contract Administration Office at the above address. Requests for prequalification for this Project will not be accepted by the Authority after the tenth (10th) day preceding the date set for the opening of bids.

Prequalified bidders may obtain from the Contract Administration Office a "Request for Bid Form" which must be properly filled out and submitted for approval.

Bidding Documents may be obtained from the Contract Administration Office at the address above from 8:30 a.m. to 4:00 p.m., beginning on **June 8, 2012**, Monday through Friday, at no charge. Copies of the Bidding Documents will be available in electronic format (CD). Contract Specifications and Contract Drawings shall be available in a portable data file (.pdf) format. If requested, Bidding Documents will be shipped for a fee of \$25.00, made payable by check to MBTA. For overnight mail service, a complete mailing label, with an approved carrier account number (i.e. Federal Express), must be included. All Bidding Documents requested by check will be shipped via U.S. Postal Service. **NONE OF THESE CHARGES ARE REFUNDABLE.**

Bidders attention is directed to Appendix 1, Notice of Requirement for Affirmative Action to Insure Equal Employment Opportunity; and to Appendix 2, Supplemental Equal Employment Opportunity, Anti-Discrimination, and Affirmative Action Program in the specifications. In addition, pursuant to the requirements of Appendix 3, Disadvantaged Business Enterprise (DBE) Participation Provision, Bidders must submit an assurance with their Bids that they will make sufficient and reasonable efforts to meet the stated DBE goal of 18% percent.

Bidders will affirmatively ensure that in regard to any contract entered into pursuant to this solicitation, minority and female construction contractors will be afforded full opportunity to submit Bids and will not be

discriminated against on the grounds of race, color, religion, sex, age, or national origin in consideration for an award.

Bidders will be required to comply with Federal Equal Employment Opportunity Regulations and the President's Executive Order No. 11246 and any amendments or supplements thereto. Bidders will also be required to comply with the Governor's Executive Order No. 481, prohibiting the use of undocumented workers on State Contracts and any amendments and supplements thereto.

Authorization for the Bidders to view the site of the work on the MBTA's property shall be obtained from the Project Manager, **Mr. Paul Hadley, 500 Arborway, Jamaica Plain, Massachusetts 02130**. The Authority will conduct an inspection tour of the site on **6/19/2012**. Bidders are requested to be present in front of the **South Acton Station main parking lot off Central Street, Acton, Massachusetts**, at 10:00 a.m. to participate in the tour. Bidders are advised that they should have representation at this tour as no additional visits are planned.

A prebid conference will be held on **6/20/2012** at 10:00 a.m. at the **Conference Room #2, 500 Arborway, Jamaica Plain, Massachusetts 02130**. Any request for interpretation of the Plans and Specifications should be submitted in writing prior to or at the pre-bid conference.

Bidders will be required to certify as part of their bids that they are able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

This Contract is subject to Federal wage and hourly laws and minimum State wage rates as well as all other applicable labor laws.

Bidders are advised that the "Buy America" provisions of the Surface Transportation Assistance Act of 1982 (Pub. L-97-424) as amended, apply to any Contract, procurement or agreement which results from this solicitation.

Bid Guaranty shall consist of a bid deposit in the amount of five (5) percent of the value of the bid, in the form of a bid bond, cash, certified check, treasurer's or cashier's check.

The successful Bidder shall be required to furnish a Performance Bond and a Labor and Materials Payment Bond each for the full amount of the Contract price.

The Authority reserves the right to reject any or all Bids, to waive informalities, to advertise for new Bids or proceed to do the work otherwise, as may be deemed to be in the best interests of the Authority.

This information may be viewed at the MBTA website:

http://www.mbta.com/business_center/bidding_solicitations/current_solicitations/

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

Date: **June 8, 2012**

By: Richard A. Davey
Secretary and Chief
Executive Officer of
MassDOT

Jonathan R. Davis
Acting General Manager of the MBTA
& Rail & Transit Administrator
of MassDOT

SECTION 00200

INSTRUCTIONS TO BIDDERS

1.1 BID FORMS AND DRAWINGS

- A. Prequalification Prior to Requesting Bid Forms.
1. Prospective Bidders proposing to bid on any work to be awarded by the Authority shall be pre-qualified and certified in accordance with the Authority's "Procedures Governing Classification and Rating of Prospective Bidders", if the value of work to be bid added to the value of the Prospective Bidder's uncompleted work already under contract with the Authority will aggregate \$1,000,000 or more. (Also see Article 1.12 of this Section.)
 2. For work aggregating under \$1,000,000, pre-qualification and certification is desirable, but not required.
- B. Issuance of Bid Forms and Drawings.
1. Pre-qualified Bidders shall obtain from the Contract Administrator a "Request for Bid Forms" and submit same properly filled out to the Contract Administrator for approval. Authority will consider each "Request for Bid Forms" and determine whether or not an officially numbered, non-transferable Bid Form will be issued to the prospective Bidder.
 2. Required payment shall entitle a prospective Bidder to receive officially numbered, non-transferable Bid Form which includes the Notice to Bidders. Instructions to bidders, and Bid Form, specifying limits, location and description of the contemplated work, time within which the work must be completed, certain special requirements for the particular Contract, and estimates of the various quantities of the Work to be performed and materials to be furnished. Payment will also entitle the prospective Bidder to a set of Contract Drawings, Contract Specifications, and other Contract Documents relating to the contemplated work.
 3. Copies of the aforementioned documents may be purchased, for informational purposes only, upon payment of such fees as the Authority shall determine.

1.2 INTERPRETATION OF BASIC ESTIMATE OF QUANTITIES

- A. Bids will be compared on the estimate of quantities of work to be done, as shown in the Bid form.
1. Quantities in the Bid Form are approximate only, being given as a basis for the comparison of bids. Authority does not expressly or by implication agree that the actual amount of Work will correspond there-with, but reserves the right to increase or decrease the amount of any class or portion of the Work, as may be deemed necessary or expedient by the Authority.
- B. Bidders shall submit their bid upon the following express condition which shall apply to and become part of every bid received, via: An increase or decrease in the quantity for any item shall not be regarded as cause for an increase or decrease in the Contract unit prices, nor in the time allowed for completion of the Work, except as provided in the Contract. (Also see Section 00700, Article 2.03, and Section 01150, Articles 1.4 and 1.5.)

1.3 EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF WORK

- A. Before submitting a Bid, each prospective Bidder shall (1) examine Contract Documents thoroughly; (2) visit the site to be familiar with observable conditions that may in any manner affect cost, progress, or performance of the Work; (3) be familiar with Federal, State, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress, or performance of the Work and; (4) study and correlate information thus determined with the Contract Documents.
- B. By submitting a bid the Bidder represents that every requirement of this Article and the following Article 1.04 has been compiled with and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.
- C. Complete information and authorization for the Bidders to view the site of the work on Massachusetts Bay Transportation Authority's property shall be obtained from the office of Mr. Paul Hadley, Project Manager, Telephone No. (617) 222-1761.
- D. The Authority will conduct an inspection tour of the site on **June 19, 2012**. Bidders are requested to be present in front of the **South Acton Station at Central Street in Acton** Massachusetts, at 10:30 a.m. to participate in the tour. Bidders are advised that they should have representation at this tour as no extra visits are planned.
- E. In addition to visiting the site for the purposes as specified above the Bidders shall visit the site to ascertain pertinent local conditions readily determined by inspection and inquiry, such as the location, accessibility, traffic conditions and general character of the site, labor conditions, the character and extent of existing work within or adjacent thereto, and any other work being performed.
- F. The Authority does not guarantee or represent that existing construction or conditions conform to the Drawings. The Bidder shall visit the site and satisfy himself as to existing conditions. All necessary information shall be verified in the field before fabrication of new material. No claim for extra cost will be allowed by the Authority because of the Contractor's unfamiliarity with site conditions.

1.4 SUBSURFACE CONDITIONS DATA

- A. Where investigation of the subsurface conditions and rock conditions has been conducted for the Authority by independent soil engineering consultants in those areas where the project work is to be performed, prospective Bidders may inspect the records of such investigations including the soil and rock samples and cores as are available at the locations and at the times as may be indicated in the Supplementary Conditions, or as otherwise stated in the Contract Documents. All reports relating to subsurface investigations in the Supplementary Conditions will be listed under one of the three following classifications which are defined in subsequent designated paragraphs.
- B. MBTA Geotechnical Data Reports. These reports contain selected records of field and laboratory investigations and testing of subsurface soil and rock conditions that have been prepared for design purposes by geotechnical engineering consultants on behalf of the Authority. They are identified in the Supplementary Conditions and are hereby made a part of the Contract Documents. Authority warrants that the boring information represents the subsurface conditions only at the specific boring location and that prospective Bidders shall form their own opinion and conclusions from these reports and Authority shall not be held responsible in any way for deductions, interpretations, or

interpolations between borings, or any conclusions drawn from them by the prospective Bidders.

- C. Other Geotechnical Data Reports. These reports include records of field and laboratory investigations and testing of subsurface soil and rock conditions that have been prepared for agencies other than Authority and records of field and laboratory investigations and testing prepared for the Authority but which have not been included in the MBTA Geotechnical Data Reports. These reports which may not necessarily have been used for design purposes are not made part of the Contract Documents but are listed in order that prospective Bidder may have access to the same information as Authority. Prospective Bidders shall form their own opinions and conclusions from these reports and Authority shall not be held responsible in any way for the accuracy of soil representation or any deductions, interpretations or conclusions drawn from them by prospective Bidders.
- D. Geotechnical Interpretative Reports. Information provided by these reports generally includes the following:
 - 1. The subsurface conditions as interpreted from available Authority data reports.
 - 2. The effect of these conditions on project design.
- E. Information, interpretations and conclusions presented in these reports are not necessarily an accurate representation of existing conditions and therefore are not made part of the Contract Documents but are furnished in order that all Bidders may have access to the same information as Authority. Prospective Bidders shall form their own opinions and conclusions from these reports and Authority shall not be held responsible in any way for the accuracy of soil representation or any deductions, interpretations or conclusions drawn from them by prospective Bidders.
- F. Test boring logs for test borings indicated and identified on the Contract Drawings are included in the Geotechnical Data Report.
- G. In addition to any geotechnical information presented in the sources and classifications listed, the results of environmental testing performed during the subsurface investigation program are included in the MBTA Geotechnical Data Reports.
 - 1. The Geotechnical Laboratory Test Results are included in the appendix of these documents.

1.5 PREPARATION OF BIDS

- A. Bid Prices.
 - 1. Bidder shall submit the Bid on Bid Form and in the envelope furnished by Authority. Bid Form and specified Bid Guaranty together with all other forms provided and such other documents as may be specified, executed, and submitted by Bidder shall constitute the Bid. All blank spaces for Bid prices shall be filled in with the unit price for the item or the lump sum for which Bid is made. Total amount of Bid shall be obtained by adding the amounts of the several items.
 - 2. All words and figures shall be in black ink or be typewritten. Bid prices of each item on the form shall be stated in words and numbers; in case of a conflict, written words shall govern. If erasures or changes appear in Bid Form, each erasure or change shall be

initialed and dated by the individual signing Bid Form.

3. Price for any item, bid and contracted for, unless otherwise noted or specified, shall include full compensation for all materials, equipment, tools, labor, and incidental work necessary to complete the item to the satisfaction of Authority. Prices, without exception, shall be net, not subject to discount, and shall include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the Work.
4. The Schedule of Bid Prices included in the following Form For Bid of this Bid Form will be used for the indicating of the Bid price information specified above.
5. In the event that there is an error in the computed totals based upon the unit prices and estimated quantities, the unit prices shall govern.

B. Addenda.

1. Prospective Bidder shall acknowledge receipt of Addenda by noting the numbers of those received on the appropriate page and location.
2. The Bidder is required to acknowledge receipt of any addendum (a) issued to this contract by inserting the addendum (a) number in the space provided on **Page 00410-3** of this Bid Form.

C. Signatures.

1. Bid shall be signed in ink in the proper place provided as follows:
 - a. If Bid is made by an individual, that person's name and post office address shall be stated.
 - b. If Bid is made by a firm, partnership, or corporation, it shall be signed by a person having such legal authority from said firm, partnership or corporation and the person so signing Bid shall give his own name and title (if any) in addition to the name and address of the firm, partnership, or corporation. If Bid is made by a firm or partnership, names and addresses of the individual members shall be given.
 - c. If Bid is made by a corporation, the name of the State under the laws of which the corporation was chartered and names and titles of the President, Treasurer, and Secretary or Clerk of the corporation shall be given.
 - d. If Bid is made by two or more individuals, partnerships, or corporations, or any combination thereof, each party joining to make Bid, shall submit, attached to, and made a part of Bid, information and signatures in compliance with the foregoing provisions applicable to an individual, firm, partnership, or corporation. In addition, if any of the joint venture are a corporation, an attested copy of the vote of the corporation authorizing such joint venture shall be attached to Bid.

D. Affidavits.

1. Bidder shall certify on the affidavit form included with Bid that:
2. To the best of the Bidder's knowledge, said Bidder has not, either directly or indirectly,

entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such Contract.

3. Bids must contain the properly completed affidavit of non-collusion on **Page 00410-9** of this Bid Form.

1.6 DELIVERY OF BIDS

- A. Prior to the time set for openings of Bids, Bidder shall submit Bid as follows:
 1. If delivered by hand, the prospective Bidder shall submit Bid properly sealed and delivered.
 2. If mailed, prospective Bidder shall submit the Bid by registered or certified mail, properly sealed. Any bid received at the office designated in the solicitation after the exact time specified for receipt will not be opened or considered for award.
 3. A Bid may also be modified or withdrawn in person by a Bidder or the Bidder's authorized representative, provided the Bidder's identity is made known and the Bidder signs a receipt for Bid, but only if the withdrawal is made prior to the exact time set for receipt of Bids. (Also see Section 00100, Article 1.08).
 4. The only acceptable evidence to establish the time of receipt at Authority's installation is the time/date stamp of such installation on Bid wrapper or other documentary evidence of receipt maintained by the installation.
 5. Bidders are advised that the Bid Form must include a Bid price for each of the items listed on the Contract Schedule of Bid Prices. The omission of a Bid price for any of the items is cause for rejection of all Bid prices of the Bid.

1.7 BID GUARANTY REQUIRED

- A. In order to insure the faithful fulfillment of its term, each Bid shall be accompanied by a Bid Guaranty. Bid Guaranty shall be in the amount as specified in the "Notice to Bidders" in the form of an acceptable bid bond, cash, certified check, treasurer's or cashier's check issued to the MBTA by a responsible bank or trust company or by a surety or insurance company licensed or authorized by the Massachusetts Division of Insurance to engage in the business of surety in the Commonwealth and satisfactory to the Authority. Bid Guaranty shall be enclosed in a sealed envelope and be submitted with the Bid Form.

1.8 WITHDRAWAL OF BIDS

- A. Bidder may withdraw the Bid provided the request in writing is in the hands of Authority by the time set for opening Bids.
 1. If not earlier returned, when any such Bid is reached during the opening of the Bids, it will be returned to the Bidder unread.

1.9 PUBLIC OPENING OF BIDS

- A. Bids will be publicly opened and the total price of each bid read at the time and place indicated in the "Notice to Bidders." Any person may at reasonable times and in the presence of a duly

authorized representative of Authority examine any or all Bids after they have been opened and read.

1.10 REJECTION OF BIDS

- A. Bids which fail to meet the requirements of Articles 1.05, 1.06, and 1.07 of this Section or which are incomplete, conditional or obscure, or which contain additions not called for, erasures, alterations or irregularities of any kind or in which errors occur, or which contain abnormally high or abnormally low prices for any class or item of work, may be rejected as informal.
 - 1. On Federally Assisted (Financed) Projects, Bids will be rejected from any Bidder whose name appears on the U.S. Comptroller General's list of ineligible contractors for federally financed and assisted construction.
 - 2. Bidders are advised that the certificate pertaining to ineligible Contractors on **Page 00410-5** of the Bid Form must be completed in its entirety. Failure to fully complete and submit the required certification will be considered an informality and may render the Bid non-responsive
- B. More than one Bid from the same Bidder, whether or not the same or different names appear on the signature page, will not be considered. Reasonable proof for believing that a Bidder is interested in more than one Bid for the Work contemplated will cause the rejection of all Bids made by the Bidder directly or indirectly. Any or all Bids will be rejected if there is reason for believing that collusion exists among Bidders. (See Article 1.14 of this Section.)

1.11 DISQUALIFICATION OF BIDDERS

- A. Bidders whose Bids have been rejected because of evidence of collusion, as specified in Article 1.10 of this Section shall not be considered in future Bids for the same work and such Bidders may be disqualified from bidding on future work.

1.12 COMPETENCY OF BIDDERS

- A. No contract will be awarded except to a responsible Bidder who has been prequalified and certified in accordance with the Authority's "Procedures Governing Classifications and Rating of Prospective Bidders" and adjudged capable of performing the class of work contemplated, when bid amount added to the value of Bidder's uncompleted work already under contract with Authority would aggregate \$1,000,000 or more.
- B. When Bidder prequalification is not required, low Bidder or lowest responsible Bidder (if requested by Authority) shall submit within five business days after the opening of bids, a post-qualification statement, duly signed and sworn to, outlining Bidder's experience, equipment and financial resources, on forms prescribed or furnished by Authority. A Bidder who fails to comply with this requirement will not be considered for Award of the Contract.

1.13 MATERIAL GUARANTY

- A. Bidder may be required to furnish without expense to the Authority a complete statement of the origin, composition, and manufacture of any or all materials proposed to be used in the construction of the work, together with samples, which may be subjected to the test required by Authority to determine the quality and fitness of the material.

1.14 CONSIDERATION OF BIDS

- A. Authority reserves the right to reject any or all Bids, to waive technicalities, to advertise for new Bids, or proceed to do the Work as may be deemed to be in the best interests of the Authority.

1.15 AWARD OF CONTRACT

- A. Contract will be awarded by Authority subject to the reservations of Article 1.14, within 30 days after the opening of Bids, to the lowest responsible and eligible Bidder. However, for Contracts requiring concurrence by other State or Federal agencies, the Contract will be awarded 45 days from the opening of Bids. The successful Bidder will be notified in writing by mail or otherwise that Bid has been accepted and that Contract has been awarded.
- B. Basis of Award. The Contract will be awarded by the Authority subject to the reservations of Section 00100 Article 1.14 as specified above, within 60 calendar days after opening of Bids to the lowest responsible and eligible Bidder whose Total Estimated Contract Bid Price, based upon the proposed schedule [of unit, lump sum, and allowance] Bid Prices, is the lowest Bid received.

1.16 CANCELLATION OF AWARD

- A. Authority reserves the right to cancel the award of any contract at any time before the execution of the said contract by all parties without any liability against the Authority.

1.17 RETURN OF BID GUARANTY

- A. Bid Guaranty in the form specified in Article 1.07, except those of two lowest bidders will be returned within five days following opening of Bid.
- B. Bid Guarantees of lowest bidder and second lowest bidder will be retained until execution of the contract, previous to which, however, either Bidder who submitted cash, certified check, treasurer's or cashier's check as Bid Guaranty, may substitute a bid bond in an acceptable form furnished by a surety or insurance company licensed or authorized by the Massachusetts Division of Insurance to engage to the business of surety in the Commonwealth and satisfactory to the Authority.
- C. After 60 days from the opening of Bids (as specified in Article 1.15), low Bidder may withdraw the Bid and request return of the Bid Guaranty, in which case Bid Guaranty of lowest Bidder and second lowest Bidder will be returned and second lowest Bidder's Bid shall not be considered or award. After 60 days from the opening of Bids (as specified in Article 1.15), second lowest Bidder may withdraw the Bid and request return of the Bid Guaranty, in which case only Bid Guaranty of second lowest Bidder will be returned.

1.18 CONTRACT BONDS REQUIRED

- A. Performance Bond in the full amount of the Contract will be required by Authority to ensure faithful performance of the Contract.
- B. Labor and Materials Payment Bond in the full amount of the Contract will be required to be furnished by the Contractor to Authority as security for payment by the Contractor and subcontractors for labor, materials, and rental of equipment. Said security shall remain in force until the validity of all claims shall be determined and if valid, paid by the surety.

- C. Name of the agency or agent writing these bonds shall be identified with or on the bond.
 - 1. Surety may be a bond in an acceptable form furnished by a surety or insurance company licensed or authorized by the Massachusetts Division of Insurance to engage in the business of surety in the Commonwealth and satisfactory to the Authority.
 - 2. All Alterations, extensions of time, extra work and any other changes authorized under these specifications, or under any part of the Contract may be made without obtaining the consent of the surety or sureties on the Contract Bonds.

1.19 EXECUTION OF CONTRACT

- A. Successful Bidder shall execute and deliver the Contract and furnish the required surety and certificate of insurance to Authority within 10 days after the date of the Notice of Award.
- B. Contract shall be in writing and shall be executed in the number of copies required by the Authority. One fully executed copy will be delivered to the Contractor.

1.20 FAILURE TO EXECUTE CONTRACT

- A. Should successful Bidder fail to execute the Contract and furnish the surety and certificate of insurance within the time stipulated, Authority may, at its option, determine that Bidder has abandoned the Contract and thereupon Bid and acceptance shall be null and void. Guaranty accompanying Bid shall be retained and collected by Authority. It is agreed that this Article shall be construed and treated by the parties to the Contract not as imposing a penalty upon said Contractor for failing to fully execute The Contract as agreed on or before the time specified in Bid, but as liquidated damages to compensate Authority for additional costs incurred by Authority because of the failure of the Contractor to fully execute the Contract on or before the date specified in Bid.

1.21 INTERPRETATIONS OF BID DOCUMENTS

- A. All questions about the meaning and intent of Bid Documents shall be submitted in writing, to the Assistant General Manager for Design and Construction of the Massachusetts Bay Transportation Authority, at the address specified in the Notice to Bidders. To be given consideration, all questions must be received at least 10 days prior to the date fixed for the opening of Bids. An interpretation of all questions which Authority elects to give will be issued by written Addenda. Only questions answered by formal written Addenda will be binding. Oral communications or interpretations will be without binding legal effect. Addenda will be mailed, by certified mail with return receipt requested, to all who obtained Bid Documents. All Addenda so issued shall become part of the Bid Documents. Obvious discrepancies in Bid Documents which are not addressed by a Bidder in accordance with the above procedure will be construed against the successful Bidder should a dispute arise.
- B. A separate copy of the questions referring to meaning and intent of the Bid Documents shall be mailed to the Project Manager, at the address specified in the Notice to Bidders, and to be given consideration must be received at least 10 days prior to the date fixed for the openings of Bids. All interpretations the Authority elects to give will be made in the form of written Addenda to the Contract Documents, which Addenda shall become a part of the Bid Documents. The Addenda will be mailed to all persons who obtained Bid Documents in the manner described in the Notice to Bidders.

1.22 MASSACHUSETTS SALES AND USE TAX LAW OF 1967

- A. Attention of Bidders is directed to the Massachusetts Sales Tax, Chapter 64H, Section 6, and the Massachusetts Use Tax, Chapter 64I, Section 7, which state that these taxes are not applicable to the sales of construction materials and supplies incorporated, consumed, employed or expended in Construction Contracts of this Authority. This exemption is also applicable to rental charges for construction vehicles, equipment and machinery rented, specifically for use on the site of the Authority's construction projects. Bidders are directed to exclude any allowance for Sales or Use Tax from their Bids as said tax would relate to the foregoing specific categories.

1.23 NOT USED

1.24 DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION PROVISION

- A. Attention of all Bidders is directed to the assurance to be submitted with their Bids that they will make sufficient reasonable efforts to meet the stated DBE goal for this Contract. This assurance is provided on **Page 00410-6** of the Bid Form.
- B. In addition, the attention of Bidders is directed to the requirements of the Disadvantaged Business Enterprise Participation Provision included as Appendix 3 of the Supplementary conditions. Forms included on **Pages 00410-20** through **00410-23** of this Bid Form may be reproduced for additional copies. Failure to comply and submit the required documentation will render the Bid non-responsive.
- C. For the purpose of this Contract, Bidders are reminded that the MBTA will only accept DBE's that are certified by the State Office of Minority and Women Business Assistance (SOMWBA) or a certified out-of-state firm certified under Section 8(a) of the Small Business Act. The Bidder must attach the DBE's most recent certification letter or document to the Affidavit on **Page 00410-22**.

1.25 BUY AMERICA

- A. This solicitation and the resulting contract are subject to the Buy America requirements of 49 U.S.C. §5323(j) and the Federal Transit Administration's implementing regulations found at 49 CFR Part 661. These regulations require, as a matter of responsiveness, that the bidder or offeror submit with its offer a completed certification in accordance with § 661.6 or § 661.12, as appropriate.
- B. A Buy America Certificate, as per attached format on **Page 00410-10**, must be completed and submitted with the bid. A bid which does not include the certificate will be considered non-responsive.
- C. A waiver from the Buy America Provision may be sought by the Authority if grounds for the waiver exist.
- D. Section 165a of the Surface Transportation Assistance Act of 1982, as amended, permits FTA participation on this contract only if steel, iron and manufactured products used in the contract are produced in the United States.

1.26 FUEL AND ASPHALT PRICE ADJUSTMENT CLAUSE

- A. Should this Contract contain a fuel and asphalt price adjustment clause, the Supplementary Conditions of the Contract Specifications will provide information for baseline prices and application guidelines.

1.27 PREBID CONFERENCE

- A. A Pre-bid Conference will be held at 10 am **June 20, 2012** at the office of the Project Manager, **Paul Hadley, 500 Arborway, Jamaica Plain Ma.** It is imperative that prospective Bidders have a representative attend this meeting. Any request for interpretation of drawings and specifications should be submitted in writing at the same time.

1.28 NOT USED

1.29 EQUAL EMPLOYMENT OPPORTUNITY (EEO)

- A. Attention of all Bidders is directed to Section 00700, General Conditions, Article 5.26, and Paragraph **DD** of the Supplementary Conditions. Compliance with these Specifications requires completion in full of the certification contained on **Page 00410-6** of the Form for Bid. Failure to comply fully and submit the required Certification may render the Bid non-responsive.

1.30 BIDDER STATUS IDENTIFICATION

- A. Bidder's attention is directed to the applicable section of **Page 00410-7** and **00410-9** regarding status identification. Bidders are advised that the applicable section of the above must be complete in its entirety.

1.31 CERTIFICATION OF DUMPING FACILITIES

- A. Bidders are advised that the Certification of Dumping Facilities attached on **Page 00410-12** must be completed in its entirety.

1.32 RIGHT-TO-KNOW LAW

- A. Bidders are advised that the Right-to-Know Law Certification attached on **Page 00410-11** must be completed in its entirety.

1.33 POST APPEALS

- A. Post - Bid appeals shall be made within five (5) working days of the bid opening date and shall be made as follows:
 1. The initial protest or appeal shall be made to the Deputy Director of Construction, Contracts who will collect the factual information pertaining to the appeal.
 2. Upon collecting such factual information, the Office of Contract Administration will forward such information to the General Counsel for a recommendation as to the merits of the appeal.
 3. After discussion with the Office of Contract Administration, the General Counsel, in conjunction with the Office of Contract Administration, will forward a recommendation

to the Assistant General Manager for Design and Construction.

4. If the Assistant General Manager for Design and Construction does not concur with the recommendations, the Deputy will obtain any other additional information required so that a determination can be made, at which time the interested party will be notified in writing of the Authority's determination.
5. If the interested party does not agree with the determination, he/she may appeal directly to the Authority's General Counsel in writing.
6. The General Counsel will review all facts of the appeal and will make a final determination and will advise both the interested party and the Assistant General Manager for Design and Construction.
7. The Authority reserves the right to extend the post-bid appeal period beyond the five-(5) day limitation when deemed necessary by the Authority.
8. "Interested Party" means an actual or prospective bidder or offeror whose direct economic interest would be affected by the award of a contract or by the failure to award a contract.
9. ONCE THE GENERAL COUNSEL'S DETERMINATION HAS BEEN MADE, THE AUTHORITY'S DECISION IS FINAL AND WILL NOT BE RECONSIDERED UNLESS THERE IS ADDITIONAL INFORMATION WHICH WAS NOT AVAILABLE TO THE APPEALING PARTY AT THE TIME THE APPEAL WAS MADE.
10. Judicial or administrative authorities which may have jurisdictions over bid protests are as following:
 - o \$25,000 or more - Superior Court Department of the Trial Court of the Commonwealth of Massachusetts.
 - o Under \$25,000 - District Court for that city, i.e., Boston Municipal Court, Cambridge District Court, etc.
 - o Massachusetts Attorney General's Office.

B. In the event that the subject contract procurement is federally funded, all prospective interested parties are notified of the following:

1. Interested parties may elect to issue a protest to the FTA if the interested party reasons that the MBTA failed to have or follow written protest procedures. If an interested party elects to issue a protest to the Federal Transit Administration (FTA), the protest must be filed in accordance with FTA Circular 4220.1B (as periodically updated).
2. FTA may entertain a protest that alleges the MBTA failed to have or follow written protest procedures.
3. If a protest is filed prior to award, all firms sent a copy of the bid documents or firms that have been issued a formal proposal number will be notified of the pending protests existence.

4. The MBTA may elect to proceed with the procurement which may include the opening of bids and the subsequent award of a contract, regardless of the existence of a protest that is pending, in the event that a determination has been made that:
 - a. The supplies or services to be contracted for are urgently required;
 - b. Delivery or performance will be unduly delayed by failure to make award promptly;
 - c. Failure to make a prompt award will otherwise cause undue harm to the MBTA or the Federal Government.

If award is made, the procurement file will be documented to explain the basis for the award. Written notice of the decision to proceed with the award will be sent to the protestor and other interested parties.

1.34 Certification regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

- A. The Bidder will meet the requirements of 49 CFR Part 29 related to Debarment, Suspension, Ineligibility and Voluntary Exclusion.
- B. In accordance with 49 CFR Part 29 and the "Instructions for Certification", the Bidder will provide either a "Primary Participant" certification (**Page 00410-14 and 00410-15**), if the contract value is \$100,000.00 or more, or a "Lower Tier" certification (**Pages 00410-16 and 00410-17**), if the contract value exceeds \$25,000.00 and is less than \$100,000.00.
- C. Additionally, for a contract of \$100,000.00 or more, the Bidder will obtain a "Lower Tier certification" (**Pages 00410-16 and 00410-17**) from its proposed subcontractors if the subcontracts are expected to exceed \$25,000.00. (See Paragraph D).
- D. Lower Tier Certification (including DBE Subcontractors) is **not required as part of the bid submittal** but may be submitted as soon as practicable but in all cases prior to subcontractor approval by the Authority in accordance with Article 6.01., Paragraph E of the Authority's Standard Specifications", General Conditions Section 00700.
- E. In the event a Bidder cannot provide a certification as set forth above, an explanation will be provided and attached to the certification.

1.35 Lobbying Restrictions

- A. Restrictions
 1. The Contractor shall timely comply with the requirements of the lobbying restrictions set forth in Section 301 of Public Law 101 - 121, as implemented by the Department of Transportation in 49 C.F.R. Part 20, and as those authorities may be hereafter amended.
 2. If a Standard Form - LLL, "Disclosure Form to Report Lobbying", is required to be completed by the Contractor or subcontractor at any tier, such disclosure shall be furnished to the Deputy Director of Construction - Contracts.

B. Certification of Restrictions on Lobbying

1. The Bidder certifies on **Page 00410-18** of the Form for Bid, to the best of his or her knowledge or belief that it and its Principals:
 - (a) No Federal appropriated funds have been paid, or will be paid, by or on behalf of the undersigned, to any person for the influencing or the attempting to influence an officer or employee of any agency, 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 of any cooperative agreement and the extension, continuation, renewal, Amendment, or modification of any cooperative of any Federal contract, grant, loan or agreement.
 - (b) If any funds other than Federal appropriate funds have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any 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.
 - (c) The undersigned shall require that the language of this certification be included in the award Documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made and entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 or not more than \$100,000 for each failure.

1.36 STANDARD PLANS

- A. The Authority's "Railroad Operations Book of Standard Plans - Track and Roadway" is available at a charge of \$30.00 per copy, which is not refundable. Also, the MBTA's Standard Plan entitled "MBTA Railroad Operations - Commuter Rail Design Standards Manual", is available at a charge of \$35.00 per copy, payable by separate check.

1.37 CERTIFICATION OF CONSTRUCTION EQUIPMENT STANDARD COMPLIANCE

- A. The contractor certifies that all diesel construction equipment used in this contract shall have emission control devices installed, such as oxidation catalysts or particulate filters on the exhaust system side of the diesel combustion engine equipment.
- B. Bidders are advised that the MBTA Construction Equipment Standard Compliance attached on page **00410-19** must be completed in its entirety

1.38 CERTIFICATION OF UNDOCUMENTED WORKERS

- A. The contractor certifies that all workers and employees used in this contract are legally documented workers and that the Contractor has verified the immigration status of all workers assigned to the Contract.
- B. Bidders are advised that the MBTA Contractor Certification for Undocumented Workers attached on page **00410-24** must be completed in its entirety

1.39 OSHA TRAINING CERTIFICATION

- A. Attention of all Bidders is directed to Section 00700, General Conditions, Article 5.15, regarding worker safety training. Compliance with these Specifications requires completion in full of the certification contained on Page **00410-25** of the Form for Bid. Failure to comply fully and submit the required Certification may render the Bid non-responsive.

1.40 CONTRACTOR CERTIFICATION MBTA RETIREE PARTICIPATION DISCLOSURE

- B. Bidders are advised that the MBTA Contractor Certification for MBTA Retiree Participation Disclosure attached on page **00410-26** must be completed in its entirety

END OF SECTION

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
TRANSPORTATION BUILDING
10 PARK PLAZA
BOSTON, MASSACHUSETTS 02116-3975**

FORM FOR BID – FTA FUNDED PROJECTS

TO THE MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

The undersigned hereby declares to have carefully examined the annexed form of Contract, Specifications and Plans therein referred to and also the site upon which the Project Work is to be performed.

The undersigned proposes to furnish all labor, materials, and equipment required for Massachusetts Bay Transportation Authority Contract No. G67CN01, **Fitchburg Commuter Rail Line Improvement Project, South Acton Station**, for the Massachusetts Bay Transportation Authority in accordance with the Plans and Specifications prepared by **HNTB Corporation, Chelmsford MA, Boston MA** for the unit price, lump sum and allowance prices specified in the Schedule of Bid Prices, subject to additions and deductions according to the terms of the Specifications.

Accompanying this Bid Form is a bid deposit in the amount of five (5) percent of the value of the bid which shall become the property of the Massachusetts Bay Transportation Authority if, in case this Bid shall be accepted by said Authority, the undersigned shall fail to comply with the applicable statutes or fail as required hereby to execute the Contract with, and furnish bonds and certificates to, said Authority, within the time provided.

The undersigned also hereby declares that he is the only person interested in this Bid; that it is made without any connection with any other persons making any Bid for the same Work; that no person acting for, or employed by, the Massachusetts Bay Transportation Authority is directly or indirectly interested in this Bid, or in any contract which may be made under it, or in expected profits to arise therefrom; and it is made without directly or indirectly influencing or attempting to influence any other person or corporation to bid or to refrain from bidding or to influence the bid of any other person or corporation and that this Bid is made in good faith, without collusion or connection with any person bidding for the same work; and that this Bid is made with distinct reference and relation to the Plans and Specifications prepared for this case and herein mentioned. The undersigned declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this Bid is based solely on his own investigation and research and not in reliance upon any plans, surveys, measurements, dimensions, calculations, estimates or representations of any employee, officer, or agent of the Authority.

If the Bidder is a foreign corporation it agrees, in case this Bid is accepted, to comply with the applicable provisions of Massachusetts General Laws, Chapter 181, before the time for execution of the Contract, as hereinafter provided, occurs.

The undersigned proposes and agrees that, if within sixty (60) calendar days after the opening of bids, notice that the Bid has been accepted by the Authority shall be mailed to him at the business address given below, he shall execute the Contract and furnish a Performance Bond and also a Labor and Materials Payment Bond for the full amount of the Contract price, within ten (10) calendar days after the date of the Notice of Award.

The undersigned agrees to commence work within fifteen (15) calendar days from the date of the mailing of the executed Contract to the Contractor (Section 00510 of these Specifications) unless otherwise ordered in writing by the Engineer; and they shall complete the entire Work, fully and acceptably, within ***Five Hundred and Ninety (590)*** calendar days from the date of the mailing of the executed Contract to the Contractor, or after the date on which he is ordered in writing by the Authority to commence work, whichever is later.

The undersigned covenants that he has not employed or retained any company or person (other than a full time bona fide employee working for the Contractor) to solicit or secure this Contract, and that he has not paid or agreed to pay any company or person (other than such an employee) any gift, fee, contribution, percentage, or brokerage fee contingent upon or resulting from the award of this Contract.

The Contractor warrants, represents and agrees that during the time this Contract is in effect, neither it nor any affiliated company, as hereinafter defined, participates in or cooperates with an international boycott, as defined in Section 999 (b) (3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by Section 2 of Chapter 151E, Massachusetts General Laws. If there shall be a breach in the warranty representation and agreement contained in this paragraph, then without limiting such other rights as it may have, the MBTA shall be entitled to rescind this Contract. As used herein, an affiliated company shall be any business entity of which at least 51 percent of the ownership interests are directly or indirectly owned by the Contractor or by a person or persons or business entity or entities directly or indirectly owning at least 51 percent of the ownership interests of the Contractor, or which directly or indirectly owns at least 51 percent of the ownership interest of the Contractor.

This bid includes **Addendum (s)** numbered

The **Total Estimated Contract Bid Price** based upon the schedule of proposed Unit, Lump Sum and Allowance Bid Price is:

_____ Dollars
Amount in Words

\$ _____
Amount in Figures

USE BLACK INK OR TYPEWRITER IN COMPLETION OF FORM FOR BID AND THE SCHEDULE OF BID PRICES

ENTER TOTAL FROM PAGE NO. 00410-4(c)

SCHEDULE OF BID PRICES

THE SUBDIVISION OF THE TOTAL ESTIMATED CONTRACT BID PRICES IS AS FOLLOWS:

**Massachusetts Bay Transportation Authority
Capital Management System
Schedule of Bid Prices
Contract G67CN01 Base Estimate**

Item Number	Description	Quantity	Unit Bid Price (written in words)	Unit Price	Amount
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	1.00	AT _____ _____ _____	LS Lump Sum	
0130.133	PROJECT OFFICE	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
0130.429	TRAFFIC OFFICERS SERVICES	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
0130.436	ELECTRIC COMPANY	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
0130.439	BUSING	1.00	AT _____ _____ _____	AN Allowance with No Overrun	

Carried Forward: _____

**Massachusetts Bay Transportation Authority
 Capital Management System
 Schedule of Bid Prices
 Contract G67CN01 Base Estimate**

Item Number	Description	Quantity	Unit Bid Price (written in words)	Unit Price	Amount
				Brought Forward:	
0211.495	SITE UTILITIES	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
0213.202	RODENT CONTROL	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
0221.330	DISPOSE OF CONTAMINATED SOIL	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
0222.003	UNCLASSIFIED EXCAVATION	2024.00	AT _____ _____ _____	CY Cubic Yard	
0222.108	ROCK EXCAVATION	950.00	AT _____ _____ _____	CY Cubic Yard	

Carried Forward: _____

Massachusetts Bay Transportation Authority
Capital Management System
Schedule of Bid Prices
Contract G67CN01 Base Estimate

Item Number	Description	Quantity	Unit Bid Price (written in words)	Unit Price	Amount
				Brought Forward:	
0290.005	RAILROAD WORK	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
1520.006	INSTALL WATER SYSTEM	1.00	AT _____ _____ _____	AN Allowance with No Overrun	
Subtotal:					
Total Estimated Contract Base Bid Price:					

A BIDDER WILL NOT BE ELIGIBLE FOR AWARD OF A CONTRACT UNDER THIS INVITATION FOR BIDS UNLESS SUCH BIDDER HAS SUBMITTED AS A PART OF ITS BID THE FOLLOWING CERTIFICATION PERTAINING TO INELIGIBLE CONTRACTORS WHICH WILL BE DEEMED A PART OF THE RESULTING CONTRACT.

A. The _____
(Name of Individual or Concern submitting this bid)

hereby certifies that **it is not included** on the U.S. Comptroller General's Consolidated **List of Parties Excluded from Federal Procurement and Non-procurement Programs** for Violations of Various Public Contracts Incorporating Labor Standards Provisions.

OR

B. The _____
(Name of Individual or Concern submitting this bid)

hereby certifies that **it is included** on the U.S. Comptroller General's Consolidated **List of Parties Excluded from Federal Procurement and Non-procurement Programs** for Violations of Various Public Contracts Incorporating Labor Standards Provisions.

(Signature of authorized representative of Bidder)

It is a condition of this Contract, and shall be made a condition of each subcontract entered into pursuant to this Contract, that the Contractor and any subcontractor shall not require any laborer or mechanic employed in performance of the Contract to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous to his health or safety, as determined under construction safety and health standards (Title 29, Code of Federal Regulations, Part 1518, published in the Federal Register on April 17, 1971) promulgated by the United States Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act, (83 Stat. 96).

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

The bidder hereby certifies he shall comply with the minority manpower ratio and specific action steps contained in the Appendices of the Supplementary Conditions in this Contract. The Contractor receiving the award of the Contract shall be required to obtain from each of its subcontractors and submit to the Contracting or administering agency prior to the performance of any work under said Contract a certification by said subcontractor, regardless of tier, that it will comply with the minority manpower ratio and specific affirmative action steps contained in these Appendices.

THE BIDDER ALSO CERTIFIES AND ASSURES THAT HE WILL MAKE SUFFICIENT REASONABLE EFFORTS TO MEET THE DISADVANTAGED BUSINESS ENTERPRISE (DBE) STATED GOAL ESTABLISHED FOR THIS CONTRACT.

Full name and address of the individual or concern submitting this bid:

Signed: _____

Title: _____

Date: _____

NOTICE: Bid should be signed in ink by a person having proper legal authority, and the person's title should be given, such as "owner" in the case of an individual, "partner" in the case of a general partnership, "president", "treasurer" or other authorized officer in the case of a Corporation.

BIDDERS MUST SET FORTH ACCURATE AND COMPLETE INFORMATION AS REQUIRED BY THIS SOLICITATION. FAILURE TO DO SO MAY RENDER THE OFFER NONRESPONSIVE OR UNACCEPTABLE.

ATTACH BID DEPOSIT HERE

NOTE: If the Bidder is a corporation, indicate state of incorporation; if a partnership, give full Names and addresses of all partners; if an individual, give residential address if different from business address; and if joint ventures, give names and addresses of all firms of the joint venture.

If a **Corporation**

Incorporated in what State: _____

President: _____

Treasurer: _____

Secretary: _____

If a **Partnership** (Name all Partners):

Name of Partner: _____

Residence: _____

Name of Partner: _____

Residence: _____

If an **Individual**:

Name: _____

Residence: _____

If an **Individual Doing Business Under a Firm Name**:

Name of Firm: _____

Name of Individual: _____

Business Address: _____

Residence: _____

If a Joint Venture:

Name of Venture: _____

Business Address: _____

Name of Firm or Corporation: _____

Address: _____

If any of the joint ventures is a corporation a copy of the vote of the corporation authorizing the joint venture should be attached hereto.

The proposed surety on the bond to be given is:

Name: _____

Home office Address: _____

Massachusetts Address (If Different): _____

AFFIDAVIT

State of _____)

ss. : (Date) _____, 20

County _____)

The undersigned being duly sworn, deposes and says that he is the

(sole owner; partner; president, treasurer, or other duly authorized official of a corporation)
of

(Name of bidders as appearing in submitted bid)

for work in _____ on _____ ;
(City / Town) (opening date of bids)

and certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Signature and Title of Person making Affidavit

Sworn to before me this

_____ day of _____ 20

Notary Public

BUY AMERICA CERTIFICATE

Certification requirement for procurement of steel, iron, or manufactured products

Certificate of Compliance with 49 U.S.C. 5323(j)(1)

The bidder hereby certifies that it will meet the requirements of 49 U.S.C. 5323(j)(1) and the applicable regulations in 49 CFR Part 661.

Date

Signature

Company Name

Title

OR

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(1)

The bidder hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j)(1), but it may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(B) or (j)(2)(D) and the regulations in 49 CFR 661.7.

Date

Signature

Company Name

Title

A BIDDER WILL NOT BE ELIGIBLE FOR AWARD OF ANY CONTRACT UNDER THIS INVITATION FOR BIDS UNLESS SUCH BIDDER HAS SUBMITTED AS PART OF ITS BID THE FOLLOWING CERTIFICATION WHICH WILL BE DEEMED A PART OF THE RESULTING CONTRACT.

RIGHT-TO-KNOW LAW

CERTIFICATION

The Bidder hereby certifies that, if awarded this Contract, he will fully comply with the Massachusetts Right-to-Know Law, c. 470 of the Acts of 1983, (the Act.). In addition, he shall:

1. Obtain a Material Safety Data Sheet, (MSDS), for all substances or mixtures of substances which appear on the Massachusetts Substance List that he or any of his subcontractors brings to or uses on the worksite and will keep a copy of that MSDS on the worksite of this Contract.
2. Label each container of a substance or mixture of substances on the Massachusetts Substance List as required in §7 of the Act.
3. Provide the same training and non-technical instruction that he is required to provide under §15 of the Act to all MBTA employees who are exposed to the substance or to the mixture of substances. Training shall include instruction on the nature and effects of any substance or mixture of substances listed on the Massachusetts Substance List which the Bidder or any of his subcontractors brings to or uses on the worksite.
4. Provide to MBTA employees on the worksite the same protective equipment that the Bidder or any of his subcontractors provides to his employees.

Signature of Authorized Representative of Bidder

Name and Address of Bidder

CERTIFICATION OF DUMPING FACILITIES

I, _____

certify that I have adequate dumping facilities available at; _____

and that these facilities will be used in connection with work undertaken on this Contract and that such use will be in a manner compliant with State and Local requirements.

Signature of Authorized Representative Bidder

Name and Address of Bidder:

Date

CERTIFICATION OF EXAMINATION
OF
AVAILABLE SUBSURFACE DATA

Bidder certifies that it has either examined (yes) or not examined (no) the available Subsurface Conditions Data listed in Article 1.4 of the Instruction to Bidders as follows:

A. GEOTECHNICAL

1. The Geotechnical Design Memorandum for the **Fitchburg Commuter Rail Line Improvement Project, South Acton Station** dated March 30, 2009 included in Appendix C.

Yes ____

No ____

B. ENVIRONMENTAL

1. Not Available

Yes ____

No ____

Signature of Authorized Representative of Bidder

Name of Firm or Corporation

Business Address

Date

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION
INELIGIBILITY AND VOLUNTARY EXCLUSION**

The Primary Participant (potential contractor for a major third party contract) certifies to the best of its knowledge and belief, that it, and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal, State or local department or agency.
2. Have not within a three-year period preceding this bid been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph, (2) of this certification; and
4. Have not within a three-year period preceding this bid had one or more public transactions (Federal, State or local) terminated for cause of default.

If the Primary Participant (potential contractor for a major third party contract) is unable to certify to any of the statements in this certification with respect to it or its principals, the Bidder shall attach an explanation to this certification).

THE PRIMARY PARTICIPANT (POTENTIAL CONTRACTOR FOR A MAJOR THIRD PARTY CONTRACT) CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE THERETO.

Primary Participant: _____
Signature

Title of Authorized Official

The undersigned chief legal counsel for the _____ hereby certifies
that _____ has authority under State and local law to comply with the
(Authorized Official)

subject assurances and that the certification above has been legally made.

Signature of Applicant's Attorney

Date

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION
INELIGIBILITY AND VOLUNTARY EXCLUSION**

Primary Covered Transactions

1. By signing and submitting this Proposal the prospective participant is providing the certification in accordance with 49 CFR Part 29.
2. The inability of a person to provide the certification will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification. 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 this prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
3. The certification is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
4. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
5. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this agreement.
6. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -Lower Tier Covered Transaction", without modification, in all lower tier covered transactions and in all solicitations for lowered tier covered transactions.
7. Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION
INELIGIBILITY AND VOLUNTARY EXCLUSION**

The Lower Tier Participant (potential third party contractor or potential subcontractor under a third party contract) certifies by submission of this proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or Voluntarily excluded from covered transactions by any Federal, State or local department or agency.

If the Lower Tier Participant (potential third party contractor or potential subcontractor under a third party contract) is unable to certify to any of the statements in this certification, such Participant shall attach an explanation to this Proposal.

THE LOWER TIER PARTICIPANT (POTENTIAL THIRD PARTY CONTRACTOR OR POTENTIAL SUBCONTRACTOR UNDER A THIRD PARTY CONTRACT) CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE THERETO.

Lower Tier Participant

(Signature)

(Title)

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION
INELIGIBILITY AND VOLUNTARY EXCLUSION**

"INSTRUCTIONS FOR CERTIFICATION"

Lower Tier Covered Transactions

1. By signing and submitting this proposal the prospective lower tier participant is providing the certification in accordance with 49 CFR Part 29.
2. This certification 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.
3. 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.
4. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
5. The prospective lower tier participation 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", without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
6. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may check the Nonprocurement List.
7. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
8. Except for transactions authorized under paragraph (4) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, 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 OF RESTRICTIONS ON LOBBYING

No Federal appropriated funds have been paid, or will be paid, by or on behalf of the undersigned, to any person for the influencing or the attempting to influence an officer or employee of any agency, 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 of any cooperative agreement and the extension, continuation, renewal, Amendment, or modification of any cooperative of any Federal contract, grant, loan or agreement.

THE PRIMARY PARTICIPANT (POTENTIAL CONTRACTOR FOR A MAJOR THIRD PARTY CONTRACT) CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE THERETO.

Primary participant:

Signature

Title of Authorized Official

The undersigned chief legal counsel for the _____ hereby certifies
that _____ has authority under State and local law to comply with
(Authorized Official)

the subject assurances and that the certification above has been legally made.

Signature of Applicant's Attorney

Date

CERTIFICATION OF CONSTRUCTION EQUIPMENT STANDARD COMPLIANCE

I, _____
Hereby certify that all diesel construction equipment used in this contract has emission control devices installed, such as oxidation catalysts or particulate filters on the exhaust system side of the diesel combustion engine equipment.

Signature of Authorized Representative/Bidder

Name and Address of Bidder

Date

Form A

**SCHEDULE OF PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISE
(TO BE ATTACHED TO THE BID FORM)**

PROJECT No. G67CN01 LOCATION South Acton Station

(NAME OF PRIME BIDDER)

NAME OF DISADVANTAGED BUSINESS ENTERPRISE	ADDRESS	TYPE OF WORK AND CONTRACT ITEMS OR PARTS THEREOF TO BE PERFORMED	PROJECTED START AND FINISH DATE FOR WORK	AGREED PRICE

A COPY OF THE DBE'S MOST RECENT CERTIFICATION AND AN ORIGINAL AFFIDAVIT MUST BE ATTACHED TO THIS SCHEDULE

V. Form B

MBTA Contract No. G67CN01
Description South Acton Station

**DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION
LETTER OF INTENT**

To:

(Name of Prime Bidder)

The undersigned intends to perform work in connection with the above project as (check one):

_____ an individual _____ DBE
_____ a partnership _____ a joint venture
_____ a corporation

The Disadvantaged Business status of the undersigned is confirmed:

- (a) on the reference list of Disadvantaged Business Enterprises dated _____, or
- (b) on the attached Disadvantaged Business Enterprise Identification Statement.

The undersigned is prepared to perform the following work in connection with the above project,
(Specify in detail particular work items or parts thereof to be performed):

at the following price: _____

You have projected the following commencement date for such work, and the undersigned is projecting completion of such work as follows:

Items	Projected Commencement Date	Projected Completion Date
_____	_____	_____
_____	_____	_____
_____	_____	_____

The above work will not be sublet to a non-Disadvantaged Business Enterprise at any tier. The undersigned will enter into a formal agreement for the above work with you, conditioned upon your execution of a contract with the MBTA.

Date _____

Name of Disadvantaged Business Enterprise

By _____

V. Form C

MBTA Contract No: G67CN01
Description : South Acton Station

DBE AFFIDAVIT

STATE OF _____ (Date _____)

COUNTY OF _____ S.S.

The undersigned being duly sworn, deposes and says that he/she is the

_____ (sole owner;
partner; president; treasurer; or other duly authorized official of a corporation)

of _____
(Name of DBE)

and certifies that since the date of its certification by

_____ (SOMWBA or out-of-state certification agency)

the certification has not been revoked nor has it expired nor has there been any change in the minority

status of _____
(Name of DBE)

(Signature and Title of Person Making Affidavit)

Sworn to before me this _____ day of _____ 19

(Notary Public)

NOTE: The Bidder must attach the DBEs most recent certification letter to this affidavit.

CERTIFICATION OF UNDOCUMENTED WORKERS

Contractor Legal Name: _____

INSTRUCTIONS:

Executive Order 481 applies to all state agencies in the Executive Branch, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established. As it is the policy of the Executive Branch to prohibit the use of undocumented workers in the connection with the performance of state and federal contracts, all contracts entered after February 23, 2007 require that consultants, contractors and vendors, as a condition of receiving Commonwealth funds under any Executive Branch contract, make the following certification:

As evidence by the signature of the Authorized Signatory below, the Contractor certifies that under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in the connection with the performance of all Executive Branch contracts; that pursuant to federal requirements, the Contractor, shall verify the immigration status of all workers assigned to such contract without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker(s). The Contractor understands and agrees that breach of any of these terms during the period of each contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

_____ Date: _____
Authorized Signature

Print Name

Title: _____ Telephone: _____

Fax: _____ Email: _____

The Contractor is required to sign this Certification only and may provide a copy of the signed Certification for any contract executed with Executive Branch Department. A copy of this signed Certification must be attached to the "record copy" of all contracts with Contractors with the Contracting Department.

M.G.L. Chapter 30, Section 39S- Certification of Work in Harmony and OSHA Training

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

The undersigned certifies, under penalties of perjury, as required by M.G.L. Chapter 30, Section 39S: That the contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

Additionally, the contractor shall comply with provisions set forth in Chapter 30 Section 39S and referenced in Specification 07000 - General Conditions, Section 5.15.K.2. Please note that this certification must be passed on to any and all contracts and subcontracts between the General Contractor and other parties.

Authorized Bidder Signature

Date

Title of Signee

Name and Address of Bidder

**Contractor Certification
MBTA Retiree Participation Disclosure**

In accordance with the MBTA Hiring of MBTA Retirees Policy, Section 3.3 dated June 5, 2009, THE CONTRACTOR IS REQUIRED TO NOTIFY THE MBTA THAT A MBTA RETIREE HAS BEEN INCLUDED AS A MEMBER OF ITS TEAM.

Every contractor is required to notify the MBTA as part of the bidding process that a MBTA retiree will be included as a member of its team. The contractor shall be required to provide the name and date of retirement for each MBTA retiree on the team. Every MBTA retiree working for the MBTA under this condition shall do so in accordance with MGL, Chapter 268A, Section 5.

The Contractor certifies that the following MBTA Retirees are assigned to the team for this contract. Use additional pages as necessary.

Project Name: _____

<u>Firm Name</u>	<u>Retiree Name</u>	<u>MBTA Retirement Date</u>
------------------	---------------------	-----------------------------

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Name of Authorized Bidder

Title of Authorized Bidder

Firm

Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

BIDDERS CHECKLIST FOR INFORMATION ONLY

MBTA Contract No. G67CN01, Fitchburg Commuter Rail Line Improvement Project, South Acton Station,

This checklist is provided to assist Bidders in determining that required signatures and submittals are included along with the Bid Proposal.

	ITEM	REFERENCE PAGE Section 00410	ACTION REQUIRED
1	Addenda acknowledged	3	Acknowledge all addenda issued
2	Letter of Commitment furnished from proposed surety	N/A	Attach letter
3	Certification pertaining to ineligible contractors completed	5	Bidder's authorized signature
4	Bid signature(s) including EEO certification and DBE assurance	6	Bidder's authorized signature
5	Required proposal guarantee (bid deposit furnished)	6	Attach amount as indicated
6	Bidder's data including joint venture authorization	7 and 8	Furnish data
7	Affidavit of non-collusion Completed	9	Bidder's authorized signature(notarized)
8	Buy America Certificate Completed	10	Data and Bidder's authorized signature
9	Right-To-Know Law Certification	11	Bidder's authorized signature
10	Certification of Dumping Facilities completed	12	Data and Bidder's authorized signature
11	Certification of Examination of Available Subsurface Data completed	13	Completed and Bidder's authorized signature
12	Certification relating to Debarment, Suspension, ineligibility, and Voluntary exclusion	14 through 17	Bidder's authorized signature
13	Certification of restrictions on lobbying	18	Bidder's authorized signature
14	Certification of Construction Equipment Standard Compliance	19	Bidder's authorized signature
15	Forms for participation by DBE Completed	20 through 23	Furnish information and authorized signatures
16	DBE's Affidavit and most recent certification	22	Completed Affidavit and attach DBE certification
17	Certification of Undocumented Workers	24	Bidder's authorized signature
18	M.G.L. Chapter 30, Section 39S – Certification of Work in Harmony and OSHA Training	25	Bidder's authorized signature
19	MBTA Retiree Participation Disclosure	26	Bidder's authorized signature

**NOTE: Disadvantaged Business Enterprise (DBE) stated goal is18%
 Minority Manpower Utilization (MMU) percent is.....5%
 Female Construction Workforce: 6.9% per trade
 NA = Not Applicable**

CONTRACT AND BOND FORMS

CONTRACT

Individual Form 00510-2 - 00510-3

Corporation Form 00510-4 - 00510-5

PERFORMANCE BOND

00510-6 - 00510-7

LABOR AND MATERIALS PAYMENT BOND

00510-8

ESCROW BID DOCUMENTS

00510-9 – 00510-20

NOTE: Bond Forms are not to be filled out when submitting Bid Form.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

CONTRACT

Clause 1. - This agreement, made this _____ day of _____ in the year two thousand and _____ between the Massachusetts Bay Transportation Authority, and _____, herein called the Contractor.

Clause 2. - Witnesseth, that the parties to this agreement, each in consideration of the agreements on the part of the other herein contained, do hereby agree, the Massachusetts Bay Transportation Authority for itself, and said Contractor for himself/themselves and his/their heirs, executors, administrators and assigns, as follows:

The Contractor agrees to furnish all equipment, machinery, tools and labor, to furnish and deliver all materials required to be furnished and delivered in and about the improvement and to do and perform all work under

MBTA Contract No. G67CN01, FITCHBURG COMMUTER RAIL LINE IMPROVEMENT PROJECT, SOUTH ACTON STATION, ACTON, MASSACHUSETTS for a sum not to exceed

\$ _____ ()
based upon a schedule of unit, lump sum and allowance bid prices

in strict conformity with the provisions herein contained and of the Notice to Bidders, Bid Form, Supplementary Conditions, Addenda, and Specifications hereto attached and with plans referred to therein. All Specifications, Supplementary Conditions, Plans, Notice to Bidders, Addenda, and Bid Form are hereby specifically made a part of this contract as fully and to the same effect as if the same had been set forth at length herein.

Clause 3. - In consideration of the foregoing premises the Massachusetts Bay Transportation Authority agrees to pay as full compensation for everything furnished and done by the Contractor under this Contract, including all work required but not shown on the plans for the items herein mentioned, and also for all loss of damage arising out of the nature of the work aforesaid, or from the action of the elements (except as excluded in the Standard Specifications, Section 00700, Article 5.19, or the Supplementary Conditions thereto) or from any delay or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description in connection with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work as herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such prices as are set out in the accompanying Bid Form and for all work required, for which there is no item in the Bid Form, such compensation as is provided for in the aforesaid Specifications.

In witness whereof, the said Contractor has/have hereto set his/their hands and seals, and the said Massachusetts Bay Transportation Authority has executed these present by its authorized representatives on the year and day above written.

By _____

_____ Contractor

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

BY:

Jonathan R. Davis
Acting General Manager of the MBTA and Rail & Transit Administrator of
MassDOT

APPROVED AS TO FORM:

Rachael Rollins
General Counsel

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

CONTRACT

Clause 1. - This agreement, made this _____ day of _____, in the year two thousand _____, between the Massachusetts Bay Transportation Authority, and _____ herein called the Contractor.

Clause 2. - Witnesseth, that the parties to this agreement, each in consideration of the agreement on the part of the other herein contained, do hereby agree, the Massachusetts Bay Transportation Authority for itself, and said Contractor for itself and its successors and assigns, as follows:

The Contractor agrees to furnish all equipment, machinery, tools and labor, to furnish and deliver all materials required to be furnished and delivered in and about the improvement and to do and perform all work under

MBTA Contract No. G67CN01, FITCHBURG COMMUTER RAIL LINE IMPROVEMENT PROJECT, SOUTH ACTON STATION, ACTON, MASSACHUSETTS for a sum not to exceed

\$ _____ ()
based upon a schedule of unit, lump sum and allowance bid prices,

in strict conformity with the provisions herein contained and of the Notice to Bidders, Bid Form, Supplementary Conditions, Addenda, and Specifications hereto attached, and with the plans referred to therein. All plans, Specifications, Supplementary Conditions, Notice to Bidders, Addenda, and Bid Form are hereby specifically made a part of this contract as fully and to the same effect as if the same had been set forth at length herein.

Clause 3. - In consideration of the foregoing premises the Massachusetts Bay Transportation Authority agrees to pay and the Contractor agrees to receive as full compensation for everything furnished and done by the Contractor under this contract, including all work required but not shown on the plans for the items herein mentioned, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements (except as excluded in the Standard Specifications, Section 00700, Article 5.19 or the Supplementary Conditions thereto) or from any delay or from an unforeseen obstruction or any difficulty encountered in the prosecution of the work, and for all risks of every description connected with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work as herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such prices as are set out in the accompanying Bid Form, and for all work required, for which there is no item in the Bid Form, such compensation as is provided for in the aforesaid Specifications.

In witness whereof, the said Contractor has caused these presents to be signed in its name and behalf and its corporate seal to be hereto affixed by

_____ Its _____

and _____ its _____

thereto duly authorized, and the said Massachusetts Bay Transportation Authority has executed these presents by its authorized representatives on the year and day above written.

By: _____

_____ Contractor

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
BY

Jonathan R. Davis
Acting General Manager of the MBTA and Acting Rail & Transit
Administrator of MassDOT

APPROVED AS TO FORM:

Rachael Rollins.
General Counsel

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____
(Insert full name and address and legal title of Contractor)

as Principal, hereinafter
called Contractor, and _____
(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto Massachusetts Bay Transportation Authority as Obligee, hereinafter called Authority, in the amount of _____ Dollars (\$) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,
Contractor has by written agreement dated _____, 20____, entered into a contract with the Authority for MBTA Contract No. G67CN01 which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Authority.

Whenever Contractor shall be, and is declared by the Authority to be in default under the Contract, the Authority having performed Authority's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

- 1) Complete the Contract in accordance with it terms and conditions, or
- 2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Authority elects, upon determination by the Authority and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and the Authority, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the Authority to Contractor under the Contract and any amendments thereto, less the amount properly paid by the Authority to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Authority or the heirs, executors, administrators or successors of the Authority.

Signed and sealed this _____ day of _____ 20_____.

WITNESS:

PRINCIPAL:

_____ (Seal)

(Title)

WITNESS:

SURETY:

_____ (Seal)

* _____
(Title)

***Attach hereto proof of authority of officers or agents to sign bond.**

LABOR AND MATERIALS PAYMENT BOND

Know all men by these presents, that _____
_____ as principal, and _____
_____ as surety, are held and firmly
bond unto the Massachusetts Bay Transportation Authority (MBTA) in the sum of
\$ _____
lawful money of the United States of America, to be paid to the MBTA, for which payments, well and truly to
be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and
severally, firmly by these presents.

Whereas, the said principal has made a contract with the MBTA for the construction of a new Commuter Rail
Station and associated infrastructure under **MBTA Contract No. G67CN01, FITCHBURG COMMUTER
RAIL LINE IMPROVEMENT PROJECT, SOUTH ACTON STATION, ACTON, MASSACHUSETTS.**

Now the condition of this obligation is such that if the principal and its subcontracts shall pay for all labor
performed or furnished and for all materials and equipment used or employed in said contract and in: any and
all duly authorized modifications, alterations, extensions, changes or additions thereto, all as set forth in
Massachusetts General Laws, Chapter 149 Section 29 and Chapter 30 Section 39A, then this obligation shall
become null and void; otherwise it shall remain in full force and virtue, the rights and obligations of the
principal, the surety and claimants being as set forth in said M.G.L. c. 149. 29.

The surety hereby stipulates and agrees that no change or modification in, or extension of time, or
alterations or additions to the contract or in the work shall in any way affect its obligations on this Bond and
does hereby waive notice of any such change, modification, extension, alteration or addition.

In witness whereof we hereunto set our hands and seals this ____ day of _____ 20__.

(Print Name of General Contractor/ Principal)

By: _____
(Signature - Title)

(Print Name of Surety) (Seal)

By : _____
(Signature - Title)

Business Address _____

Countersigned MA Resident Agent by _____

Address _____

Telephone No. _____

Attach herewith proof of authority of officers or agents to sign the bond.

SECTION 00510
ESCROW BID DOCUMENTS

THE REQUIREMENTS

A. Scope

1. The purpose of this specification is to preserve the bid documents of the successful bidder (Contractor) for use by the parties in any claims, change orders, or litigation between the Authority and Contractor arising out of this contract.
2. The low bidder shall submit one (1) legible copy of all documentary information including, but not limited to, electronic files generated in preparation of bid prices for this project. This material is hereinafter referred to as “Escrow Bid Documents.” The term “Escrow Bid Documents” as used in this specification means all writings, working papers, computer print outs, charts, and all other data compilations which contain or reflect information, data and calculations used by the Contractor to determine the bid in bidding for this project. The term “Escrow Bid Documents” also includes any manuals which are standard to the industry used by the Contractor in determining the bid to this project. Such manuals may be included in the bid documentation by reference. Such reference shall include the name and date of the Publication and the Publisher. The term does not include bid documents provided by the Authority for use by the Contractor in bidding on this project.
3. The low bidder shall certify that the Escrow Bid Documents constitute all of the information used in preparation of the Bid, and that no other bid preparation information shall be considered in resolving disputes or claims. The successful bidder also agrees that nothing in the Escrow Bid Documents shall change or modify the terms or conditions of the Contract Documents. In the event the Contractor omits information used in estimating its costs for the bid, then the Contractor will forfeit the ability, in connection with any claim, change, or litigation, to prove what it carried in its bid for the cost of the relevant item of work for which the information was omitted. For example, if the contractor has a claim for labor or material escalation and it omits from the Escrow Bid Documents the worksheets it prepared or the supplier quotes it received for the labor or materials for which escalation is claimed, then the Contractor will be precluded from presenting evidence of what it actually carried in its bid for labor or material.

B. Submittal Of Escrow Bid Documents

1. The Escrow Bid Documents are to be submitted to the following Escrow Agent:

ATTN:

Robinson & Cole LLP
One Boston Place, Suite 2500
Boston, Ma 02108
Attn: Matthew Lawlor, Esquire
Phone: (617) 557-5948

2. The low bidder will be required to execute an escrow agreement with the Authority and the Escrow Agent in the form attached as Exhibit 3. The low bidder shall submit a signed Escrow Agreement in triplicate and the Escrow Bid Documents to the Escrow Agent in a sealed container acceptable to the Escrow Agent, no later than five business days following the Notice of Award. 24-hour advance notice to the Escrow Agent is required prior to submitting the Escrow Bid Documents. The construction contract will not be executed until the Bid Documentation Certification (Exhibit 1) and the Bid Documentation Delivery Certification (Exhibit 2) has been delivered as set forth in section B.3. The container shall be clearly marked "Bid Documentation" and shall also show on the face of the container the Contractor's name, the date of submittal and the Contract Number. Compliance with the provisions of Section 00510 is within the discretion of the Authority.
3. The bidder shall obtain certification from the Escrow Agent in the form attached as Exhibit 2 and will deliver that acknowledgement and a copy of the Bid Documentation Certification form (Exhibit 1) to the Authority within said 5 days.
4. The Escrow Bid Documents shall be accompanied with the certification (attached as Exhibit 1) signed by an individual authorized by the Bidder to execute Bids, stating that the material in the Escrow Bid Documents constitutes all the documentary information used in preparation of the Bid and that the Bidder has personally examined the contents of the Escrow Bid Documents container and has found that the documents in the container are complete and meets the requirements of this Section 00510.

C. Ownership

1. The Escrow Bid Documents are, and shall always remain, the property of the Contractor, subject to joint review by the Authority and the Contractor as provided herein. The Escrow Bid Documents are proprietary and secret information belonging to the Contractor.
2. The Authority stipulates and expressly acknowledges that the Escrow Bid Documents, as defined herein, constitute trade secrets. This acknowledgement is based on the Authority's express understanding that the information contained in the Escrow Bid Documents is not known outside the Bidder's business, is known only to a limited extent and only to a limited number of employees of the Bidder, is safeguarded while in the Bidder's possession, is extremely valuable to the Bidder and could be extremely valuable to the Bidder's competitor by virtue of it reflecting the Bidder's contemplated techniques of construction. The Authority acknowledges that the Bidder expended substantial sums of money in developing the information included in the Escrow Bid Documents and further acknowledges that it would be difficult for a competitor to replicate the information contained therein. The Authority further acknowledges that the Escrow Bid Documents include a compilation of information used in the bidder's business, intended to give the Bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The Authority further agrees to safeguard the Escrow Bid Documents, and all information contained therein, against disclosure to the fullest extent permitted by law.

D. Purpose

3. The purpose of the Escrow Bid Documents procedure is intended to create a spirit of cooperation in an atmosphere of honesty between the Authority and the Contractor.
4. Escrow Bid Documents will be used to assist in the negotiation of price adjustments and Change Orders and in the settlement of disputes and claims. They will not be used for pre-award evaluation of the contractor's anticipated methods of construction or to assess the contractor's qualifications for performing work.

E. Format and Content

1. Bidders may submit Escrow Bid documents in their usual cost estimation format; provided that all information is clearly presented and ascertainable. It is not the intention of this Article to cause the Bidder extra work during the preparation of the Bid, but to ensure that the Escrow Bid Documents will be adequate to enable complete understanding and proper interpretation for their intended use. The Escrow Bid Documents shall be in English.

F. Not Used.

G. Payment

1. There will be no separate payment for compilation of the data, container or cost of verification of the Escrow Bid Documents. All costs shall be included in the overall Contract bid price.

H. Storage

1. The Escrow Bid Documents of the successful low bidder will be placed in escrow for the life of the Contract with the Escrow Agent. The cost of storage will be paid by the Authority.

I. Examination

1. The Escrow Bid Documents shall be examined by both the Authority and the Contractor, at any time deemed necessary by the Authority and/or the Contractor; provided, however, that the Escrow Bid Documents may only be examined for the purpose of determining the costs carried in the Contractor's bid for those specific items of work that are the subject of negotiation of price adjustments and Change Orders or the settlement of disputes and claims. No other documents may be examined. The Authority may delegate review of relevant Escrow Bid Documents to members of its construction management staff and/or consultants.
2. Examination of the Escrow Bid Documents is subject to the following conditions:
 - a. As trade secrets, the Escrow Bid Documents are proprietary and confidential to the extent provided by law.

- b. Access to the Escrow Bid Documents may take place only in the presence of duly designated representatives of both the Authority and the Contractor. The AUTHORITY and CONTRACTOR shall provide written direction signed by the AUTHORITY and CONTRACTOR to the ESCROW AGENT directing that the Escrow Bid Documents be made available for such joint examination. The Authority or the Contractor shall give at least 5 business days written notice to the other's project manager of its request to examine the Escrow Bid Documents. Refusal by Contractor to be present or to cooperate in any way in the review of the documents after the provision of the written notice by the Authority, will be the basis for the Authority to reject the claim.
5. The Escrow Bid Documents at all times remain the property of the Contractor and the Authority will take all reasonable steps necessary to protect confidentiality to the fullest extent permitted by law.
6. The Authority agrees to notify the Contractor of its receipt of any request made pursuant to M.G.L.c.66§10 to inspect or examine any material contained in the Escrow Bid Documents.

J. Final Disposition

1. The Escrow Bid Documents will be promptly returned to the Contractor by the Escrow Agent when all of the following have occurred:
 - a. all disputes regarding the contract work have been settled,
 - b. the contract work has been completed and,
 - c. Final Payment has been made and accepted.
2. The AUTHORITY and the CONTRACTOR shall provide joint written confirmation of the above to the ESCROW AGENT to allow the ESCROW AGENT to release the Escrow Bid Documents.

EXHIBIT 1

BID DOCUMENTATION CERTIFICATION

THE UNDERSIGNED HEREBY CERTIFIES THAT THE BID DOCUMENTATION CONTAINED HEREIN CONSTITUTES ALL OF THE INFORMATION USED IN PREPARATION OF THE BID; THAT NO OTHER BID PREPARATION INFORMATION SHALL BE CONSIDERED IN RESOLVING DISPUTES OR CLAIMS; AND THAT I HAVE PERSONALLY EXAMINED THESE CONTENTS AND HAVE FOUND THAT THIS BID DOCUMENTATION IS COMPLETE AND MEET THE REQUIREMENTS OF SECTION 00510.

SIGNATURE: _____

NAME: _____

TITLE: _____

CONTRACT NO. _____

CONTRACTOR: _____

DATE: _____

EXHIBIT 2

BID DOCUMENTATION DELIVERY

---- CERTIFICATION ----

ROBINSON & COLE LLP, as ESCROW AGENT, identified in Massachusetts Bay Transportation Authority Contract No. G67CN01, hereby certifies that _____ [NAME OF BIDDER] as identified by _____ [REPRESENTATIVE OF BIDDER] has delivered to ESCROW AGENT's office for storage, a sealed container which BIDDER represents to be all documentation used in the preparation of BIDDER's bid, otherwise known as the "Escrow Bid Documents," as BIDDER represents it is required to do in accordance with the Contract Documents of the above referenced Contract, on this ____ day of _____, 20__.

ROBINSON & COLE LLP

By: _____

Name: _____

Title: _____

Exhibit 3

ESCROW AGREEMENT

This ESCROW AGREEMENT (this "Agreement") is dated the ___ day of _____, 20___, by and among the MASSACHUSETTS BAY TRANSPORTATION AUTHORITY (the "MBTA" or the "AUTHORITY"); _____ ("BIDDER"); and Robinson & Cole LLP as Escrow Agent ("ESCROW AGENT").

RECITALS

WHEREAS, the AUTHORITY is a public body politic and corporate and political subdivision of the Commonwealth of Massachusetts created by Chapter 161A of the Massachusetts General Laws, as amended, which is presently engaged in a competitive bidding process governed by law to award a construction contract to the lowest responsible and eligible bidder for a construction project entitled MBTA Contract No. **G67CN01, FITCHBURG COMMUTER RAIL LINE IMPROVEMENT PROJECT, SOUTH ACTON STATION, ACTON, MASSACHUSETTS** (the "Contract"); and

WHEREAS, BIDDER has submitted a bid on the Contract and is the low bidder therefore; and

WHEREAS, Section 00510 of the documents for the Contract (the "Contract Documents") requires the low bidder to submit, within five business days following the Notice of Award, one copy of all documentary information generated in preparation of bid prices for the Contract, which information is hereinafter referred to as "Escrow Bid Documents," to ESCROW AGENT together with a certification in the form contained in the Contract Documents; and

WHEREAS, ESCROW AGENT, for stated consideration, is willing to assume the obligations of ESCROW AGENT as agreed herein;

NOW, THEREFORE, for consideration mutually acknowledged, the AUTHORITY, BIDDER and ESCROW AGENT hereby agree as follows:

1. Escrow of Bid Documents. BIDDER shall comply with the provisions of Section 00510 of the Contract Documents by delivering a complete copy of the Escrow Bid Documents to ESCROW AGENT in a sealed container acceptable to the Escrow Agent within the required time limit and otherwise complying with Section 00510 of the Contract Documents together with the required Bid Documentation Certification (Exhibit 1 of Section 00510). BIDDER will receive from ESCROW AGENT a Bid Documentation Delivery Certification (Exhibit 2 of Section 00510) at the time BIDDER delivers the Escrow Bid Documents to ESCROW AGENT. BIDDER will deliver an original of ESCROW AGENT's Bid Documentation Delivery Certification and a copy of BIDDER's Bid Documentation Certification to the AUTHORITY within the required time limit.

2. Protection of Bid Documents. The AUTHORITY shall comply with the provisions of Section 00510 of the Contract Documents regarding receipt, storage, and use of the Escrow Bid Documents and will safeguard the Escrow Bid Documents and all information contained therein against disclosure to the fullest extent permitted by law.

3. Holding of Bid Documents by ESCROW AGENT. ESCROW AGENT is hereby expressly authorized and agrees to receive, store, safeguard, release, and return the Escrow Bid Documents during the duration of the Contract as set forth in this Agreement..

4. Return/Release of Bid Documents. ESCROW AGENT is expressly authorized to release the Escrow Bid Documents only under the following circumstances:

(a) In order to return the Escrow Bid Documents to BIDDER if the AUTHORITY informs ESCROW AGENT in writing that BIDDER and the AUTHORITY have not executed the Contract; or

(b) For joint examination by the AUTHORITY and BIDDER after delivery of a written direction signed by both the AUTHORITY and BIDDER; or

(c) For return to BIDDER when ESCROW AGENT has received joint written confirmation from the AUTHORITY and BIDDER that all of the following have occurred: all disputes regarding the Contract work have been settled, the Contract work completed and Final Payment has been made and accepted; or

(d) Upon joint written direction from the Authority and Bidder, either under such circumstances as is provided for in Section 00510 of the Contract Documents, or as otherwise directed by mutual agreement of the AUTHORITY and BIDDER, which direction shall be delivered in writing by the AUTHORITY, signed by both parties, to ESCROW AGENT.

5. ESCROW AGENT's Obligations and Protection. AUTHORITY and BIDDER further acknowledge and agree as follows:

(a) That ESCROW AGENT (i) shall not be responsible for any of the agreements referred to herein but shall be obligated only for the performance of such duties as are specifically set forth in this Escrow Agreement; (ii) shall not be obligated to take any legal or other action hereunder which might in its judgment involve any expense or liability unless it shall have been furnished with acceptable indemnification; (iii) may rely on and shall be protected in acting or refraining from acting upon any written notice, instruction, instrument, statement, request or document furnished to it hereunder and believed by it to be genuine and to have been signed or presented by the proper person, and shall have no responsibility for determining the authenticity or accuracy thereof; and (iv) may consult counsel satisfactory to it, including counsel internal to ESCROW AGENT, and the opinion of such counsel shall be full and complete authorization and protection in respect of any action taken, suffered or omitted by it hereunder in good faith and in accordance with the opinion of such counsel.

(b) That neither ESCROW AGENT nor any of its partners, officers, or employees shall be liable to anyone for any action taken or omitted to be taken by it or any of its partners, officers, or employees hereunder except in the case of gross negligence or willful misconduct. The AUTHORITY and BIDDER, jointly and severally, covenant and agree to indemnify ESCROW AGENT and hold it harmless without limitation from any loss, liability, or expense of any nature incurred by ESCROW AGENT arising out of or in connection with this Agreement or with the administration of its duties hereunder, including but not limited to legal fees and other costs and expenses of defending or preparing to defend against any claim or liability unless such loss, liability, or expense shall be caused by ESCROW AGENT's willful misconduct or gross negligence. In no event shall ESCROW AGENT be liable for indirect, special, or consequential damages. Notwithstanding any provision of this Agreement to the contrary, ESCROW AGENT'S liability shall be limited to the value of its compensation hereunder.

(c) That the AUTHORITY shall pay or reimburse ESCROW AGENT for any legal fees incurred by ESCROW AGENT in connection with the preparation of this Agreement and in addition compensate ESCROW AGENT for its services hereunder in accordance with the Revised Estimate for MBTA Bid Escrow Agent Services dated December 18, 2009. ESCROW AGENT shall be entitled to reimbursement on demand for all expenses incurred in connection with the administration of the escrow created hereby which are in excess of its compensation for normal services hereunder, including without limitation, payment of any legal fees incurred by ESCROW AGENT in connection with resolution of any claim by any party hereunder.

(d) That ESCROW AGENT may at any time for any reason or for no reason resign as ESCROW AGENT hereunder by giving sixty (60) days prior written notice of resignation to AUTHORITY and BIDDER. Prior to the effective date of the resignation as specified in such notice, AUTHORITY will issue to ESCROW AGENT a written instruction authorizing redelivery of the Escrow Bid Documents to another escrow agent that AUTHORITY selects subject to the reasonable consent of BIDDER. If, however, AUTHORITY shall fail to name such a successor escrow agent within forty (40) days after the notice of resignation from ESCROW AGENT, BIDDER shall be entitled to name such escrow agent within twenty (20) days. If no successor escrow agent is named by AUTHORITY or BIDDER within said sixty (60) day period, ESCROW AGENT may apply to a court of competent jurisdiction for appointment of a successor escrow agent.

(e) That ESCROW AGENT's service as escrow agent under this Agreement shall not be construed as constituting legal representation of either AUTHORITY or BIDDER and both AUTHORITY and BIDDER expressly acknowledge, with reference to the rules of professional conduct governing lawyers that ESCROW AGENT's service hereunder is not intended to prevent either the AUTHORITY or BIDDER from retaining ESCROW AGENT as its counsel in any matter, nor shall it be asserted by the AUTHORITY or BIDDER as grounds for disqualifying ESCROW AGENT from representing any client in a matter in which the AUTHORITY's and/or BIDDER's interests are directly adverse to or otherwise different from those of ESCROW AGENT's client. ESCROW AGENT will not knowingly disclose to any such client directly adverse to AUTHORITY and/or BIDDER any confidential information about AUTHORITY and/or BIDDER which ESCROW AGENT has acquired or will acquire pursuant to its services provided in accordance with this Agreement.

(f) That it is the intent of BIDDER and the AUTHORITY that the Escrow Bid Documents remain the sole property of BIDDER.

(g) That the AUTHORITY's maximum obligation under this Agreement is \$15,000. In the AUTHORITY's discretion, the maximum obligation may be increased by written agreement signed by the AUTHORITY and ESCROW AGENT.

6. Dispute Resolution. It is understood and agreed that should any dispute arise with respect to the delivery, ownership, right of possession, access to and/or disposition of the Escrow Bid Documents, or should any such claim be made upon such documents by a third party, ESCROW AGENT upon receipt of written notice of such dispute or claim by the parties hereto or by a third party, is authorized and directed to retain in its possession without liability to anyone, all or any of said Escrow Bid Documents until such dispute shall have been settled either by the mutual agreement of the parties involved or by a final order, decree, or judgment of a court of the United States of America, the time for perfection or any appeal of such order, decree, or judgment having expired. At any time after the ESCROW AGENT becomes aware of a dispute or claim or at any time after one year after the contract completion date in the Contract, ESCROW AGENT may, but shall be under no duty whatsoever to, after thirty days prior written notice to the AUTHORITY and BIDDER, institute or defend any legal proceedings related to the Escrow Bid Documents, including without limitation, commencement of an action in the nature of an interpleader in a court of competent jurisdiction, after depositing the Escrow Bid Documents therewith, for a determination of the respective rights of the AUTHORITY and BIDDER, and, in such case, recover from the AUTHORITY, ESCROW AGENT's costs and expenses including reasonable attorneys' fees .

7. Consent to Jurisdiction and Service. AUTHORITY and BIDDER hereby absolutely and irrevocably consent and submit to the jurisdiction of the courts of the Commonwealth of Massachusetts and of any Federal court located in said Commonwealth in connection with any actions or proceedings brought against AUTHORITY and BIDDER brought by ESCROW AGENT arising out of or relating to this Escrow Agreement. In any such action or proceeding, AUTHORITY and BIDDER hereby absolutely and irrevocably agree that the

service thereof may be made by certified or registered mail directed to AUTHORITY or BIDDER, as the case may be, at their respective addresses in accordance with Section 9 hereof.

8. Force Majeure. Neither AUTHORITY nor BIDDER nor ESCROW AGENT shall be responsible for delays or failure in performance resulting from acts beyond its control. Such acts shall include but not be limited to acts of God, strikes, lockouts, riots, acts of war, epidemics, governmental regulations imposed after the fact, fire, communication line failures, power failures, earthquakes or other disasters.

9. Notices. Any notice permitted or required hereunder shall be deemed to have been duly given if delivered personally or if mailed certified or registered mail, postage prepaid, to the parties at their addresses set forth below or to such other address as they hereafter designate.

If to AUTHORITY:

Massachusetts Bay Transportation Authority
10 Park Plaza, Room 6720
Boston, MA 02116
Attention: Assistant General Manager for Design and Construction
with a copy to MBTA Project Manager for the Contract

If to BIDDER:

Attention: _____

If to ESCROW AGENT:

Robinson & Cole LLP
One Boston Place, Suite 2500
Boston, MA 02108
Attention: Matthew J. Lawlor, Esq.

10. Binding Effect. This Agreement shall be binding upon the respective parties hereto and their heirs, executors, successors, and assigns.

11. Modification/Termination. This Agreement may not be altered, modified, or terminated without the express written consent of the parties hereto. No course of conduct shall constitute a waiver of any of the terms and conditions of this Agreement, unless such waiver is specified in writing, and then only to the extent so specified. A waiver of any terms and conditions of this Agreement on one occasion shall not constitute a waiver of the other terms of this Agreement, or of such terms and conditions or any other occasion.

12. Governing Law. This Agreement shall be governed by and construed under the laws of the Commonwealth of Massachusetts.

13. Counterparts. This Agreement may be executed in multiple counterparts, each of which shall be deemed an original, but all of such counterparts shall together constitute but one and the same instrument.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement effective as of the day and year first written above.

AUTHORITY

MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY

By: _____
Name: _____
Title: Assistant General Manager for Design
and Construction

BIDDER

By: _____
Name: _____
Title: _____

ESCROW AGENT

ROBINSON & COLE LLP

By: _____
Name: _____
Title: _____

GENERAL CONDITIONS

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SECTION 00700

GENERAL CONDITIONS

PART 1 - DEFINITION OF TERMS

1.1 DEFINITION OF TERMS

- A. Wherever in the Bid or Contract Documents the following terms, or pronouns in place of them, are used, the intent and meaning shall be as follows:
1. Acceptance - Formal written acceptance by the Authority of the completed Work.
 2. Addenda - Written interpretations of and/or revisions to the Bid Documents issued by the Authority prior to opening of Bids.
 3. Alteration - A change or substitution in the form, character, or detail of the Work done or to be done within the original scope of the Contract.
 4. Authority - Massachusetts Bay Transportation Authority, created by Chapter 563, Section 18 of the Acts of 1964, of the Commonwealth, the Party of the First Part to the Contract.
 5. Award - Award by the Authority of a Contract.
 6. Bid - Offer of the Bidder for the Work when submitted on the prescribed Bid Form, properly signed, dated, and guaranteed, and which includes the schedule of bid items.
 7. Bid Documents - Documents provided by the Authority for the purpose of soliciting Bids for the Work. Bid Documents will include, as applicable, Standard Specifications, Contract Specifications, Contract Drawings, MBTA Geotechnical Data Reports, Bid Form, and Addenda.
 8. Bid Form - Forms issued by the Authority requesting bids for a specific Contract and includes the Notice to Bidders, Instructions to Bidders, and Form for Bid.
 9. Bid Security (Bid Guaranty) - The cash, cashier's or treasurer's check, certified check, or Bidder's Bond accompanying the Bid submitted by the Bidder, as a guaranty that the Bidder will enter into a Contract with the Authority for the performance of the Work and furnish acceptable bonds and insurance if the Contract is awarded to the Bidder.
 10. Bidder - An individual, firm, partnership, corporation, or combination thereof, submitting a Bid for the Work on the prescribed Bid Form.
 11. Chairman of the Board of Directors of the Authority - Chief Executive Officer or designee, such designee acting within the scope of the particular duties entrusted to him.
 12. Change Order - A document executed and issued to the Contractor by the Authority amending the Contract.
 13. Commonwealth - Commonwealth of Massachusetts.

14. Contract Documents - The Standard Specifications, Contract Specifications, Bid, and Contract Drawings revised to incorporate all changes made during the Bid period by Addenda and to incorporate information included in the Bid accepted by the Authority and all authorized changes to the Contract issued subsequent to the execution of the Contract in accordance with the most recent MBTA Change Order Guidelines.
15. Contract - The written agreement executed by the Authority and the Contractor, setting forth the obligations of the Parties there under. Further, any and all executed changes made in accordance with the MBTA Change Order Guidelines.
16. Contract Administrator - Manager of the Office of Contract Administration or his designee.
17. Contract Bonds –
 - a. Performance Bond - A bond executed by the Contractor and the Contractor's Sureties in the full amount of the contract to ensure the faithful performance of the contract.
 - b. Labor and Materials Payment Bond - A bond executed by the Contractor and the Contractor's Sureties in the full amount of the Contract to ensure the payment of labor, materials, and rental of equipment.
18. Contract Drawings - Plans, profiles, typical cross sections, general cross sections, elevations, and details list as referenced on the Drawing Index, or amendments thereto, and working drawings and shop drawings approved by the Engineer, all of which show locations, character, dimensions, and details of the Work.
19. Contract Item - A specifically described unit of work for which a price is provided in the Contract.
20. Contract Specifications - A set of documents issued by the Authority for the intended Work which includes the Notice to Bidders, Instructions to Bidders, Bid Form, Contract Forms, Contract Bond Forms, Supplementary Conditions, technical provisions, and other requirements, forms and exhibits identified therein.
21. Contract Time - Number of calendar days allowed or specified date(s) for completion of the Contract.
22. 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 Authority, as Party or Parties of the Second Part, and who is referred to throughout the Contract Documents by singular number.
23. Days - Every day shown on the calendar, Saturdays, Sundays and holidays included.
24. Engineer - The General Manager of the Authority or designee acting within the scope of the particular duties entrusted to this person.
 - a. Design Engineer and/or Consultant (name of Consultant firm) has been retained by the Authority as engineering consultant during the construction of (name of project). The terms "Design Engineer" and "Consultant" are at times interchangeable.
25. Engineer's Estimate of Quantities - List of quantities of work estimated to be performed as contained in the Bid.
26. Extra Work - Work which is not included in the Contract as awarded but found to be necessary for the satisfactory completion of the Contract within its intended scope, and

bears a reasonable subsidiary relation to the full execution of the Work originally described in the Contract.

27. Extra Work Order - An order in writing issued by the Engineer to the Contractor prior to performing the Extra Work, setting forth the Extra Work to be done, the basis of payment and time adjustments, if any. Following the issuance of an Extra Work Order, a Change Order will be executed to amend the Contract Documents.
28. Form for Bid - see Bid Form.
29. General Manager - Shall be the Chief Executive Officer of the Authority, and shall have general direction, supervision and control of the conduct of the business, property, personnel and affairs of the Authority except as may be otherwise prescribed by law or by the regulations of the Board of Directors.
30. General Terms - Wherever the words "required," "determined," "directed," "specified," "authorized," "ordered," "given," "designated," "considered necessary," "deemed necessary," "Permitted," "reserved," "suspended," "established approval," "approved," "disapproved," "acceptable," "unacceptable," "suitable," "accepted," "satisfactory," "unsatisfactory," "sufficient," "insufficient," "rejected," "condemned," or words of like import are used, they shall be understood to imply "by the Engineer" or "to the Engineer," unless the context clearly indicates a different meaning.
31. Indicated - A term meaning as shown on the Contract Drawings, as described in the Specifications, or as required by other Contract Documents.
32. Manager of Contract Administration – the Manager of the Office of Contract Administration for the Massachusetts Bay Transportation Authority or his designee.
33. MBTA Transit System - Authority Transit System, including right-of-way, pavement, tracks, facilities, structures, equipment, appurtenances, and other property of the Authority.
34. Non-System facilities - Facilities which are not a part of the MBTA Transit System.
35. Notice to Bidders - That portion of the Bid which advertises for Bids for a specific Contract. Notice to Bidders will indicate time and place for submitting and for opening of Bids, location of the Work, a brief description of the Work to be provided, and bid security required.
36. Notice to Proceed - Written notice from the Authority to the Contractor to proceed with the Work.
37. Project - That specific portion of MBTA Transit System indicated in the Contract Documents.
38. Provide - In reference to work to be performed by the Contractor, "provide" means furnish, install, and (as applicable) test complete in place.
39. Reference Utility Standards - Drawings and specifications, published by municipalities, utility companies, and railroads which are included or referenced in the Contract Documents.
40. Specifications - Directions, provisions, and requirements contained in the Contract Specifications.

41. Subcontractor - The individual, firm, partnership, corporation, vendor, supplier, or combination thereof to whom the Contractor, with written approval of the Authority, sublets any part of the contract.
42. Supplementary Conditions - Supplements and additions to the General Conditions.
43. Surety - Corporate body bound with and for the Contractor for the full and complete performance of the Contract and for the payment of all legal debts pertaining to the Work, and who executed the Contract Bonds.
44. U.S. Department of Transportation (DOT) - Secretary of the U.S. Department of Transportation, and other person authorized to perform the functions of that office, including representatives of the Federal Transportation Administration (FTA).
45. Value Engineering - The systematic application of recognized techniques which identify the function of a product **or** service, and provide the necessary function or service reliably at lower overall cost.
46. Work - All the construction, materials, equipment, and contractual requirements as specified, shown, or indicated in the Contract Documents, including all alterations, amendments, or extensions thereto made by authorized changes.
47. Working Drawings and Shop Drawings - Any supplementary drawings or similar data which the Contractor is required to submit to the Engineer for approval, including but not necessarily limited to erection, falsework, and formwork drawings; dewatering; bending diagrams and bar schedules for reinforcing steel; calculations; and manufacturers' catalog information and data.

PART 2 - SCOPE OF WORK

2.1 INTENT OF THE CONTRACT

- A.** Intent of the Contract is to provide for the construction and completion in every detail of the Work. The Contractor shall complete the Work to the satisfaction of the Engineer at the prices set forth and agreed upon. Where portions of the Work are described in general terms, but not in complete detail, the best general practice shall be followed. Only materials and workmanship of best standard quality shall be used. The Contractor shall, unless otherwise specified, furnish all labor, superintendence, materials, tools, equipment and incidentals necessary to complete the Work in a proper, thorough, and workmanlike manner.
- B.** The scope of work for the new South Acton Commuter Rail Station will consist of modifications to the existing station layout which will include construction of two new 800 foot long, high level, side boarding platforms; two head houses each with lobby space, a stairway, and an elevator; a pedestrian bridge; platform access stairs and ramps; canopies over ramps and sections of the platforms; a lighting system; a communications system; signage; sidewalks and a new drop off area and plaza; parking lot drop off area and site improvements; other site features and elements necessary to create an accessible and fully functional commuter rail station. These improvements will be made while the existing station continues to function.
- C.** The work will require extensive coordination with various track and signal work that will be done by the MBTA's commuter rail service operating railroad or by other contractors who will be responsible for the installation of the new second track laid upon the new track bed provided by

the Contractor. Work is described more in more detail on the Contract drawings and in Section 01010 Summary of the Work.

2.2 CHANGES IN THE WORK

- A.** The Authority reserves the right at any time during the progress of the Work to make alterations to, deviations from, additions, to, and deletions from the Contract Drawings and Specifications. Such changes shall not invalidate the Contract nor release the surety. The Contractor agrees to accept the Work as changed, the same as if it had been a part of the original Contract. Such changes will be authorized in writing by the Engineer. The Contractor shall accept as full compensation for Work, except as specified in Paragraphs B. and C., the Contract unit prices stipulated in the Contract for the actual quantity of work provided in an acceptable manner. Such changes shall not invalidate the Contract, or any part thereof.
- B.** Wherever an alteration, deviation, addition, or deletion involves a change in the nature of design or in the type of construction which increases or decreases the cost of performance of the Work or requires the Contractor to furnish materials or provide work of a kind not susceptible of classification for payment under any of the items scheduled in the Bid, the Authority and the Contractor may enter into Supplementary Agreements covering the work to be done and -the manner and method of payment therefor. If the Contractor and the Authority disagree on increased or decreased costs, the changes shall be by a Change Order.
- C.** If the changes, in the opinion of the Engineer, are of sufficient magnitude as to require additional time to complete the Contract, such time adjustment may be made in accordance with the provisions of Article 6.8.

2.3 EXTRA WORK

- A.** The Contractor shall do any work not herein provided for when and as ordered in writing by the Engineer, such written order to contain particular preference to this Article and to designate the work to be done as Extra Work.
- B.** Unless specifically noted in the Change Order, Extra Work will not extend the time of completion of the Contract as stipulated in Article 6.8 A.6.
- C.** Determination of the Engineer will be final upon all questions concerning the amount and value of Extra Work (except as provided in Article 5.19).
- D.** Payment for Extra Work will be as specified in Section 01150 - MEASUREMENT AND PAYMENT.

2.4 CONTRACTOR COST REDUCTION PROPOSALS VALUE ENGINEERING (APPLICABLE TO CONTRACTS IN EXCESS OF \$200,000)

- A.** The Contractor may submit cost reduction Proposals for changing the Contract requirements. The Proposals shall be based upon a sound study made by the Contractor indicating that the Proposal:
 - 1. Will result in a net reduction in the total Contract cost to the Authority;
 - 2. Will not impair any essential form, fit, function, or characteristic of the Work, such as safety, service life, reliability, economy of operation, ease of maintenance, and necessary standardized features;

3. Will not require an unacceptable extension of the Contract completion time; and
 4. Will require a Change Order to the Contract.
- B.** Cost reduction or Value Engineering Proposals shall be processed in the same manner as prescribed for any Contract initiated Proposal which would necessitate issuance of a Change Order. The Contractor shall submit the following information as a minimum, with each Cost reduction Proposal:
1. A description of the difference between the existing Contract requirements and the proposed change, and the comparative advantages and disadvantages of each;
 2. An itemization of the requirements of the Contract which must be changed if the Proposal is adopted and a recommendation as how to make such change (e.g., suggested revision);
 3. An estimate of the reduction in Contract performance costs that will result from adoption of the Proposal, taking into account the cost of implementation by the Contractor (including any amount attributable to subcontracts in accordance with Paragraph E. below and the basis for the estimate).
 4. A statement of the time by which a Change Order must be issued so as to obtain the maximum cost reduction during the remainder of this Contract, noting any effect of the Contract delivery schedule.
- C.** The Authority will not be liable for any delay in acting upon, or for failure to act upon, any Value Engineering Proposal submitted pursuant to this Article. The decision of the Authority as to the acceptance of any such Proposal shall be final. The Authority may accept in whole or in part, any Proposal submitted pursuant to this Article by issuing a Change Order. Unless and until a Change Order is issued, the Contractor shall remain obligated to perform in accordance with the terms of the Contract.
- D.** If a Value Engineering (cost reduction) Proposal is accepted and applied, an equitable adjustment in the Contract price and in any other affected provisions will be made. The equitable adjustment in the Contract price will be established by determining the total estimated decrease in the Contractor's cost of performance resulting from the accepted changes, taking into account the Contractor's cost of implementing the change (including any amount attributable to subcontracts in accordance with Paragraph E. below). The Contract price shall be reduced by such total estimated decrease in the cost of performance minus 50 percent of the difference between the amount of such total estimated decrease and any ascertainable collateral costs to the Authority which must reasonably be incurred as a result of application of the cost reduction Bid.
- E.** The Contractor shall include appropriate value engineering arrangements in any subcontract which, in the judgment of the Contractor, is of such a size and nature as to offer reasonable likelihood of cost reductions. In computing any equitable adjustment in the Contract price under Paragraph D., the Contractor's cost of implementation of a Value Engineering Proposal which is accepted shall include any implementation cost of a Subcontractor and any value engineering incentive payments to a Subcontractor, which clearly pertain to such Proposal and which are incurred, paid or accrued in the performance of a subcontract.
- F.** The Contractor may restrict the Authority's right to see any portion of the Contractor's Proposal by marking it with the following requirement:
1. This data, furnished pursuant to Article 2.4 of the General Conditions of Contract No. _____ may not be duplicated, used or disclosed, in whole or in part, for any purpose except for evaluation, unless the Proposal is accepted by the Authority. This restriction does not limit the Authority's right to use information contained in this data if it is or has been obtained, or is otherwise available, from the Contractor or from another source, without limitations. When this Proposal is accepted by the Authority, the Authority will have the right to

duplicate, use, and disclose any data in any manner and for any purpose whatsoever, and have others do so whether under this or any other Authority contract.

- G. Contract modifications made as a result of this Article will state that they are made pursuant to it.

2.5 INCREASED OR DECREASED CONTRACT QUANTITIES

- A. The Contractor shall accept as payment in full, so far as Contract Items are concerned, payment at the original bid contract unit prices for up to 100% of the units in the bid. The Engineer may order omitted from the work any items or portions of work. Such omissions shall not operate as a waiver of any conditions of the Contract nor invalidate any of the provisions thereof, nor shall the Contractor have any claim for anticipated profit or overhead.
- B. When the accepted quantities of work reach 75% of the quantities in the Bid Form and the Contractor anticipates that known work will require a quantity of units in excess of the units in the bid, the Contractor shall notify the Authority that additional quantities of work will be required, and submit a proposed cost to complete the work in excess of the bid units. If the Authority is in agreement, an Extra Work Order Authorization Letter (EWOAL) will be issued to the Contractor for a not to exceed amount. No payment will be made against a unit price pay item after expenditure of 100% of the quantity in the bid. After 100% of the units in the bid have been expended, the Contractor will proceed on a time and materials basis, or as directed in the EWOAL, until such time as a final lump sum can be negotiated for the extra work scope. Once agreement is reached a Change Order will be issued in accordance with SECTION 01150 – MEASUREMENT AND PAYMENT - SECTION 1.5 – PAYMENT FOR EXTRA WORK.
- C. Except as specified herein, no payment will be made for any increased expenses, loss of expected reimbursement, loss of anticipated profits or loss of overhead absorption, suffered or claimed by the Contractor either directly or indirectly from such increased or decreased quantities or from unbalanced allocation among the Contract Items of overhead expense on the part of the Contractor and subsequent loss of expected reimbursement, or from any other cause.

2.6 RIGHTS IN THE USE OF MATERIALS FOUND ON THE WORK.

- A. Contractor, with prior written approval of the-Engineer, may take suitable ledge, gravel, sand, loam, clay, or other material from within the location lines of the Contract and use it on the same Contract for other purposes than for forming embankments. If such use necessitates securing additional material for forming embankments, the Contractor shall replace, at no additional expense to the Authority, material of at least similar quality. The Contractor shall not excavate or remove any material which is not within the excavation as indicated by the Contract Documents without written approval. Excavated material suitable for use shall not be wasted, unless otherwise directed.

2.7 ARCHEOLOGICAL AND PALEONTOLOGICAL SALVAGE

- A. The Contractor's attention is directed to the United States Department of Transportation, Federal Highway Administration, Federal Aid Highway Program Manual, Volume 7, Chapter 7, Section 4, subject "Archaeological and Paleontological Salvage", incorporating Policy and Procedure Memorandum 20-7, dated March 31, 1979, and to the Commonwealth of Massachusetts, Acts of 1973, Chapter 1155.
- B. In compliance with these procedures and legislation, the Contractor shall exercise special care during his operations to avoid injury to underground prehistoric and historic archaeological

remains or paleontological remains. Should any archaeological or paleontological remains be encountered during any phase of construction, the Contractor shall immediately suspend all work in the area and shall notify the Engineer. The Engineer shall immediately notify the State Archaeologist and the Massachusetts Historical Commission. All construction work in that area will be temporarily delayed while the State Archaeologist and representatives of Massachusetts Historical Commission inspect the site to determine the importance of the discovery. Areas of prehistorical, historical, or paleontological significance shall be carefully protected in accordance with the above referenced manual and shall not be disturbed by the Contractor until so directed by the Engineer.

- C. Contractor shall receive no extra compensation for such special care, unless said compensation is authorized in writing by the Engineer as specified under Section 01150 - MEASUREMENT AND PAYMENT, Part 1 "Payment for Extra Work" Article. Material from such areas shall be carefully protected, and if necessary to remove specimens, the Contractor shall do so only at the Engineer's direction, and after an authorized agent has witnessed or otherwise referenced their locations.

2.8 WARRANTY OF WORK

- A. Neither final acceptance, final payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the premises by the Authority shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability with respect to any express warranties or responsibility for faulty materials or workmanship.
- B. Except where longer periods of warranty are specified for certain items, the Contractor warrants all work done under the Contract to be free from faulty materials and workmanship for a period of one year from date of acceptance thereof.
- C. Upon receiving notification from the Authority, the Contractor shall immediately make the required repairs or replacements to any work found defective. If repairs or replacements are not started within 10 days from the date of notification and prosecuted to completion, the Authority reserves the right to employ others to complete the Work. The Contractor agrees, upon demand, to pay the Authority all amounts which it expends for such repairs or replacements.
- D. All remedied Work shall carry the same warranty as the original work starting with the date of acceptable replacement or repair.

2.9 CHANGED CONDITIONS

In accordance with Chapter 30, Section 39N of the General Laws of the Commonwealth, as amended, the following paragraph shall apply to the Contract:

- A. If during the progress of the Work, the Contractor or the Awarding Authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those indicated in the Contract Documents either the Contractor or the Authority may request an equitable adjustment in the Contract price of the Contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the Authority will make an investigation of such physical conditions, and, if they differ substantially or materially from those indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents-and are of such a nature as to cause an increase or decrease in the cost

of performance of the Work or a change in the construction methods required for the performance of the Work which results in an increase or decrease in the cost of the Work, the Authority will make an equitable adjustment in the Contract price and the Contract will be modified in writing accordingly.

1. Filing, investigation, and settlement of all claims made under said Chapter and Section shall be as follows:
 - a. The Contractor shall promptly and before such conditions are disturbed, notify the Engineer in writing describing in full detail the subsurface or latent physical conditions at the site where it is maintained, that conditions differ substantially or materially from those conditions indicated in the Contract Documents. The Engineer will promptly investigate the conditions and will promptly submit a written report of its findings and determinations to the Contractor, and if it is found that such conditions as have been described in detail by the Contractor do exist and in fact do so differ materially or substantially, an equitable adjustment will be made and the Contract modified in writing accordingly. No such claim of the Contractor will be allowed unless the Contractor has given the detailed notice specified, or shall it be allowed if such conditions are disturbed prior their investigation by the Engineer.
 - b. No adjustment or allowance of any kind except as provided in Article 6.8 will be made to the Contractor due to delay or suspension of the Work or any portion thereof where the actual subsurface or latent physical conditions encountered at the site differ substantially and materially from those indicated in the Contract Documents.
 - c. No claim will be approved and no adjustment or allowance made when encountering subsurface or latent physical conditions at the site that differ substantially and materially from those indicated in the Contract Documents unless such conditions were in existence at the time of the Award of the Contract.
 - d. Any dispute concerning a question of fact under the Subsection which is not disposed of by agreement shall be decided by the engineer.
 - e. If as provided in (a) of this Subsection an equitable adjustment is to be made or contemplated, the Contractor shall submit promptly in writing to the Engineer an itemized statement of the details and amount of work together with his estimated costs for the same and the Engineer shall require the Contractor to keep actual costs and certify the same to the Authority in writing.
- B. If the Contractor and the Authority fail to agree on an equitable adjustment to be made under this Article, then the Contractor shall accept as full payment for the Work in dispute an amount determined in accordance with Section 01150 - MEASUREMENT AND PAYMENT.

2.10 CONTRACTOR PROPOSED CHANGES

- A. Contractor may at any time submit to the Engineer for the Engineer's review and approval or denial, proposed changes to the Contract Documents which will benefit the Authority. Upon acceptance of the proposed changes, the provisions of Article 2.2 and 2.4 (as applicable) shall apply. Denial of a proposed change shall neither provide the Contractor with any basis for claim for damages nor release the Contractor from contractual responsibilities.

2.11 COMMUNITY RELATIONS

- A. The Contractor shall establish and maintain a continuing liaison with persons residing or doing business in the vicinity of the Project site, for the purpose of minimizing inconveniences resulting from construction, and shall appoint a representative, acceptable to the Engineer, for community

relations. The representative shall have the authority to act directly, or through the Contractor's approved Superintendent, regarding all valid requests or complaints. Information as to their disposition by the Contractor shall be furnished to the Engineer. The name and telephone number of the Contractor's community relations representative shall be furnished to those residents or businessmen in the community who might reasonably be expected to be affected by the construction.

PART 3 - CONTROL OF WORK

3.1 AUTHORITY OF THE ENGINEER

- A.** The Engineer will decide all questions relating to interpretation of the Contract Documents, and may alter, adjust, and approve same when necessary; all questions relating to quality, quantity, value, and acceptability of materials to be furnished and work provided or to be provided; all questions relating to progress of the Work and need for and manner of correcting same, and also the need for and terms of delays and suspensions; all questions relating to the need for and terms of Extra work; all questions relating to the supervision, control and direction of Work on the site and the use thereof; and all questions as to the acceptable fulfillment of the Contract by the Contractor.

- B.** Attention of the Contractor is directed to the following limitations on the scope of the duties entrusted to the Engineer.
 - 1. The Regulations of the Authority's Board of Directors state that the General Manager is authorized to approve, without prior authorization of the Board, issuance of Change Orders or Extra Work Orders, pursuant to any Agreement previously authorized by the Board or the General Manager, in a total amount not exceeding 7% or \$500,000.00 above the contract price of such Agreement, whichever is greater; provided that if the issuance of any such Change Order or Extra Work Order would result in exceeding said 7% or \$500,000.00 limitation or if the issuance of any one such Change Order or Extra Work Order would require an expenditure by the Authority of an amount exceeding \$500,000.00, it shall not be issued without prior authorization of the Board.
 - 2. The General Manager, as provided by the Regulations of the Board of Directors, has delegated to the Assistant General Manager for Design and Construction the power to approve, without prior authorization of the General Manager or the Board, the issuance of Change Orders or Extra Work Orders, pursuant to any agreement previously authorized by the Board or the General Manager, in a total amount not exceeding 7% or \$100,000.00 above the contract price of such agreement, whichever is greater; provided that if the issuance of any such Change Order or Extra Work Order would result in exceeding said 7% or \$100,000.00 limitation or if the issuance of any one such Change Order or Extra Work Order would require an expenditure by the Authority of an amount exceeding \$100,000.00, it shall not be issued without prior authorization.
 - 3. The General Manager, as provided by the Regulations of the Board of Directors, has delegated to the Chief of Engineering and Construction the power to approve, without prior authorization of the General Manager or the Board, the issuance of Change Orders or Extra Work Orders, pursuant to any agreement previously authorized by the Board or the General Manager, in a total amount not exceeding 7% or \$50,000.00 above the contract price of such agreement, whichever is greater; provided that if the issuance of any such Change Order or Extra Work Order would result in exceeding said 7% or \$50,000.00 limitation or if the issuance of any one such Change Order or Extra Work Order would require an expenditure by the Authority of an amount exceeding \$50,000.00, it shall not be issued without prior authorization.

4. The General Manager, as provided by the Regulations of the Board of Directors, has delegated to the Directors of Design and Construction, the power to approve, without prior authorization of the General Manager or the Board, the issuance of Change Orders or Extra Work Orders, pursuant to any Contract or other Agreement previously authorized by the Board or the General Manager, in a total amount not exceeding 7% or \$25,000.00 above the contract price of such agreement, whichever is greater; provided that if the issuance of any such Change Order or Extra Work Order would result in exceeding said 7% or \$25,000.00 limitation or if the issuance of any such Change Order or Extra Work Order would require an expenditure by the Authority of an amount exceeding \$25,000.00, it shall not be issued, without prior authorization.
5. Employees of the Authority are not authorized to request work to be performed or service to be provided other than as specified above. The Authority will not accept any responsibility whatsoever for extra work performed for which there is no specific proper authorization.

3.2 CONTRACT DRAWINGS

- A. Contract Drawings showing the general arrangement and such details as necessary to give a comprehensive idea of the construction contemplated will be furnished by the Authority. As work progresses, the Contract Drawings may be supplemented by the Engineer as required to amplify or control the work. The Contractor shall perform the work required by such supplements without additional compensation, except as provided by the Contract.

3.3 CONFORMITY WITH DRAWINGS AND SPECIFICATIONS

- A. Attention is directed to Chapter 30, Section 391 of the General Laws of the Commonwealth which provides that no willful and substantial deviation from Contract Drawings and Specifications shall be made unless directed in writing by the Engineer duly authorized by the Authority to approve such deviation. Chapter 30, Section 391 further provides that in order to avoid delays in the prosecution of the Work, such deviation may be authorized by a written order of the Engineer authorized to approve such deviation, and that within 30 days thereafter such - written order shall be confirmed by a certificate of the Authority.
- B. All work provided and all materials furnished shall be in conformity with the lines, grades, cross sections, dimensions, details, gradations, physical, and chemical characteristics of materials and other specific requirements of the Contract. Where the terms "in conformity with" "in agreement with" "in compliance with" or terms of like exactness occur in the Contract Documents, they shall be understood to imply "in reasonable close conformity with".
- C. Where definite tolerances are specified in the Contract, such tolerances shall fix the limits of conformity. Where tolerances are not specified in the Contract, the Engineer will determine the limits of conformity in each individual case and such determination shall be final and conclusive and mutually accepted by all parties.
- D. If materials or the finished product in which the materials are used are not within conformity with the Contract Documents, but acceptable work has been produced, the Engineer will make a determination whether the work shall be accepted and remain in place. The Engineer will document the basis of acceptance by Contract modification which will provide for an appropriate adjustment in the Contract price for such work or materials as he deems necessary to conform to his determination based on engineering judgment, and in accordance with current construction practices.

- E. If the Engineer finds the materials, or the finished product in which the materials are used or the work provided, are not in conformity with the Contract Documents and have resulted in an inferior or unsatisfactory product. The work or materials shall be removed and replaced or otherwise corrected by the Contractor and at no additional expense to the Authority.
- F. Deviations from the Contract Drawings and approved Shop or Working drawings that may be required by the need of the construction will be determined by the Engineer and authorized by him in writing.

3.4 COORDINATION OF CONTRACT DRAWINGS, CONTRACT SPECIFICATIONS, AND STANDARD SPECIFICATIONS

- A. Contract Drawings (including Authority Standards as may be referenced therein), Contract Specifications, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as finding as though occurring in all. They are intended to be complementary and to describe and provide for a complete Work. In the event of any discrepancy between a Drawing and figures written thereon, the figures, unless obviously incorrect, are to govern over scaled dimensions. Contract Drawings will govern over Contract Specifications. Where work is to be accepted by a municipality, railroad, or utility company, the Reference Utility Standards which apply to their materials and workmanship will govern.
- B. The Contractor shall take no advantage of any apparent error or omission in the Contract Documents. If the Contractor discovery, such an error or omission, the Engineer shall be notified immediately. The Engineer will then make such corrections and interpretations as may be deemed necessary to fulfill the intent of the Contract.

3.5 COOPERATION BY CONTRACTOR

- A. The Contractor will be given three copies of the Contract Documents. The Contractor may request and the Authority may approve furnishing additional copies of Contract Drawings, either full or half-size. The Contractor shall have one copy of The Contract Documents on the work site and available for reference at all times during the prosecution of the Work.
- B. Prior to starting Work the Contractor shall designate in writing the name, title, qualifications, and experience of his proposed representative who, upon approval by the Engineer, shall have complete authority to represent and to act for the Contractor. A facsimile of the authorized representative's signature shall be furnished to the Engineer. The authorized representative or a substitute acceptable to the Engineer shall be present at the work site at all times while work is actually in progress on the Project. Arrangements for responsible supervision acceptable to the Engineer shall be made for emergency work which may be required during periods when Work is suspended. The Contractor shall notify the Engineer, in writing, of any proposed change of his representative, and shall provide identical information for approval of the new representative.
- C. The Contractor shall ascertain that the materials and workmanship are in accordance with the Contract Documents. The Contractor shall preserve baseline monuments, benchmarks, and other controls for the Work.
- D. The Contractor shall carry on his work under the direction of the Engineer such that representatives of Utility Owners, State, or Municipal Departments may enter on the work site without interference to make changes in their facilities which may be affected by the Work. The Contractor shall have no claim for, or use of any delay which may be due to or result from work of Utility Owners, State or Municipal Departments. No allowance of any kind will be made except as provided in Article 6.8. Nothing contained herein shall be construed to hold the

Contractor responsible for any acts or omissions by such Utility Owners, State or Municipal Departments, or their contractors.

- E.** The Contractor is responsible for providing two (2) week look ahead schedules, submittal logs, RFI logs and issue logs at each bi- weekly meetings. At a minimum, the topics discussed at each bi-weekly meeting shall include safety issues, status of RFI's, submittals and change orders, outstanding non-conformance reports, issues involving operations, community and/or a municipality, old and new business. The Contractor is responsible for maintaining up to date schedules at all times as the schedule is the basis for payment. The Contractor is responsible for attendance and participation in pre- construction and progress meetings with the MBTA. These meetings address all project issues including safety and schedule. The Contractor may be responsible to attend additional special meetings that may be necessary to resolve issues of an immediate or short term nature that cannot wait until the regularly scheduled progress meetings.

3.6 ADJACENT CONTRACTS

- A.** The Authority reserves the right at any time to contract for and perform other or additional work on or near the Work covered by the Contract. The intent of this Article is to provide for the cooperation of contractors where the Authority deems it expedient or necessary and in the best interest of the Authority to let separate contracts for the performance of other work on or near the location of the Work being performed under the Contract, but it is not intended to indicate an intention on the part of the Authority to let separate contracts for work within the scope of or necessary for the successful completion of the Contract.
- B.** When separate contracts are let within the limits of any one project (either prior to Award of Contract, as specified in the Bid, or as specified above), each contractor shall conduct their work so as not to interfere with or hinder the progress or completion of the work being performed by other contractors. Contractors working on the same project shall cooperate with each other as directed.
- C.** Each contractor involved shall assume all liability, financial or otherwise, in connection with its contract and shall protect and save harmless the Authority from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced because of the presence and operations of other contractors working within the limits of the same project. No allowance of any kind will be made except as provided in Article 6.8.
- D.** The Contractor shall arrange the work and shall place and dispose of the materials being used so as not to interfere with the operations of other contractors within the limits of the same Project. The Contractor shall join the work with that of others in an acceptable manner and perform the work in proper sequence to that of others.

3.7 LINE AND GRADE

- A.** The Authority will establish primary control for the Work, both horizontal and vertical. The Authority will provide the Contract or Project centerline and such benchmarks and basic tie-in points on or near construction site as in its judgment are necessary for the proper control of the Work. Monuments, stakes, and marks set by the Authority shall be preserved by the Contractor. If such monuments, stakes, or marks are destroyed or damaged, they may be replaced by the Authority. The Contractor will be charged the cost of replacing monuments, stakes, or marks destroyed or damaged by reason of his operations. The replacement cost will be deducted from payment for the Work.

- B.** The Contractor shall proceed from the controls established by the Authority to make all surveys and layouts necessary to conform all of the work to the requirements of the Contract Documents; shall provide qualified engineering and other personnel for the purpose; and shall be solely responsible for the accuracy of the line and grade features of his Work.
- C.** The Authority will make such checks, as necessary, of the control work established by the Contractor as the Work progresses. The Contractor will be informed of results of such checks but the Authority by so doing will in no way relieve the Contractor of responsibility for accuracy of the Contract control. The Contractor shall provide such assistance as may be required for checking purposes when requested by the Authority.
- D.** The Contractor shall notify the Authority a reasonable time in advance of his needs, of the time and place the Contractor plans to provide the Work for which such primary control will be needed. The Authority will furnish the Contractor with such primary lines, grades, and elevations as it deems necessary by such time so as not to delay the Contractor's operations. The Authority, however, will not be held responsible for any delay resulting from lack of such information if the Contractor fails to notify the Authority sufficiently in advance of the Contractor's needs.

3.8 AUTHORITY AND DUTIES OF ENGINEER'S ASSISTANTS

- A.** The Engineer may appoint assistants and representatives. The assistants and representatives are authorized to inspect work and materials, to give directions pertaining to the Work or to the safety and convenience of the public, to approve or reject materials and to make measurements of quantities.
- B.** In case of any dispute arising between the Contractor and the Engineer's assistants, as to materials furnished or the manner of providing work, the Engineer's assistants are authorized to reject materials or to suspend work until the dispute is referred to and decided by the Engineer.
- C.** The Engineer's assistants are not authorized to revoke, alter, enlarge, relax, or release any requirements of these Specifications nor to issue instructions contrary to the Contract Drawings and Specifications.
- D.** The Engineer's assistants will not act as foremen or perform other duties for the Contractor.

3.9 INSPECTION OF WORK

- A.** All materials and each part or detail of the Work shall be subject to inspection by the Engineer. The Engineer shall at all times have access to the Work and be furnished with information and assistance by the Contractor as required allowing a complete and detailed inspection by the Engineer.
- B.** The Contractor, if requested by the Engineer, shall before acceptance of the Work, remove or uncover such portions of the finished Work as directed. After examination, the Contractor shall restore said work to the standard required by the Contract Documents. Should Work exposed or examined prove accessible, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as Extra Work. Should Work exposed or examined prove unacceptable, the uncovering or removing and the replacing of the covering or making good of the parts removed, will be at no additional expense to the Authority.
- C.** Any Work done or materials used without authorization by the Engineer may be ordered removed and replaced at no additional expense to the Authority.

- D. The Contractor shall furnish written information to the Engineer stating the original sources of supply of all materials manufactured away from the Work site. This information shall be furnished at least two weeks (or as otherwise required by the Engineer) in advance of the incorporation in the Work of such materials.
- E. When any unit of government or critical subdivision is to pay a portion of the Cost of the Work, its respective representatives shall have the right to inspect the Work. Such inspection shall in no sense make any unit of government or political subdivision a party to this Contract, and shall in no way interfere with the rights of either party hereunder.
- F. Inspection of Work shall not relieve the Contractor of any of his obligations to fulfill the requirements of the Contract Documents.
- G. Failure to reject any defective Work or materials shall not in any way prevent later rejection when such defect is discovered, nor obligate the Authority to make final acceptance.
- H. The Contractor shall give prior notice to the Engineer when Work on the various items is to be performed by him or his subcontractors. If Work is suspended on any item, prior notice shall be given to the Engineer before resumption of such Work. Except in the case of an unforeseen emergency, neither the Contractor nor any subcontractor shall perform any Work requiring inspection at hours other than during the normal workday without prior approval of the Engineer.

3.10 REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

- A. Defective Work shall be promptly remedied, or removed and replaced, notwithstanding that such Work has previously been inspected and approved or estimated for payment. If the Work or any part thereof shall be found defective at any time, the Contractor shall, at no additional expense to the Authority, make good such defect in a satisfactory manner.
- B. Work performed beyond the lines and grades shown on the Contract Drawings or established by the Engineer, and extra Work done without written authorization, will be considered unauthorized Work and the Contractor will receive no compensation therefor. If required by the Engineer, unauthorized work shall be remedied, removed, or replaced at no additional expense to the Authority.
- C. Upon failure of the Contractor to remedy, remove, or replace defective or unauthorized Work, or to comply promptly with any requirement of the engineer made under this Article 3.10, the Authority may cause defective or unauthorized Work to be remedied, removed, or replaced by others and deduct the costs thereof from any monies due or to become due to the Contractor.

3.11 FINAL ACCEPTANCE (ALSO SEE ARTICLE 5.24)

- A. Upon substantial completion of the Work, the Contractor shall present, in writing, to the Authority its certification that the Work has been substantially completed. Within 21 days thereafter, the Authority as a result of its inspection of the Work will 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 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. If the Authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the Contractor's certification within the 21-day period, the Contractor's certification shall take effect as the Authority's declaration that the Work has been substantially completed.

- B. If the Work or any part thereof is not acceptable to the Engineer at the time of the inspection, the Contractor will be notified in writing of the particular defects or parts to be remedied before final acceptance. If the Contractor has not arranged within a period of five days after the date of transmittal of such notice of nonacceptability, to complete the Work as directed by the Engineer, the Authority may, without further notice and without in any way affecting the Contract, make such other arrangements as may be considered necessary to insure satisfactory completion of the Contract. The cost of completing such Work will be deducted from any moneys due or which may become due to the Contractor under the Contract.
- C. Substantial completion, for the purposes of this Article, shall mean either that the Work required by the Contract has been completed except for Work having a Contract price of less than one percent 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.
 - 1. See Section 01150 - MEASUREMENT AND PAYMENT, for Final Acceptance and Final Payment.

PART 4 - CONTROL OF MATERIALS

4.1 TRADE NAMES AND ALTERNATIVES

- A. An item equal to that named or described in the specifications may be furnished by the Contractor, and the naming of any commercial name, trademark, or other identification shall not be construed to exclude any item or manufacturer not mentioned by name or as limiting competition, but shall establish a standard of equality only. An item will be considered equal to the item so named or described if:
 - 1. it is at least equal in quality, durability, appearance, strength, safety, reliability, operability, maintainability, and design;
 - 2. it will perform at least equally the function imposed by the general design for the Work being contracted for; and
 - 3. it conforms substantially, even with deviations to the detailed requirements for the item specified.
- B. For each item of material the specifications shall provide for either a minimum of three brands of material or a description of material which can be met by a minimum of three manufacturers or producers and for the equal of any one of said named or described materials.
- C. Burden of proof as to the quality and suitability of alternatives shall be upon the Contractor. The Contractor shall furnish, in writing, all information necessary as required by the Engineer at no additional cost to the Authority. Requests for review of alternative materials will not be accepted by the Engineer from anyone other than the Contractor. The Engineer will be the sole judge as to the quality and suitability of alternative materials and the Engineer's decision will be final.
- D. Information furnished shall state whether or not acceptance of the alternative material for use in the Work will require a change in the Contract Drawings or Specifications to adapt the design to the alternative and whether or not incorporation or use of the alternative in connection with the Work is subject to payment of any license fee or royalty. The Authority does not pay license fees or royalties. Where use of an alternative material involves redesign of or changes to other parts of the Work, the cost and the time required to effect such redesign or changes will be considered in evaluating the suitability of the alternative material and the Contractor shall pay charges incurred by the Authority for such redesign or change.

- E.** No tests nor action relating to the approval of alternative materials will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the materials proposed. Such request shall be made in ample time to permit approval without delaying the Work, but such requests need not be made less than 30 days after receipt of Notice to Proceed.
- F.** Whenever classification, rating, or other certification by a body, such as UL, NEMA, or AREA, is a part of the specification for any material, proposals for use of alternative materials shall be accompanied by reports from the listed or equivalent independent testing laboratory indicating compliance with specification requirements.
- G.** The Contractor shall pay costs of testing required to prove equality of the material proposed.
- H.** Approval of an alternative material shall be only for the characteristics or use named in such approval, and shall not be used to change or modify any Contract requirement, or to establish a basis for subsequent approval for material to be used on any other phase of the Work of the Massachusetts Bay Transportation Authority Transit System.

4.2 CERTIFICATES OF COMPLIANCE

- A.** The use of certain materials on the basis of a notarized certificate of compliance may be allowed under the following conditions: Before such materials are incorporated into the Work, the Contractor shall submit to the Engineer, for approval, copies of the manufacturer's or supplier's statement for each kind of such material furnished. The statement shall contain the following information:
 - 1. Contract to which the material is consigned;
 - 2. Name of the Contractor to which the material is supplied;
 - 3. Kind of material supplied;
 - 4. Quantity of material represented by the certificate;
 - 5. Means of identifying the consignment, such as label, marking, seal number, etc.;
 - 6. Date and method of shipment;
 - 7. Statement to the effect that the material has been tested and found in conformity with the pertinent parts of the Contract;
 - 8. Results of all required tests including the chemical analysis in the case of metal; or in lieu of furnishing the results a statement that the results of all required tests pertinent to the certificate and not submitted shall be maintained available by the undersigned for a period of not less than 3 years from date of final acceptance;
 - 9. Signature of a person having legal authority to bind the supplier.
- B.** If the Contractor has new materials purchased for use on a previous Authority contract which have never been used and which comply with the Contract Documents, these materials may be furnished and installed in the Work provided the Contractor submits his own sworn statement certifying that such materials were purchased for use on a previous contract (name and identifying such contract) and that certificates of compliance were furnished for such materials on the previous contract, to which reference can be made.
 - 1. Costs involved in furnishing the certificates shall be borne by the Contractor.
 - 2. Materials used on the basis of a certificate of compliance may be sample and tested at any time. The fact that material is used on the basis of a certificate of compliance shall not relieve the Contractor of responsibility for incorporating material in the Work which conforms to the requirements of the Contract Documents and Specifications and any such material not conforming to such requirements will be subject to rejection, whether in place or not.

3. The Engineer reserves the right to refuse to permit the use of materials on the basis of a certificate of compliance alone.
- C. Certification of specification compliance shall be furnished for all materials and installation of the same as specified throughout the construction specifications. (See sample Certificate of Compliance included on page SC- 00700-50)

4.3 AUTHORITY-FURNISHED MATERIALS

- A. Materials furnished by the Authority will be available at locations designated in Supplementary Conditions of the Contract Specifications or, if not so designated, they will be delivered to the Work site. Authority-furnished materials shall be stored and transported to the place of use by the Contractor at his expense, including all necessary loading and unloading. The Contractor's costs of storing, handling, and installing Authority furnished material shall be considered as included in the Contract price paid for the Item involving such Authority-furnished material.
- B. Contractor shall be responsible for all materials furnished to him, and shall pay all demurrage and storage charges as a result of his failure to take delivery of Authority-furnished material. The Contractor shall be liable to the Authority for the cost of replacing or repairing Authority-furnished material lost or damaged from any cause whatsoever after receipt by the Contractor. The costs will be deducted from any moneys due or to become due the Contractor, except those amounts when covered under any claims' payments made under insurance policies furnished by the Authority.

4.4 DEFECTIVE MATERIALS

- A. Contractor furnished materials not conforming to the requirements of the Contract Documents will be rejected, whether in place or not. Rejected material shall be removed immediately from the site of the Work unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used in the Work unless approved in writing by the Engineer. If the Contractor fails to comply promptly with a request by the Engineer, made under the provisions of this Article, the Engineer may cause the removal and replacement of rejected material and the cost thereof will be deducted from any moneys due or to become due the Contractor.

4.5 ASBESTOS MATERIALS

- A. Contractor shall not furnish or install asbestos or any material containing asbestos under this Contract.

4.6 BANNED MATERIALS

- A. Lead Paints: Contractor shall not furnish or install lead containing paint on any surfaces within the limits of this Contract. A lead containing paint is defined by the Consumer Product Safety Commission's Paint Poisoning Prevention Act of 1979 as any coating whose dried film contains greater than 0.06% by weight of lead.

PART 5 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

5.1 LAWS TO BE OBSERVED

- A.** The Contractor shall keep fully informed concerning all requirements of law, including all state and federal laws, county and municipal ordinances, and regulations which in any manner affect those engaged or employed in the Work. or the materials used in the Work. or such orders and decrees of bodies or tribunals having jurisdiction or authority over the same. The Contractor shall protect, indemnify and hold harmless the Authority and the Engineer. and all of their officers, agents, and employees against all claims and liabilities arising from or based on the violation of any such requirement of law whether by the Contractor, his employees, agents, or subcontractors. If any discrepancy or inconsistency is discovered in the Contract Documents in relation to any such requirements of law, the Contractor shall immediately report the facts to the Engineer in writing. The Contract shall be governed by the laws of the Commonwealth.
- B.** The Contractor, if a foreign corporation (a corporation established, organized, or chartered under laws other than those of the Commonwealth) shall comply with the provisions of Chapter 181 of the General Laws as amended. The Contractor shall file with the Authority a certificate of the State Secretary stating that such corporation has complied with Chapter 181 and the date of such compliance.
- C.** Other out-of-state business organizations, such as individual proprietorship, partnership, and joint ventures, shall appoint an agent in this Commonwealth for the service of legal process and furnish a copy of such appointment to the State Secretary prior to the issuance of a contract by the Authority.
- D.** Work shall be in accordance with the Massachusetts State Building Code.
 - 1. The Contractor shall protect and indemnify the Authority and its representatives against any claim or liability arising from or based on the violation of any law, ordinance, safety code, regulation, order or decree whether caused by the Contractor, its employees or its subcontractors employed on the Project.
 - 2. Such laws, ordinances, codes, regulations, orders, or decrees may restrict and limit the Contractor's working hours or use of certain types of equipment on the Project. The Contractor shall become familiar with such restrictions and limitations prior to submitting a Bid.
 - 3. The Contractor shall give all necessary notices, obtain all permits as required and pay all government taxes, fees, and other costs in connection with the Work. The Contractor shall file all necessary drawings, prepare all documents, and obtain all necessary approvals of all governmental departments which have jurisdiction. The Contractor shall obtain all required Certificates of Inspection prior to acceptance and final payment for the Work. Compensation for conforming to all provisions of this Article 5.1, except as may be provided otherwise in Supplementary Conditions, shall be considered as included in the prices for the various Contract Items of Work and no additional compensation will be allowed therefor.
- E.** Without limiting the Contractor's responsibility for ascertaining and complying with all applicable laws, ordinances, regulations, orders, and decrees, the Contractor's attention is called particularly to Division 1, General Requirements, Section 01560 - TEMPORARY CONTROLS.

5.2 PERMITS AND LICENSES

- A.** The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes and give all notice necessary and incidental to the due and lawful prosecution of the Work.

5.3 MOTOR VEHICLES

- A.** Motor vehicles (except vehicles used solely for transporting employees to and from the Contract location) used wholly or in part within the Commonwealth by the Contractor or a subcontractor, or by a person directly or indirectly employed by them in the execution of the Contract, shall be registered in the Commonwealth and bear Massachusetts registration plates.
- B.** Motor vehicles used solely for transporting employees to and from the Contract location shall be registered as required under General Laws, Chapter 90, Section 3, of the Commonwealth, as amended.
- C.** A vehicle shall not be driven on any way, as defined in Section I of Chapter 90 of the General laws of the Commonwealth, unless it is constructed or loaded so as to prevent any of its load from dropping, shifting, leaking, or otherwise escaping therefrom, except that sand may be dropped for the purpose of securing traction, or water or other substance may be sprinkled on such a way in cleaning or maintaining the same. (General Laws, Chapter 85, Section 30, of the Commonwealth as amended.)
- D.** All Diesel Construction Equipment must have emission control devices installed, such as oxidation catalysts or particulate filters on the exhaust system side of the diesel combustion engine equipment.

5.4 INSURANCE REQUIREMENTS

- A.** The Contractor shall carry Commercial General Liability Insurance for personal injury, bodily injury and property damage with limits not less than \$1,000,000 per occurrence, \$1,000,000 aggregate covering all work performed under this Contract. The insurance should include the following:
 - 1. All operations.
 - 2. Contractual liability.
 - 3. Coverage for the so-called "X, C, U" hazards, i.e., collapse of building, blasting, and damage to underground property.
 - 4. Completed operations hazard for a period of at least two years following acceptance by the Authority of the completed Contract.
 - 5. Use of watercraft, aircraft when applicable.
- B.** Pollution Liability Insurance
 - 1. The Contractor or his designated Subcontractor shall carry Pollution Liability in an amount not less than \$1,000,000 per occurrence and \$5,000,000 aggregate, for sudden and gradual occurrences arising out of the work being performed under this Contract including, but not limited to, all hazardous material identified under this Contract.
 - 2. The Contractor shall designate the disposal site and furnish a Certificate of Insurance from the Disposal Facility for Environmental Impairment Liability insurance covering liability for sudden and accidental occurrences in the amount of not less than \$3,000,000 per occurrence and \$6,000,000 aggregate and shall also include liability for non sudden

occurrences in the amount of not less than \$5,000,000 per occurrence and \$10,000,000 aggregate.

3. The Contractor shall designate the hauler and furnish a Certificate of Insurance from the hauler for Automobile Liability insurance with endorsement MCS90 for the liability arising out of the transportation of hazardous material with an amount not less than \$5,000,000 annual aggregate.
4. Certificates of Insurance shall clearly state the hazardous materials exposure identified under the contract.

C. Automobile Liability Insurance - including the use of all vehicles; owned, leased, hired and non-owned, with limits not less than \$1,000,000 combined single limit covering all work performed under the Contract.

D. Railroad Protective Insurance

1. The Contractor shall furnish, with respect to the operations of the Contractor or any of the Contractor's subcontractors performing within the Railroad right-of-way, broad form Railroad Protective Liability Insurance covering all work performed under this Contract in the amount of not less than \$5,000,000 per occurrence, \$10,000,000 aggregate combined bodily injury and property damage.
2. The insurance hereinbefore shall be written on an occurrence basis.
3. The MBTA and applicable railroads shall be named insured on the insurance hereinbefore.
4. The Contractor shall furnish to the MBTA and railroad companies a signed original of the policy for Railroad Protective Liability prior to entry upon the railroad right-of-way.
5. All certificates shall be endorsed to provide 30 days notice to each named insured by the insurance company before any change or cancellation of the policies.
6. The required Railroad Protective Insurance provided herein must be in the form commonly referred to as the AAR-AASHTO- Form (not Oregon).
7. Original policies and certificates shall be made out to the MBTA and applicable railroads and mailed to:

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

MBCR: General Superintendent
Massachusetts Bay Commuter Rail
32 Cobble Hill Road
Somerville, MA 02143
Tel. (617) 222-3620

Pan Am Railways: General Manager
1700 Iron Horse Park
North Billerica, MA
01862-1641
(978) 663-1129

E. The Contractor shall carry Worker's Compensation Insurance, including Employers Liability Insurance as provided by Massachusetts General Laws, Chapter 152, as amended, covering all work performed by him under the Contract.

- F. The Contractor shall carry Umbrella Liability Coverage with limits of not less than \$10,000,000 per occurrence, covering all work performed by him under this Contract.
- G. The Contractor shall carry Builder's Risk Insurance (All Risks' form) on a 100 percent completed value basis for the full insurable portion of such Work for the benefit of the Authority, the Contractor and all Subcontractors.
- H. The required insurance coverages hereinbefore specified shall be placed with insurance companies licensed by the Massachusetts Division of Insurance to do business in the Commonwealth of Massachusetts and having a Best's rating of B+ or better, shall be taken out before the Contract is commenced and be kept in full force and effect throughout the term of the Contract, shall be primary to and non-contributory to any insurance or self-insurance maintained by the MBTA, and shall require that the MBTA be given at least 30 days advance written notice in the event of any cancellation or materially adverse change in coverage. All such required insurance, with the possible exception of Pollution Liability Insurance, shall be written on an occurrence basis form, as opposed to a claim made basis form. The MBTA shall be named as an additional insured under the Commercial General Liability, Automobile Liability, Umbrella, Pollution Liability, and Builder's Risk Insurance Policies. The Workers' Compensation and Employers' Liability Insurance Policies shall include a waiver of subrogation in favor of the MBTA which precludes these insurers from being able to make any subrogation claims against the MBTA. All such required insurance shall not contain any exclusions for acts of terrorism, and shall fully cover any acts of terrorism, irrespective of whether such acts of terrorism are caused by domestic or foreign terrorists, and irrespective of whether such acts of terrorism are certified or non-certified by the Secretary of the Treasury, in concurrence with the Secretary of State and the Attorney General of the United States, to be an act of terrorism pursuant to the federal Terrorism Risk Insurance Act of 2002. All such insurance as is required of the Contractor shall be provided by or on behalf of all subcontractors to cover their operations performed. The Contractor shall be held responsible for any modifications, deviations or omissions in the compliance with these requirements by the subcontractors. At the inception date of the Contract and throughout the term of the Contract, the MBTA shall be provided with certificates of insurance evidencing that such insurance policies are in place and provide coverage as required. The following statement affirming that coverage completely complies with contract requirements shall be included in the special items section of the certificate or in an attached special items addendum page:

The aforementioned insurance coverages completely comply with Article 5.4
Insurance Requirements Paragraphs A - I of MBTA Contract No. G67CN01.

- I. In the event it is determined during excavation or construction that an asbestos condition does exist, a Licensed Asbestos Specialist shall be employed by the Contractor to perform the asbestos containment and abatement work. Prior to asbestos containment and abatement work, the Contractor shall, through the Licensed Asbestos Specialists, obtain insurance in amounts and types specified by the Authority, naming the MBTA as an additional insured as its interest appears under this Contract. Payment for this work will be made in accordance with Division 1 - General Requirements, Section 01150, Article 1.5. **PAYMENT FOR EXTRA WORK.**

5.5 PATENTED DEVICES, MATERIALS, AND PROCESSES

- A. The Contractor shall indemnify and save harmless the Authority and all persons acting for or on behalf of the Authority from all claims and liability of any nature or kind, and all damages, costs and expenses, including attorney's fees, arising from or occasioned by an infringement or alleged infringement of any patents or patent rights on any invention, process, material, equipment, article, or apparatus, or any part thereof, furnished and installed by the Contractor, or arising from or occasioned by the use of manufacture thereof, including their use by the Authority. In case

such materials, equipment, devices, or processes are held to constitute an infringement and their use enjoined, the Contractor, at his expense, shall:

1. Secure for the Authority the right to continue using said materials, equipment, devices, or processes by suspension of the injunction or by procuring a license or licenses; or
 2. Replace such materials, equipment, devices, or processes with noninfringing materials, equipment, devices, or processes; or
 3. Modify them so that they become noninfringing, or remove the enjoined materials, equipment, devices, or processes and refund the sums paid therefor without prejudice to any other rights of the Authority or the Engineer.
- B.** When Federal Funds are involved, patent rights to any patentable result arising out of the Work, as well as all information, designs, specifications, know-how, data, and findings, shall be made available to the Government for public use, unless the Federal Department involved shall, in specific cases where it is legally permissible, determine that it is in the public interest that it not be so made available.

5.6 RESTORATION OF SURFACES OPENED BY PERMIT

- A.** Contractor shall not allow any party to make an opening in a street or highway for any purpose except upon the direction of the Engineer and the presentation of a duly authorized permit or other instrument. The holder of such a permit or instrument shall be considered in the same class as a contractor on an adjacent contract, and the provisions of Articles 3.5 and 3.6 shall apply.

5.7 FEDERAL PARTICIPATION

- A.** (Applicable only to contracts where the cost of any portion thereof is paid out of federal funds). Attention is directed to the provisions of the Federal Transportation Act of 1964 (U.S. Public Law 88-365), as modified or amended, and any other provisions of law, or amendments thereto whereby such federal participation is authorized, and any regulations properly and lawfully promulgated thereunder, under which the United States shall aid the individual states in the development of efficient and coordinated mass transportation systems. When the United States government is to pay any portion of the cost of the Contract, the above act of Congress provides that the construction work and labor in each State shall be done in accordance with the laws of that State and applicable federal laws. The Work embraced in the Contract will, therefore, be subject to such inspection by representatives of the U.S. Department of Transportation or other such Federal Agency as may be necessary to meet the above requirements. Such inspection shall, however, in no sense make the United States government a party to the Contract, and will in no way interfere with the rights of either party hereunder.

5.8 RELATIONS WITH RAILROAD AND RESPONSIBILITY FOR DAMAGE TO RAILROAD

- A.** Provisions in these General Conditions, which require the Contractor to protect property against damage, and which place upon the Contractor all responsibility for damage to property, injury to persons, and loss, expense, and delay to the owners of property and others, shall also apply to railway lines or railroads, their tenants, licenses, and utility companies which jointly own or use facilities with a railroad company (hereinafter collectively and severally referred to as "Railroad"), the same as in connection with other kinds of property.

- B.** General and special requirements concerning the Contractor's relations with Railroad will be set forth in the Supplementary Conditions. The Contractor shall conform to those requirements in the conduct of his work under the Contract.
- C.** The Contractor shall be solely and directly responsible to the owners and operators of such properties for any damage, injury, expense, loss, or delay which may result from the carrying out of the work to be done under the Contract; and if specified in the Supplementary Conditions, the Contractor shall give bond or insurance of the kind and in the amount therein specified to each corporation, company, partnership, or individual owning or operating any of the properties affected, in guarantee of this responsibility. Any extension of time granted the Contractor in which to complete the Contract shall not relieve him or his surety from this responsibility.
- D.** If any of the Work required to be done by the Contractor may obstruct the tracks of a Railroad or in any way endanger the operation of its trains and the services of a flagman or flagmen or other railroad protective personnel are required by the Chief Engineer of the Railroad and men are assigned by him for the protection of the property and traffic of the Railroad against hazards capable of being caused by the Contractor, the cost of all such flagging and protective services shall be borne by the Contractor and no compensation therefor will be made other than that provided by the Contract unit prices. The provisions of this paragraph do not apply to the tracks of the MBTA or to the operations of its trains thereon. Required flagmen and other protective personnel for such purposes will ordinarily be furnished by the Authority at no cost to the Contractor.

5.9 USE OF EXPLOSIVES

- A.** Explosives, when necessary for use in the Work, shall not be brought within the Contract limits or onto property under the jurisdiction of the Authority, without the prior approval of the Authority.
- B.** Explosives shall be stored safely under lock and key. The storage places shall be marked conspicuously DANGEROUS EXPLOSIVES and be in the care of a competent watchman at all times. Storage, handling, and use of explosives shall conform to the regulations of the Massachusetts Department of Public Safety, federal regulations and local ordinances relating thereto.
- C.** The Contractor shall be responsible for all damages resulting from the use of explosives. The Contractor shall exercise care not to endanger life and property, including new Work. When directed, the number and size of the charges shall be reduced. Flagmen shall be provided, when directed, to warn and keep traffic from the danger area. All persons within the danger area shall be warned and given time to withdraw.
- D.** Prior to start of the blasting, the Contractor shall give at least a 48-hour notice and a schedule of his operations thereof to the operating official, company, or companies leasing, owning, or responsible for pipes, conduits, poles, wires, railroad tracks, or any other public or private utility which may be endangered by the blasting in order that a representative of said owner or lessee may be present at the site. The Contractor shall take proper precautions to prevent injury to said properties during all blasting operations.

5.10 PROTECTION AND RESTORATION OF PROPERTY

- A.** The Contractor shall, at no additional expense to the Authority, preserve and protect from injury all property either public or private along and adjacent to the proposed Work. The Contractor shall be responsible for and shall repair at no additional expense to the Authority any and all

damage and injury thereto, arising out of or in consequence of any act or omission, neglect or misconduct in the execution of the Work, or in consequence of the nonexecution thereof by the Contractor or his employees or subcontractors in the performance of the Work covered by the Contract prior to completion and acceptance thereof. The Contractor shall be solely responsible for any trespass upon adjacent property or injury thereto, resulting from or in connection with his operations. The Contractor shall be liable for any claims that may be made on account of the felling of trees or the deposit of debris of any kind upon private property. Special care shall be exercised during blasting operations to avoid injury to underground structures and utilities.

- B.** Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of public or private utilities of his intention to commence operations affecting such utilities at least five days, exclusive of Saturdays, Sundays, and legal holidays in advance of the start of such operations in accordance with Chapter 82, Section 40 of the General Laws of the Commonwealth, as amended. The Contractor shall, at the same time, file a copy of said notice with the Engineer.
- C.** Although the Contract Drawings may indicate the approximate location of existing subsurface utilities in the vicinity of the Work, accuracy and completeness of the information is not guaranteed by the Authority. Before commencing any work or operations which may endanger or damage subsurface structures, the Contractor shall carefully locate all such structures and conduct his operations in such manner as to avoid damage thereto. When necessary, the Contractor shall cooperate with representatives of public service and utility companies in order to avoid damage to their structures by furnishing and erecting suitable supports, props, shoring, or other means of protection. The Contractor shall not interrupt live services until new services have been provided. All abandoned services shall be plugged or otherwise made safe and secure. Compensation for conforming to all provisions of this Article 5.10, unless compensation is authorized in writing by the Engineer, as specified in Article 2.3, Extra Work, or as may be Conditions, shall be considered as included in the prices for the various Contract items of Work and no additional compensation will be allowed therefor.
- D.** If the Contractor desires to temporarily relocate a utility, other than those contemplated by the Authority, he shall make the necessary arrangement with the appropriate utility company and make reimbursement for the cost thereof at no additional expense to the Authority.
- E.** Access to fire hydrants and fire alarm boxes shall be maintained by the Contractor throughout the prosecution of the Work. Hydrants, alarm boxes, and standpipe connections shall be kept clear of obstructions and kept visible at all times. If visibility cannot be maintained, the Contractor shall provide clearly visible signs and lights showing the locations of fire hydrants, fire alarm boxes, or standpipe connections. Utility companies and municipal agencies having facilities within the limits of the Work shall have access to their facilities at all times for inspection and repair.
- F.** Land monuments and property marks shall be carefully protected by the Contractor and if necessary to remove the same, he shall do so only at the Engineer's direction and after an authorized agent has witnessed or otherwise referenced their location.
- G.** The Contractor shall protect and preserve natural surroundings and roadside growth either within or adjacent to the project site from damage or injury due to these operations. The Contractor shall not, except by written permission of the Engineer, remove, destroy, or trim roadside trees or shrubs. Trees or landscape features carelessly scarred or damaged by the Contractor's operations shall be removed and replaced or neatly trimmed and restored to their original condition as required by the Engineer. The Contractor shall be responsible for all damage to roadside growth due to his operations and shall, without compensation, satisfactorily repair or replace all such damaged growth. Scars on trees shall be painted as soon as possible with an approved tree paint.

- H.** The Contractor shall protect existing structures, shall provide lights and fences and take all other precautions that may be necessary to protect life and property at no additional expense to the Authority. The Contractor shall carry on all operations and use equipment of such types that noise resulting from construction operations will be kept to a minimum. Barriers and bridges shall be provided for the protection and use of the public and for the protection of the Work as necessary. The Contractor shall provide and maintain access for occupant and customer entrance to and exit from all adjacent buildings and property at all times. All temporary facilities required for the general protection of the public and the Work shall be subject to approval of the Authority.
- I.** Prior to commencing Work, the Contractor shall record the existing condition of abutting property. The Contractor shall obtain the necessary permission for entry and cause a detailed examination to be made of such abutting property as the Contractor deems necessary, as required in the Supplementary Conditions, or as directed by the Engineer. The Contractor shall invite the owner, in writing or by registered mail, to be present during the examination. A representative of the Authority shall also be invited. A complete report of the existing conditions, including photographs, if required, shall be made in triplicate, and signed by the Contractor. One copy shall be delivered to the owner, one to the Authority and one shall be retained by the Contractor. If at any time thereafter a claim for damages or alleged damages is filed by the owner or tenant, the Contractor shall make further detailed examinations. A representative of the Authority will be invited to attend. All facts as to changes between the then existing conditions of said property and those which existed at the time of the original examination shall be noted and recorded in triplicate. One copy of this report shall be delivered to the owner, one to the Authority, and one shall be retained by the Contractor.
1. In the event that the Contractor cannot obtain from the owner of such abutting property permission to enter upon the property for such examination, the Contractor shall immediately notify the Authority.
 2. For these detailed examinations, the Contractor shall employ an independent person who has had previous experience in examining or surveying the conditions of the property and who shall be approved by the Authority.
- J.** The Contractor shall conform to all requirements of this Article and shall serve written notice to all Utility Owners or officials and to all others concerned with or having charge of public or private-owned utilities, of his intention to commence operations affecting such utilities at least one week in advance of the beginning of such operations. The Contractor shall at the same time file a copy of said notices with the Engineer.
- K.** The Contractor shall confine his movements and operations insofar as possible to the area within the limits of the Work, and the area outside the limits of the Work shall not be disturbed except as directed.
- L.** All costs of work included in this subsection shall be borne by the Contractor and no separate payment will be made to the Contractor.

5.11 FOREST PROTECTION

- A.** In the execution of any Work within or adjacent to any State or National forest, park, or other public or private lands, the Contractor shall comply with all of the regulations of the appropriate authorities having jurisdiction over such forest, park, or lands. The Contractor shall keep the areas in his construction operations in an orderly condition and properly dispose of all refuse and discarded materials.

- B. The Contractor shall obtain construction permits which may be required for Contract operations, not a part of the Contract, in accordance with the requirements of the regulations of the appropriate authorities.
- C. The Contractor shall take all reasonable precautions to prevent and suppress open fires in any area involved in his construction operations or occupied by him as a result of such operations. The Contractor shall cooperate with the proper authorities of the state and federal governments in reporting, preventing, and suppressing any open forest fires.

5.12 PROTECTION OF FENCES

- A. By constructing temporary fences, or by other adequate means, the Contractor shall restrain stock from leaving the lands wherein they are confined or from trespassing which would be made possible by, or which might result from, the removal or destruction of existing fences or the carrying out of any part of the Work under the Contract. The Contractor shall be responsible for all loss, injury, or damage that may result from the Contractor's failure to restrain stock as above provided. Compensation for erecting and maintaining temporary fences and for otherwise providing for the restraint of stock shall be considered as included in the prices for the various Contract Items and no additional compensation will be allowed therefor.
- B. If the Contractor is ordered by the Engineer to construct new right of way fences or to move and reconstruct existing fences, such Work shall be paid for at the unit price bid for same, or as Extra Work.
- C. The Contractor shall use care to avoid damaging existing fences. The Contractor shall repair or replace at no additional expense to the Authority, and to the satisfaction of the Engineer, all fences which are in any way damaged by Contract operations.
- D. Tearing down and removal of fences occurring within the right-of-way limits shall be considered to be a part of the clearing and grubbing work as set forth in the Contract Specifications, and payment therefor included in the payment for clearing and grubbing.

5.13 SAFEGUARDING OF EXCAVATIONS

- A. Contractor shall provide safeguards and protection around and in the vicinity of excavations necessary to prevent and avoid the occurrence of damage, loss, injury, and death to property, animals, and persons because of such excavations. Liability for any such damage, loss, injury, or death shall rest with the Contractor.

5.14 DISPOSAL OF MATERIALS OUTSIDE THE WORK SITE

- A. Unless otherwise specified in the Contract Specifications, the Contractor shall make his own arrangements for disposing of waste and excess materials outside the work site at no additional expense to the Authority.
- B. Prior to disposing of material outside the Work site, the Contractor shall obtain written permission from the owner on whose property the disposal is to be made. The Contractor shall file with the Engineer the permit, or a certified copy thereof, together with a written release from the property owner absolving the Authority from any and all responsibility in connection with the disposal of material on said property.

- C. When material is disposed of as provided in Paragraph B. and the disposal location is visible from an MBTA System track or a public highway, the Contractor shall dispose of the material in a manner to the satisfaction of the Engineer and the Owner.
- D. Unless otherwise provided in the Contract Specifications, full compensation for all costs involved in disposing of materials as above specified, including all costs of hauling, shall be considered as included in the price paid for the Contract Item involving such materials and no additional compensation will be allowed therefor.

5.15 SAFETY AND FIRST AID REQUIREMENTS

- A. The Contractor shall have a full-time (all working hours/one each shift) **on-site** experienced Safety Supervisor/Representative, whose **sole** responsibility is on-site safety management. The Contractor shall submit, within five (5) working days after receipt of notification of contract award, to the Engineer (Authority Resident Engineer) a detailed site-specific Safety Program, including the name, experience, and qualifications of the Contractor's full-time, on site Safety Supervisor/Representative and alternate. In the absence of the Safety Representative (e.g. vacation, sick leave, short term shift work not exceeding two weeks) the contractor must assign a full time Authority approved alternate Safety Supervisor/Representative to this contract. All safety submittals must be approved by the Engineer (MBTA Safety Department) prior to the start of construction. No work at the job site shall begin until the Engineer has reviewed and commented on the Contractor's safety program and safety representatives. Implementation and enforcement of the safety program for the forces of the Contractor and all subcontractors shall be the responsibility of the General Contractor.
- B. The Contractor's full-time Safety Supervisor/Representative shall have a thorough knowledge of construction safety and OSHA regulations. If, in the opinion of the Engineer, the Contractor's safety representative is not effective in carrying out the assigned duties as described below, the Engineer may request, in writing, that the Contractor replace the safety representative.

Contractors Safety Supervisors/Representatives and alternate are classified into levels with their qualifications based upon the extent of their construction safety supervisory experience and capabilities, and the nature of each individual contract. All contracts require a Class III Full-time Safety Supervisor/Representative unless otherwise specified. Qualifications for each classification shall include, at minimum:

Class I

Basic safety and health training (minimum requirement: successful completion of OSHA 10 hour Construction Safety and Health training course):

- Two years experience as a construction safety supervisor where safety was 100% of the position responsibility
- Working knowledge of safety regulations and hazard control measures
- Demonstrated ability to conduct safety training
- Working knowledge of safety specific contract hazardous work procedures Physically able to perform the job.

Class II

Five years experience as a construction safety supervisor, three of which include full-time on-site construction safety experience (minimum requirement: successful completion of OSHA 30 hour Construction Safety and Health training course):

- Specialized safety training relevant to the project
- Demonstrated ability in creating a safe work environment
- Working knowledge of safety regulations and hazard control measures
- Demonstrated ability to conduct safety training
- Working knowledge of safety specific contract hazardous work procedures
- Physically able to perform the job.

Class III

Seven years experience as a construction safety supervisor, five of which include full-time on-site construction safety experience (minimum requirement: successful completion OSHA 30 hour Construction Safety and Health or OSHA's Instructor #500 Training course):

- Specialized safety training relevant to the project
 - Demonstrated ability in creating a safe work environment.
 - Working knowledge of safety regulations and hazard control measures.
 - Demonstrated ability to conduct safety training.
 - Working knowledge of safety specific contract hazardous work procedures.
 - Physically able to perform the job.
- C.** The duties of the Safety Supervisor/Representative shall include maintenance of the Contractor's safety program, enforcement of safe practices, and the use of safety equipment and personal protective equipment, and other such activities as may be required by OSHA and the Engineer to maintain job safety and accident prevention. The safety representative shall not be replaced, terminated, nor reassigned without the written approval of the Engineer. A minimum transition of two weeks shall occur. Vacancies in these positions must be filled within two weeks of the vacancy occurring. The Safety Representative shall be assigned full-time to the contract and shall not be utilized concurrently on any other MBTA contract or any other projects outside this MBTA contract.
- D.** Attention of the Contractor is, specifically directed to the General and Supplementary Conditions of this Contract, which shall be made a condition of each subcontract entered into pursuant to the Contract. Further, that the Contractor and any subcontractor shall not require any laborer or mechanic employed in performance of the Contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to health or safety, as determined under construction safety and health standards (Title 29, Code of Federal Regulations, Part 1518, Published in the Federal Register on April 17, 1971) promulgated by the United States Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (83 Stat. 96). This contract will require all contractors and subcontractors to comply one hundred percent (100%) with OSHA's fall protection standard.
- E.** The Authority may stop any work that it considers to be unsafe.
- F.** The Contractor shall notify the Engineer 48 hours prior to bringing in any hoisting equipment (cranes, etc.) on the Authority's property. Equipment must be inspected by the Engineer (MBTA Safety Department) before being used on the work site.
- G.** The Contractor shall assume full responsibility for the safety of all his work. He shall perform work in a manner that will insure the safety of personnel and the work; and not expose personnel and equipment to hazardous or potentially hazardous conditions. All work in the construction of the project shall comply with the requirements of the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) provisions, as well as those of State and local regulations. Safe breathing levels must conform to the Massachusetts Department of

Environmental Projection (DEP) standards. In the case of conflict of regulations, the most stringent regulations shall apply.

- H.** The Contractor shall provide at the site such equipment and medical facilities as are necessary to supply first-aid service to any person who may be injured in the progress of the work. At least one individual member of the contractor's staff, properly qualified with current certification (Red Cross or equivalent) in basic first aid and cardiopulmonary resuscitation (CPR), must be continuously present, on the site at all times when work is in progress. This individual must also have a general knowledge regarding blood borne pathogens. First-aid equipment shall be complete in all respects. The Contractor shall also have standing arrangements for the removal and hospital treatment of any employee who may be injured or who may become ill.
- I.** The Contractor shall promptly report in writing to the Authority all accidents whatsoever arising out of or in connection with the performance of the work, whether on or adjacent to the site, which cause death, personal injury or property damage, giving full details and statements of witnesses. In addition, if death, or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone to the Authority.
- J.** If any claim is made by any third person against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the fact in writing to the Authority, giving full details of the claim.
- K.** REQUIRED TRAINING
 - 1. Prior to commencement of any work within the MBTA property limits all workers employed by the Contractor or subcontractors shall complete the Railroad Workers Protection (RWP) training conducted by the Operating Railroad. All workers shall be in possession of the photo ID when attending RWP Training. RWP training is valid for one year and every worker shall be re-certified before training expiration date. All Contractors' personnel shall be in possession of the valid RWP Training identification card at all times while on the MBTA property. RWP Training shall be obtained by the Contractor at no additional cost to the Contract.
 - 2. The Contractor shall certify that all employees to be employed at the worksite shall have successfully completed a course in construction safety and health. The course must be approved by the United States Occupational Safety and Health Administration, and it must be at least 10 hours in duration per MGL 30.39S. The Contractor shall submit documentation of successful completion of said course with the first certified payroll report for each employee.
- L.** All personnel working on the project site, within the MBTA construction project limits are required to wear high visibility reflective orange safety vests, similar to the standard MBTA equipment. In addition, all personnel working in the MBTA track area or on the platform will require the use of MBTA flagman.
- M.** Work activities necessitating the traction power system (third rail and trolley wire) deenergization will require the services of an Authority power lineman on site at all times.
- N.** The Contractor will be required to comply with the applicable requirements of the Environmental Protection Agency's National Emission Standards for Hazardous Air Pollutants, Part 51, Chapter 1, Title 40, Code of Federal Regulations, Subpart B, effective April 6, 1973, and as amended October 5, 1975 (Published October 14, 1975, in the Federal Register), and also subpart M published in June 1984.
- O.** All equipment used by the contractor on Authority property must be inspected by the Engineer (MBTA System wide maintenance and Improvement representative) prior to use on the work site

and shall not be used if considered unsafe or not conforming to Authority specifications. All contractor/subcontractor equipment (including hi-rail) operators must be trained, certified, and properly licensed for each specific piece of equipment they will operate. The contractor/subcontractor must keep a copy of the Manufacturers Operating Manual or instructions onboard the hi-rail equipment at all times. The contractor/subcontractor hi-rail vehicles must be equipped with an exhaust gas purifier, and the hi-rail equipment used shall comply with requirements of the hi-rail equipment manufacturer. Documentation of same must be readily available and provided to the Authority upon inspection. If the contractor/subcontractor equipment is involved in a derailment or a near miss incident or accident which caused injury or exposed personnel to injury and/or caused damage to Authority property, that equipment is subject to the Authority's Impound Policy/Procedure. Contractor equipment to be used on or in the vicinity of the tracks shall be in first-class condition, so as to positively prevent any failure that would cause delay in Authority operations or damage to its property or compromise the health and safety of personnel working on the project. Equipment shall not be placed or operated within fouling distance (15' from the centerline) of track without first obtaining the permission of the Authority.

- P. The Authority will not compensate the Contractor for delays or denials to work when the Contractor is in violation of the above regulations.
- Q. Heavy Equipment used in tunnel operations must utilize Fire Resistant hydraulic fluids and conform to OSHA 20 CFR 1926.800 (m)(8), and the Massachusetts Fire Prevention Regulations {527 CMR 1.03 (8)} and the Boston Fire Prevention Code {Section 1.05 (b)}.

5.16 RESPONSIBILITY FOR DAMAGE CLAIMS

- A. The Contractor shall indemnify, defend, and save harmless the Authority and all its officers, agents, and employees against all suits, claims, or liability of every name and nature, for or due to any injuries to persons or damage to property arising out of or in consequence of the arts of the Contractor in the performance of the Work covered by the Contract or failure to comply with the terms and conditions of said Contract, whether by the Contractor or the Contractor's employees or subcontractors.
- B. The Contractor shall be held responsible for any and all claims for damage to underground structures and utilities due to the Contractor's operations or to the operations of any of the Contractor's subcontractors.
- C. The Authority agrees to indemnify the Contractor against loss by reason of the liability to pay damages to others for entry upon any land included within and adjoining the boundaries of the area within which the Work is to be provided as set forth in the Contract Documents applying to such Contract or any approved changes thereof or for damage sustained upon any lands adjoining said land by reason of the flowage or drainage of water thereto or therefrom, in any case wherein such damages and interest or easement in such adjoining area, provided that the Authority acting by an authorized representative thereof has issued a notice in writing to the Contractor prior to the making of any entry upon such premises directing or permitting the Contractor to proceed with the Contract and to make such entry upon the premises for the purpose of providing the Work required by said Contract, or any approved alteration thereof, and provided, further, that the Contractor has given notice in writing to the Authority within 15 days after receiving notice of any claim to come in and settle the same and upon the commencement of any action against the Contractor to come in and defend said action, but in no event shall any such damage claim be compromised or adjusted without the written consent of the Authority. The provisions of this Article shall in no way relieve the Contractor from any liability for damage to property of others caused by the Contractor's negligence or that of the Contractor's employees nor shall they be

construed to require the Authority to indemnify the Contractor against any loss resulting from such acts of negligence.

5.17 CLAIMS AGAINST CONTRACTOR FOR PAYMENT OF LABOR AND MATERIALS

- A.** The Contractor shall be responsible for prompt payment for all services, labor, equipment, and materials furnished by or through the Contractor for purposes of the Contract.
1. Forthwith after the Contractor receives payment for a periodic estimate, the Contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the Contractor.
 2. Not later than the sixty-fifth day after each subcontractor substantially completes its work in accordance with the Contract Documents, the entire balance due under the subcontract less amounts retained by the Authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the Authority will pay that amount to the Contractor. The Contractor shall forthwith pay to the subcontractor the full amount received from the Authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the Contractor.
 3. Each payment made by the Authority to the Contractor pursuant to subparagraphs 1. and 2. of this Article for the labor performed and the materials furnished by a subcontractor shall be made to the Contractor for the account of that subcontractor; and the Authority will take reasonable steps to compel the Contractor to make each such payment to each such subcontractor. If the Authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the Contractor or which is to be included in a payment to the Contractor for payment to the subcontractor as provided in subparagraphs 1 and 2, the Authority shall act upon the demand as provided in this Article.
 4. If, within 70 days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the Contractor the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the Authority as the estimated cost of completing the incomplete and unsatisfactory items of Work, the subcontractor may demand direct payment of that balance from the Authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the Authority, and a copy shall be delivered to or sent by certified mail to the Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within 10 days after the subcontractor has delivered or so mailed the demand to the Authority and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the Authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain detailed breakdown of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the subcontractor.
 5. Within 15 days after receipt of the demand by the Authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the Authority will make direct payment to the subcontractor of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor, less any amount (1) retained by the Authority as the estimated cost of completing the

incomplete or unsatisfactory items of work, (2) specified in any court proceedings barring such payment, or (3) disputed by the Contractor in the sworn reply; provided, that the Authority will not deduct from a direct payment any amount as provided in part (3) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph 4. The Authority will make further direct payment to the subcontractor forthwith after the removal of the basis for the deductions from direct payments made as provided in parts (1) and (2) of this subparagraph.

6. The Authority will forthwith deposit the amount deducted from a direct payment as provided in part (3) of subparagraph 5. in an interest-bearing joint account in the names of the Contractor and the subcontractor in a bank in Massachusetts selected by the Authority or agreed upon by the Contractor and the subcontractor and shall notify the Contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.
7. All direct payments and all deductions from demands for direct payments deposited in an interest bearing account or accounts in a bank pursuant to subparagraph 6, shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later became payable to the Contractor and in the order of receipt of such demands from subcontractors. All direct payments will discharge the obligation of the Authority to the Contractor to the extent of such payment.
8. The Authority will deduct from payments to the Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph 6, are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall be right in such deductions prior to any claims against such amounts by creditors of the Contractor. Subcontractor, for contracts awarded as provided in paragraph (a) of Section Thirty-Nine M, Chapter Thirty shall mean a person approved by the Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor.

5.18 PAYMENT OF TAXES

- A. Contract prices paid for the Work shall include full compensation for all taxes which the Contractor is required to pay whether imposed by federal, state, or local government, including, without being limited to, federal excise tax.
- B. However, attention is directed to the Massachusetts Sales Tax, Chapter 64H, Section 6 and the Massachusetts Use Tax, Chapter 64I, Section 7, which state that these taxes are not applicable to the sales of construction materials and supplies incorporated, consumed, employed or expended in construction projects of the Authority. This exemption is also applicable to rental charges for construction vehicles, equipment, and machinery rented, specifically for use on the site of the Authority's construction projects. Bidders are directed to exclude any allowance for Sales or Use Tax from their Bid Form as said tax would relate to the foregoing specific categories. The MBTA Sales Tax Exemption Number is E-042-323-989.

5.19 CLAIMS OF CONTRACTOR FOR COMPENSATION

- A. No person or corporation, other than the signer of the Contract as Contractor, now has any interest hereunder, and no claim shall be made or be valid; and neither the Authority nor any member, agent, or employee thereof, shall be liable for, or be held to pay, any money except as

provided in Article 2.2, 2.3, 2.4, 2.5, and Section 01150 - MEASUREMENT AND PAYMENT, of these Standard Specifications and Clause 3 of the Contract.

- B.** All claims of the Contractor for compensation other than as provided for in the Contract due to any act of omission or commission by the Authority or its agents must be made in writing to the Engineer within 10 days after the beginning of any work or the sustaining of any damage due to such act. Such written statement shall contain a description of the nature of the Work provided or damage sustained; and the Contractor, shall on or before the fifteenth day of the month succeeding that in which such Work is performed or damage sustained file with the Engineer an itemized statement of the details and amount of such work or damage. Unless such statement shall be made as required, the claim for compensation shall be forfeited and invalidated, and the Contractor shall not be entitled to payment due to any such work or damage. Such notice by the Contractor and the keeping of costs by the Engineer shall not in any way be construed as proving the validity of the claim. The provisions of this paragraph shall not apply to changes in quantities as provided under Article 2.5 or to Extra Work ordered by the Engineer in writing.
- C.** On the basis of information provided in writing by the Contractor's own employees, servants, or agents, the Contractor shall certify, in writing, that the Work for which he is claiming payment, other than as provided for in the Contract, is work actually performed, and the costs as shown are the amounts legally due for providing such Work for which payment is claimed.
- D.** The Engineer will determine all questions as to the amount and value of such Work, and the fact and extent of such damage and will notify the Contractor in writing of this determination.
- E.** Acceptance by the Contractor of the final payment made under the provisions of Section 01150 - MEASUREMENT AND PAYMENT shall operate as and shall be a release to the Authority and every member, agent, and employee thereof, from all claim and liability to the Contractor for anything done or furnished for, or relating to, the Work, or for any act or neglect of the Authority or of any person relating to or affecting the Work except the claim against the Authority for the remainder, if any there be, of the amounts kept or retained as provided in Article 5.17. For claims for extensions of time, see Article 6.8.

5.20 OPENING PORTIONS OF CONTRACT FOR OPERATION

- A.** Any portion of the Work which is in acceptable condition for operation may be opened for MBTA Transit System operation as directed in writing by the Engineer, but such opening for operation shall not be construed as an acceptance of the Work or part thereof, nor shall it act as a waiver of any of the provisions of the Contract Specifications or of the Contract; provided, however, that on such portions of the Contract as are opened for such use, the Contractor shall not be required to assume any expense entailed in maintaining the MBTA Transit System for operation. The Authority will be responsible for maintenance and any damage to the Work caused solely by MBTA Transit System operation on any portion of the Contract which has been opened to operation as stipulated above, and it may order the Contractor to repair or replace such damage, where upon the Contractor shall make such repairs at Contract unit prices so far as the same are applicable, or as Extra Work under the provisions of Article 2.3, if there are no applicable items in the Contract.
- B.** If the Contractor is dilatory in completing shoulders, drainage structures, or other features of the nontransit system portion of the Work, the Engineer may order all or a portion of the nontransit system portion of the Work open to traffic, but in such event the Contractor shall not be relieved of his liability and responsibility during the period the Work is so opened prior to final acceptance. The Contractor shall conduct the remainder of his construction operations so as to cause the least obstruction to traffic.

5.21 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

- A. Until final written acceptance of the Work, the Contractor shall have the charge and care of the Work. The Contractor shall take every necessary precaution against injury or damage to the Work by action of the elements, or from any other cause, whether arising from the execution or the nonexecution of the Work, and especially when blasting is to be done.
- B. Except as provided in Article 2.9, the Contractor shall bear all losses resulting from or due to the amount or the character of the work or because the nature of the land in or on which the Work is done is different from that which was estimated or expected, or due to bad weather or other causes.
- C. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the Work occasioned by any cause before its completion and final acceptance, and all bear the expense thereof, except damage to the Work due to war, whether or not declared civil war, insurrection, rebellion or revolution, or to any act or condition incident to any of the foregoing, to "Acts of God" (limited to hurricane, tornado, cyclone and earthquake as classified by the United States Weather Bureau for the particular locality and for the particular season of the year and in addition thereto, damages resulting directly from flooding from any of the aforementioned "Acts of God"). The repair of such damages shall be done by the Contractor and paid for at the respective Contract unit prices for the quantity and items of Work involved. In any case in which the estimate for replacing such Work or repairing such damage caused by war, whether or not declared, civil war, insurrection, rebellion or revolution, or to any act or condition incident to the foregoing, or an "Act of God" combined with any previously authorized Extra Work results in a change of such magnitude as to be incompatible with competitive bid status, the Authority reserves the right to terminate the Contract and to call for new bids and award a new Contract for such Work. In the event a Contract is terminated for such reason, the Authority will pay the Contractor such sum as may be due for Work performed up to the date of the "Act of God", or of damage directly due to war, whether or not declared, civil war, insurrection, rebellion or revolution, or to any act or condition incident to any of the foregoing and will also take over and pay for any material stored at the site of the Work provided said material was intended to be and could have been incorporated into the Work; the Authority will also take over and pay for any material which was being especially fabricated for incorporation into the Work, provided, however, that as a condition precedent to the Authority's liability for such material, the Contractor is legally liable therefor and the material was intended to be and could have been incorporated in the Work.
- D. Issuance of an estimate on any part of the Work done will not be construed as final acceptance of any Work completed up to that time.
- E. Should the Contractor fail to take prompt action whenever conditions make it necessary, the Authority will make emergency repairs or cause the same to be made, with the stipulation that the costs for such repairs shall be charged against the Contractor and deducted from moneys due the Contractor.
- F. In case of suspension of Work from any cause whatever, the Contractor shall be responsible for the Contract and shall take such precautions as may be necessary to prevent damage to the Work, provide suitable drainage and shall erect any necessary temporary structures, signs, or other facilities at no additional expense to the Authority. The Contractor shall also maintain in an acceptable growing condition all living material in newly established plantings, seeding, and sodding furnished under the Work, and take adequate precautions to protect new tree growth and other important vegetative growth against injury.

5.22 CONFLICT OF INTEREST

- A.** It is understood and agreed that no gift, loan, or other thing of value has been or shall be given to any employee, agent, or officer of the Authority in connection with the award or performance of the Contract. Also no employment shall be given to and no renting, leasing, or purchasing of equipment, supplies, or materials shall be arranged or made with or through any employee, agent, or officer of the Authority by the Contractor.
- B.** No Board Member, officer or employee of the Authority, officer or employee of any independent authority or political subdivision of the Commonwealth of Massachusetts, officer, employee or elected official of the Commonwealth of Massachusetts, officer, employee or elected official of any city, county or town within the Commonwealth of Massachusetts, officer, employee or elected official of any city, county or town authority within the Commonwealth of Massachusetts, during his/her tenure and for one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.
- C.** No member of or delegate to the Congress of the United States shall be admitted to any share or part of this contract or to any benefit arising therefrom.

5.23 PERSONAL LIABILITY OF AUTHORITY OFFICIALS

- A.** In carrying out any of the provisions of the Contract Documents, or in exercising any power or authority granted to them by or within the scope of the Contract, there shall be no liability upon the Directors, Engineer, or their authorized representatives, either personally or as officials of the Authority, it being understood that in all such matters they act solely as agents and representatives of the Authority.

5.24 NO WAIVER OF LEGAL RIGHTS

- A.** Authority shall not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefor, from showing the true amount and character of the Work provided and materials furnished by the Contractor, nor from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made, nor that the Work or materials do not in fact conform to the Contract. The Authority shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the Contractor or the Contractor's sureties, or both, such damage as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract. Neither the acceptance by the Authority, or any representative of the Authority, nor any payment for or acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the Authority, shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages. A waiver of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach. Any remedy provided in the Contract shall be taken and construed as cumulative, that is, in addition to each and every other remedy herein provided; and the Authority shall also be entitled as of right to writ of injunction against any breach of any of the provisions of the Contract.

5.25 LABOR, LODGING, BOARD, MAXIMUM HOURS OF EMPLOYMENT, KEEPING OF PAYROLL RECORDS

- A.** Every employee in public work shall lodge, board, and trade where and with whom the employee elects; and no person or person's agents or employees under contract with the Authority for the

doing of public work, shall directly or indirectly require as a condition of employment therein, that the employee shall lodge, board, or trade at a particular place or with a particular person (Chapter 149, Section 25 of the General Laws of the Commonwealth).

- B.** No laborer, workman, mechanic, foreman, or inspector working within this Commonwealth, in the employ of the Contractor, subcontractor, or other person doing or contracting to do the whole or a part of the Work contemplated by the Contract, shall be required or permitted to work more than 8 hours in any one day or more than 48 hours in any one week, or more than six days in any one week, except in cases of emergency. The Authority or the Contractor or any subcontractor may employ laborers, workmen, mechanics, foremen, and inspectors for more than 8 hours in any one day in the work to be done or under the Contract when, in the opinion of the Commissioner of Labor and Industries, public necessity so requires. (Chapter 149, Section 34 of the General Laws of the Commonwealth, as amended.)
- C.** Upon request of the Engineer or the Massachusetts Department of Labor and Industries, the Contractor shall furnish certified copies of any or all payrolls for the Contract, showing the name, address, and occupational classification of each employee on said Works, and the hours worked by, and the wages paid to each such employee. Such payroll shall also include the rates paid for rented trucks or rental equipment of any kind used on the Work. This requirement shall also apply to the work of any subcontractor, having a subcontract for any of the Work performed on the Contract. Such records shall be kept in such manner as the Commissioner of Labor and Industries shall prescribe, and shall be open to inspection by the Engineer or any authorized representative of the Department of Labor and Industries at any reasonable time and as often as may be necessary.
- D.** In case the Work covered by the Contract is financed from federal funds, the above provisions relative to the hours of employment shall be subject to such revision and amendment as are required by the Rules and Regulations controlling the expenditures of such federal funds.

5.26 EQUAL OPPORTUNITY CLAUSE

- A.** During the performance of the Contract, the Contractor agrees as follows:
- B.** The Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, religion, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: 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. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- C.** The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor; state that all qualified applicants shall receive consideration for employment, without regard to race, creed, color, religion, sex, or national origin.
- D.** The Contractor shall send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

- E. The Contractor shall comply with all provisions of Executive Order 11246 of September 24, 1965, as amended, and of the rules, regulations and relevant orders of the Secretary of Labor.
- F. The Contractor shall furnish all information and reports required by Executive Order 11246 of September 24, 1965, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts of investigation to ascertain compliance with such rules, regulations, and orders.
- G. In the event of the Contractor's noncompliance with the nondiscrimination clauses of the Contract or with any of the said rules, regulations or orders, the Contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, as amended and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, as amended or by rules, regulations, or orders of the Secretary of Labor, or as otherwise provided by law.
- H. The Contractor shall include the portion of the sentence immediately preceding paragraph A. and the provisions of paragraphs A. through G. in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, as amended so that such provisions shall be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.
- I. Applicable Massachusetts and Federal Anti-Discrimination Requirements are contained in the Appendix to the Bid Conditions, Affirmative Action Requirements, Equal Employment Opportunity of the Supplementary Conditions.

5.27 REQUIREMENTS OF CHAPTER 30, SECTION 39R OF GENERAL LAWS OF THE COMMONWEALTH OF MASSACHUSETTS

- A. The words defined below shall have the meaning stated whenever they appear in this subsection:
 - 1. "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to Section 39M of Chapter 30.
 - 2. "Contract" means any contract awarded or executed pursuant to Section 39M of Chapter 30.
 - 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 this person's 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 she has made and sets forth her 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 therefore shall be stated. An accountants report shall include as a part 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 A2 hereof notwithstanding, every agreement or contract awarded or executed pursuant to Section 39M of Chapter 30 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 awarding authority, office of inspector general, and the deputy commissioner of capital planning and operations shall have the right to examine any books, documents, papers or records of the Contractor or of his/her subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his/her 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/her description the date of the change and reasons therefore, 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
 - a. to permit preparation of financial statements in conformity with generally accepted accounting principles, and
 - b. to maintain accountability for assets;

3. access to assets is permitted only in accordance with management's general or specific authorization; and
the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.
 2. 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 she has, examined the statement of management on internal accounting controls, and expressing an opinion as to
 3. 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
 4. whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.
- D.** Every Contractor awarded a contract by the Commonwealth or by any political subdivision thereof shall annually file with the awarding authority during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountants report.
- E.** The office of inspector general, the deputy commissioner for capital planning and operations and any other awarding authority shall enforce the provisions of this section. The deputy commissioner of capital planning and operations may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of Chapter 30A such rules, regulations and guidelines may be applicable to all awarding authorities. A Contractor's failure to satisfy any of the requirements of this section may be grounds for disqualification pursuant to Section 44C of Chapter 149.
1. Note: The record retention aspects of this subsection apply to all contracts awarded by the Authority regardless of value. The requirements relative to the internal auditing and management controls, including the filing of an annual statement, apply to contracts awarded with a value greater than \$100,000.

PART 6 - PROSECUTION AND PROGRESS

6.1 SUBLETTING OR ASSIGNMENT OF CONTRACT

- A.** The Contractor shall give personal attention to the fulfillment of the Contract and shall keep the Work under control.
- B.** The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of the Contractor's right, title, or interest therein, without written consent of the Authority. If consent is given, the Contractor shall be permitted to sublet a portion thereof, but shall provide with the Contractor's own organization, Work amounting to not less than 50 percent of the original total Contract amount, except that any items designated in the Contract as "specialty items" may be provided by subcontract and the amount of any such specialty items provided by subcontracts may be deducted from the total amount in computing the amount of Work required to be provided by the Contractor's own organization. No subcontracts, or transfer of contract, shall in any case release the Contractor from liability under the Contract and bonds.

- C. Consent to sublet any part of the Work shall not be construed to be an approval of the said subcontract or of any of its terms, but shall operate only as an approval of the making of a subcontract between the Contractor and subcontractor.
- D. A subcontractor (vendor or supplier) will be recognized only in the capacity of an employee or agent of the Contractor and the subcontractor's removal may be required as in the case of an employee.
- E. As soon as practicable after execution of the Contract, the Contractor shall submit to the Authority applications for approval of subcontractors for any part of the Work A is proposed to sublet. In addition to stating the name and address of the proposed subcontractor each application shall give the items, or any portions thereof, proposed to be sublet by item number and description, and the total value of the Work proposed to be sublet based on the primary contract unit prices where established or, where not established, on the approved breakdown estimate of a lump sum price required under Section 01150 - MEASUREMENT AND PAYMENT, and not on the amount of the subcontract. The application shall also show other pertinent information in order to enable the Authority to ascertain whether the proposed subcontractor is reliable and able to perform the work.
- F. The Contractor shall direct the attention of subcontractors to the requirements of:
 - 1. Article 5.4 regarding insurance, and also to the Minimum Wage Rates and Health and Welfare and Pensions Fund Contributions as determined by the Commission of Labor and Industries of the Commonwealth and also to the provisions of Article 5.25 and 5.26; and:
 - 2. Chapter 30, General Laws of the Commonwealth, Section 39L, requires under 1. above that the Commonwealth and every county, city, town, district, board, commission shall not enter into a contract for such Work with, and shall not approve as a subcontractor furnishing labor and materials for a part of any such Work, a foreign corporation which has not filed with the Authority a certificate of the State Secretary stating that such corporation has complied with Sections 3 and 5 of Chapter 181 and the date of such compliance. Chapter 181, Section 3, requires foreign corporations to appoint the Secretary of the Commonwealth as an attorney for service of process, and Section 5, Chapter 181, requires foreign corporations to file certain documents with the Secretary of State which will permit them to do business in Massachusetts.
- G. The Contractor shall direct the attention of subcontractors and of all suppliers of material to the requirements of Article 3.9, and Section 01400 - QUALITY ASSURANCE, regarding facilities for the Engineer and his inspectors.

6.2 PROSECUTION OF WORK

- A. The Contractor shall commence Work within fifteen (15) calendar days from the date of the mailing of the executed contract to the Contractor unless otherwise ordered in writing by the Engineer; and he shall complete the specified milestones within the days specified below from the date of the mailing of the executed contract to the Contractor.
- B. The Contract Drawings include Construction Staging Plans in Phase 1 through 6. These plans are included for the purpose of identifying to the Contractor what the general sequence of the work should follow. The Contractor should plan their work to follow the general sequence of the phasing but must be such that the work plan will include all elements that must be completed to achieve the milestones indicated below. The Contractor shall submit their proposed phasing plan and demonstrate in their schedule that the milestone will be accomplished prior to acceptance.

In the event the Contractor fails to complete the specified milestones within the days specified, liquidated damages will be assessed pursuant to Section 00700, Article 6.09 of the General Conditions for each calendar day of delay in the completion of the specified milestones as follows:

<u>Milestone</u>	<u>No. of Calendar Days</u>	<u>Liquidated Damages</u>
1. The Contractor shall fabricate and deliver the elevator assembly to within 50 miles of the job site and make the elevator available for inspection by the Authority.	290 days from NTP	\$2500/day
2. Substantial completion to open the new station on the inbound side only.	440 days from NTP	\$2500/day
3. Substantial completion of entire Contract (open outbound platform).	540 days from NTP	\$2500/day
4. Landscaping complete. Punch list complete and Contract Closeout	595 days from NTP	\$2500/day

1. Milestone 1 - Completion of this milestone will be dependent upon the Contractor having the Elevator fabrication complete and delivered to within 50 miles of South Acton Station and available for inspection by the Authority and their representatives.
2. Milestone 2 - Completion of this milestone will be dependent upon the Contractor having the entire inbound platform and entryway off Maple St. complete with egress stair, egress sloped walkway, protective guard fencing, signage or other acceptable temporary protective closure of the back of the platform and with the headhouse on both inbound and outbound sides, overhead pedestrian walkway, and headhouse stairs and elevator complete and in place and in working condition. Systems including lighting, VMS signs, CCTV, and other related electrical and communications system shall be completed, tested, inspected and certified as required by the Contract Documents or authorities having jurisdiction such as the department of public safety. In addition, the outbound (Track 1) track bed which is to be prepared by Station Contract G67CN01 to include drainage, subballast and an initial ballast layer in accordance with the requirements of the Contract Documents shall be completed within this milestone. The outbound track system work that includes rails, ties, other track material and final ballast layer within the project limits between Main St. (Rte. 27) Bridge and Martin St. grade crossing will be performed by others under a separate MBTA Contract. The remaining outbound platform work and all other station improvements work to be performed by Station Contract G67CN01 shall be coordinated and carried out in cooperation with the track work described above being performed by others in the station area.”
3. Milestone 3 - Completion of this milestone will be dependent upon the Contractor having completed the outbound platform and all other work related to systems installation including but not limited to lighting, VMS signs, CCTV, and other related architectural, structural, civil, electrical and communications system elements including testing, inspection and certification as required by the Contract Documents.

4. Milestone 4 - Completion of this milestone will be dependent upon the Contractor having all landscaping completed as required by the Contract Documents. All other work of the Contract including punch list items shall be completed to the satisfaction of the Engineer.

In no event shall the total amount of liquidated damages for failure to complete the above milestones within the days specified exceed \$2,500.00 for any one day.

- B. Should the prosecution of the Work for any reason be discontinued, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.
- C. If in the Engineer's judgment it is necessary at any time, the Contractor shall when directed, employ such forces and equipment for one or more additional shifts as will be required to insure the proper and timely completion of the Work.
- D. The Contractor shall not provide work at any time when conditions are unsuitable for its execution, safety, and permanence. This provision shall not be interpreted as constituting any waiver, release or lessening of the Contractor's obligation to bring the Work to entire completion within the Contract time stipulated therefor.
- E. The Contractor shall not receive any additional compensation for the requirements of this Article.

6.3 REMOVAL OR DEMOLITION OF BUILDINGS AND LAND TAKINGS

- A. When the removal or demolition of buildings within the Contract limits is done under other and separate contracts, the provisions of Article 3.6 shall apply. The Authority will not be held liable for any expense to the Contractor due to any delay or interference with his Work, due to removal or demolition of the buildings, or due to any failure to remove or demolish any buildings, or due to the necessary land takings.
- B. No allowance of any kind will be made except as provided in Article 6.8.

6.4 LIMITATIONS OF OPERATIONS

- A. The Contractor shall conduct the Work at all times in such a manner and in such sequence as will assure the least interference with vehicular, marine, and pedestrian traffic, operations of railroads, and existing portions of the MBTA Transit System, and occupant and consumer entrance to and exit from adjacent buildings and property. The Contractor shall have due regard to the location of detours and to the provisions for handling traffic. The Contractor shall not open up work to the prejudice or detriment of work already started.

6.5 CHARACTER OF WORKMEN, METHODS, AND EQUIPMENT

- A. The Contractor shall at all times employ sufficient labor and equipment to prosecute the several classes of work to full completion in the manner and time required by the Contract Documents.
- B. The Contractor shall provide all cutting, fitting, and patching of the work that may be required to make its several parts fit together properly, and shall not endanger any work by cutting, excavating, or otherwise altering the work or any part thereof.
- C. All workmen shall have sufficient skill and experience to perform the Work assigned to them. Workmen engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

- D.** Any person employed by the Contractor or by any subcontractor who, in the Engineer's judgment, does not perform the work in a proper and skilled manner or is intemperate or disorderly or otherwise unsatisfactory or not employed in accordance with the provisions of Article 5.25, shall at the written request of the Engineer, be removed by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the Work without the approval of the Engineer.
- E.** Should the Contractor fail to take the necessary action to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work, the Engineer may suspend the Work by written notice until such orders are complied with.
- F.** The Contractor shall employ engineers registered in the Commonwealth of Massachusetts, qualified superintendents, foremen, and other supervisory employees to plan all construction operations and to represent the Contractor at all of the several parts of the Work and they shall be present at all times while the Work entrusted to them is in progress and shall be informed thoroughly regarding the Work.
- G.** All equipment used on the Work shall be of sufficient size and in such mechanical condition as to meet the requirements of the Work and to produce a satisfactory quality of work. Equipment used on any portion of the Work shall be such that no injury to the transit system, city streets, highways, or adjacent property will result from its use.
- H.** When methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the Contract, the Contractor may use any methods or equipment that demonstrate to the satisfaction of the Engineer the ability to accomplish the Work in conformity with the requirements of the Contract.
- I.** When the Contract Documents specify the methods and equipment by which the construction shall be performed, such methods and equipment shall be used unless otherwise authorized in writing by the Engineer. If the Contractor desires to use a method or type of equipment other than that specified, such authority should be requested in writing from the Engineer. The request shall include a full description of the methods and equipment proposed to be used as an explanation of the reasons for desiring to make the change. If written approval is given, it will be on the condition that the Contractor shall be fully responsible for producing construction work in conformity with the Contract requirements. If after trial use of the substituted methods or equipment, the Engineer determines that the Work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining construction with the specified methods and equipment. The Contractor shall remove the deficient Work and replace it with Work of specified quality, or take such other corrective action as the Engineer may direct. No changes will be made in basis of payment for the construction items involved nor in Contract time as a result of authorizing a change in methods or equipment under these provisions.
- J.** Prior to the Contractor's selection of the job superintendent, a detailed resume must be submitted to the Authority for approval. Included in the job superintendent's requirements are:

 - 1. Commonwealth of Massachusetts Department of Public Safety License for Construction Supervisor without any restrictions.
 - 2. A minimum of 10 years of related construction experience.

The above requirements may only be waived by the Director of Construction.

6.6 DELAY AND SUSPENSION OF WORK

- A.** The Engineer has the authority to delay the commencement of the Work and delay or suspend any portion thereof, for such period or periods as it may be deemed necessary, because of conditions beyond the control of the Authority or the Contractor, for the failure of the Contractor to correct conditions unsafe for the general public; for failure to carry out provisions of the Contract; for failure to carry out orders; for causes and conditions considered unsuitable for the prosecution of the Work; for acts of third persons not a party to the Contract; or for any other cause, condition, or reason deemed to be in the public interest.

- B.** Upon receipt of written order of the Engineer, the Contractor shall immediately delay the commencement of the Work or delay or suspend any portion thereof in accordance with said order. Work shall not be suspended or delayed without prior written approval or order of the Engineer. The work shall be resumed when conditions warrant or deficiencies have been corrected and the conditions of the Contract satisfied as ordered or approved in writing by the Engineer. The Contractor's attention is also directed to the requirements of Section 01560 - TEMPORARY CONTROLS, Part 1 "Laws to be Observed" Article, and Article 5.21 herein which shall govern during any period of temporary or partial suspension of work.

6.7 CLAIM FOR DELAY OR SUSPENSION OF WORK

- A.** The Contractor shall have no claim for damages of any kind due to any delay in commencement of the Work or any delay or suspension of any portion thereof, except as hereinafter provided.
 - 1. Attention is directed to Section 39.0 of Chapter 30 which requires that every contract subject to the provisions of Section 39M of Chapter 30 contain the following provisions
 - a. and b. in their entirety and, in the event a suspension, delay, interruption, or failure to act by the Authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions a. and b. give the Contractor against the Authority, but nothing in provisions a. and b. shall in any way change, modify, or alter any other rights which the Contractor or the subcontractor may have against each other.
 - a. The Authority may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as it may determine to be appropriate for the convenience of the Authority; provided, however, that if there is a suspension, delay, or interruption for 15 days or more or due to a failure of the Authority to act within the time specified in the Contract, the Authority will make an adjustment in the Contract price for any increase in the cost of the Contract but shall not include any profit to the Contractor on such increases; and provided further, that the Authority will not make any adjustment in the Contract price under this provision for any suspension, delay, interruption, or failure to act to the extent that such is due to any cause for which this Contract provides for an equitable adjustment of the Contract price under any other contract provision.
 - b. The Contractor shall submit the amount of a claim under provision a. to the Authority in writing as soon as practicable after the end of the suspension, delay, interruption, or failure to act and, in any event, not later than the date of final payment under the Contract and, except for costs due to a suspension order, the Authority shall not approve any costs in the claim incurred more than 20 days before the Contractor notified the Authority in writing of the act or failure to act involved in the claim.

6.8 DETERMINATION AND EXTENSION OF CONTRACT TIME FOR COMPLETION

- A. The Contractor shall complete, entirely, and in an acceptable manner, the Work required under the Contract within the time stated in the Bid Form, except that the Contract time for completion shall be adjusted as follows:
1. If the Contract is not awarded as contemplated by Section 00100 of the Contract Specifications, then the number of days allowed for the completion of the Work will be computed from the date of receipt of the Contract by the Contractor or the date on which the Contractor was ordered to commence work whichever is later. For the purpose of this paragraph, the Contractor will be presumed to have received the Contract on the day following the mailing of the executed Contract to the Contractor by the Authority. If the Contract specifies a specific calendar date for completion and the Contract is not awarded as contemplated by Section 00100, of the Contract Specifications then the Contractor will be entitled to an extension of time equivalent to the number of days elapsed from 60 days (45 days if Federal funds are involved) after the opening of bids up to and including the day of receipt of the executed Contract by the Contractor or the date on which the Contractor was ordered to commence Work whichever is later.
 2. In case commencement of work is delayed or any part thereof is delayed or suspended by the Authority (except for unsuitable weather, winter months, or reasons caused by the fault or neglect of the Contractor), the Contractor will be granted an extension of time in which to complete the Work or any portion of the Work required under the Contract equivalent to the duration of the delay less a reasonable period of time within which the Contractor could have done necessary preliminary work.
 3. When delay occurs due to reasonable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to "Acts of God", to war, whether or not declared, civil war, insurrection, rebellion or revolution, or to any act or condition incident to any of the foregoing, acts of the Government, acts of the state or any political subdivision thereof, acts of other contracting parties over whose acts the Contractor has no control, fires floods, epidemics, abnormal tides (not including spring tides), severe coastal storms accompanied by high winds or abnormal tides, freezing of streams and harbors, abnormal time of winter freezing or spring thawing, interference from recreational boat traffic, use of beaches and recreational facilities for recreational purposes during the summer season, abnormal ship docking and berthing, unanticipated use of wharves and storage sheds, strikes except those caused by improper acts or omissions of the Contractor, extraordinary delays in delivery of materials caused by strikes, lockouts, wrecks, freight embargoes, the time for completion of the Work shall be extended as determined by the Engineer to be equitable.
 4. An "Act of God" as used in this Article is understood to imply an earthquake, flood, cyclone, or other cataclysmic phenomenon of nature beyond the power of the Contractor to foresee or make preparation in defense of. A rain, windstorm or other natural phenomenon of normal intensity, based on United States Weather Bureau reports, for the particular locality and for the particular season of the year in which the Work is being prosecuted, shall not be construed as an "Act of God" and no extension of time will be granted for delays resulting therefrom. Within the scope of acts of the Government, consideration will be given to properly documented evidence that the Contractor has been delayed in obtaining any material or class of labor because of any assignment of preference ratings by the Federal Government or its agencies to other defense contracts.
 5. In case the Work is delayed by public or private utility owners or municipal agencies, see Article 3.5.
 6. Each Extra Work Order or Change Order as issued will include a statement of additional time, if any, that is agreed upon by the Contractor and the Engineer required for the completion of the Contract by reason of this Extra Work Order or Change Order, and no other time allowance due to the performance of the Work covered by such Extra Work Order or Change Order will be allowed.

- B. An extension of time will not be granted for any delay or any suspension of the Work due to the fault of the Contractor, nor if a written request for an extension of time on account of delay due to any of the aforesaid causes is not filed within 15 days of the date of the commencement of the delay nor if the request is based on any claim that the Contract period as originally established was inadequate.
- C. Contract period has been carefully considered and has been established for reasons of importance to the Authority. This time limit will be enforced.
- D. The probable slow-down or curtailment of Work during inclement weather and winter months has been taken into consideration in determining the total time required to complete the Contract-hence no extension of time will be allowed due to this reason.

6.9 FAILURE TO COMPLETE WORK ON TIME

- A. On or before the date stated in the Contract Specification for completion, or the date to which the time of completion will have been extended under the provisions of Article 6.8, the Work shall have been performed in accordance with the terms of the Contract. The time in which the various portions and the whole of the Contract are to be Provided and the Work is to be completed is an essential part of the Contract.
- B. In case the Work has not been substantially and physically completed by the time stipulated in the Contract Specification (or by the date in which the completion time may have been extended in accordance with Article 6.8), the Contractor shall pay to the Authority a designated sum per day for the entire period of overrun in accordance with the following Schedule of deductions unless a different amount is stated in the Supplementary Conditions.

SCHEDULE OF DEDUCTIONS

VALUE OF CONTRACT		Charges per calendar day
For more than \$ 0	To and including \$ 25,000	\$ 60
\$ 25,000	\$ 50,000	\$ 150
\$ 50,000	\$ 100,000	\$ 225
\$ 100,000	\$ 500,000	\$ 300
\$ 500,000	\$1,000,000	\$ 450
\$1,000,000	\$2,000,000	\$ 600
\$2,000,000	\$3,000,000	\$ 900
\$3,000,000	\$3,500,000	\$ 1,050
\$3,500,000	\$4,000,000	\$ 1,200
\$4,000,000	\$4,500,000	\$ 1,350
\$4,500,000	\$5,000,000	\$ 1,500
\$5,000,000		\$ 2,000

- C. Whatever sum of money may become due and payable to the Authority by the Contractor under this Article may be retained out of money belonging to the Contractor in the hands and possession of the Authority. This Article shall be construed and treated by the parties to the Contract not as imposing a penalty upon the Contractor for failing fully to complete the Work as agreed on or before the time specified in the Contract Specification (as it may have been extended in accordance with Article 6.8), but as liquidated damages to compensate the Authority for all additional costs incurred by the Authority because of the failure of the Contractor fully to complete said Work on or before the date of completion specified in the Contract Specification (as it may have been extended).
- D. Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall not operate as a waiver on the part of the Authority of any of its rights under the Contract.

6.10 TERMINATION OF CONTRACT

- A. If the Contractor shall be adjudged bankrupt, or make a general assignment for the benefit of creditors, or if a receiver shall be appointed of the Contractor's property, or if the work to be done under the Contract shall be abandoned, or if the Contract or any part thereof shall be sublet without the previous written consent of the Authority, or if the Contract or any claim there under shall be assigned by the Contractor otherwise than as herein specified, or at any time the Engineer certifies in writing to the Authority that the Work, or any part thereof, is unnecessarily or unreasonably delayed, or that the Contractor has violated any of the provisions of the Contract, the Authority may, by written notice, instruct the Contractor to discontinue the Work, or any part thereof, and thereupon the Contractor shall discontinue such Work or such part thereof, as the Authority may designate, and the Authority will require the surety or sureties to complete the Contract.
- B. If the Engineer determines that the rate of progress as reflected by the Contractor's CPM submitted and approved in accordance with the requirements of Section 01300 - SUBMITTALS, is not satisfactory, the Authority, instead of notifying the Contractor to discontinue the Work or any part thereof, may notify the Contractor from time to time to increase the force, equipment, and plant, or any of them, employed on the whole or any part of the Work, stating the amount of increase required; and unless the Contractor shall, within five working days after any such notice, increase such force, equipment, and plant to the extent required therein, and maintain and employ the same from day to day until the completion of the Work or such part thereof or until the conditions as to the rate of progress shall, in the Engineer's judgment, be fulfilled; or unless the Contractor submits and receives approval of a revised CPM indicating the Work being completed on time, the Authority may employ and direct the labors of such additional force, equipment, and plant as may, in the Engineer's judgment, be necessary to insure the completion of the Work or such part thereof within the time specified, or at the earliest possible date thereafter, and charge the expense thereof to the Contractor. Neither the notice from the Authority to the Contractor, to increase the force, equipment, or plant, nor the employment of additional force, equipment, or plant by the Authority shall be held to prevent a subsequent notice from the Authority to the Contractor to discontinue Work under the provisions of the preceding portion of this Article.
- C. The Engineer may exercise the rights under this paragraph to rectify adverse conditions described in Article 3.10, Removal of Defective or Unauthorized Work, and Article 4.4, Defective Material, and notify the Contractor's bonding company to take the necessary appropriate action to remedy the situation. It shall be understood that when the Authority exercises its rights hereinbefore described, the breach of Contract by the Contractor does not itself constitute termination unless stipulated by the Authority. The Contractor shall, as directed by the Engineer, continue other works of the Contract.

- D.** All expenses charged under this Article will be deducted and paid by the Authority out of any moneys then due or to become due the Contractor under the Contract, or any part thereof, and in such accounting, the Authority will not be held to obtain the lowest figures for the Work of completing the Contract or any part thereof, or for insuring its proper completion, but all sums actually paid therefore shall be charged to the Contractor. In case the expenses so charged are less than the sum which would have been payable under the Contract if the same had been completed by the Contractor, the Contractor will be entitled to receive the difference; and in case such expenses shall exceed the said sum, the Contractor shall pay the amount of the excess to the Authority upon completion of the Work without further demand being made therefor.

6.11 TERMINATION FOR CONVENIENCE

- A.** If the Engineer determines that it is in the public interest to do so, the Engineer may notify the Contractor to discontinue all work, or any part thereof, such notice shall be given to the Contractor in writing and thereupon the Contractor shall discontinue such work, or such part thereof, as the Engineer may designate.
- B.** If the Engineer notifies the Contractor to discontinue all work, or any part thereof, the Engineer shall pay and the Contractor shall accept, as full payment for all work done and materials provided, the following sums:
1. For all completed items of work for which there are unit prices provided in the contract.
 - a. The original contract unit prices.
 2. For all work on partially completed items.
 - a. A sum agreed to by the Contractor and the Engineer or:
 - 1) The actual costs for direct labor, materials (less salvage value, if any) and use of equipment, plus 10% of this total for overhead; and
 - 2) the actual cost for Workmen's Compensation and Employer's Liability, Insurance, Health, Welfare and Pension benefits, Social Security deductions, and Employment Security Benefits; and
 - 3) 6 percent of the total of (a) and (b) for profit and;
 - 4) the estimated proportionate cost of surety bonds; and
 - 5) the actual cost to the Contractor for work performed by a Subcontractor, plus 10 percent of such cost. No allowance shall be made for general superintendence and the use of small tools and manual equipment,
 3. For costs of settlement as:
 - a. Reasonable and necessary accounting, legal, clerical and other costs of work discontinuance; and reasonable and necessary storage, transportation and other costs incurred for the preservation, protection or disposition of the discontinued work.
 - b. When requested by the Engineer, the Contractor shall furnish itemized statements of the cost of the work performed and shall give the Engineer access to all accounts, bills and vouchers, relating thereto and unless the Contractor, when requested, shall furnish such itemized statements and access to all accounts, bills and vouchers, he shall not be entitled to payment for the work for which such information is sought by the Engineer.
 - c. The Contractor shall not be paid and the Contractor shall not have any claims for loss of anticipated profits, for loss of expected reimbursement or for any increased expenses resulting directly or indirectly from the discontinuance of any or all, work or from unbalanced allocation, among the contract item, of overhead expense on the part of the bidder and subsequent loss of expected reimbursement therefor or for any other cause. The Contractor shall incorporate the provisions of this section as provisions in its contracts with each of its subcontractors.

CERTIFICATE OF COMPLIANCE
(Manufacturer of Fabricated Material)

Date _____ 20__

WE HEREBY CERTIFY THAT

(Description or Kind of Material)

Furnished to _____
(Name of Contractor Prime or Sub)

For Use on _____ Federal No. _____
(Project No.)

In the Amount of _____
(Quantity Represented)

Identify by _____
(Label, Marking, Seal No., Consignment, or Waybill No.)

Shipped on _____ 20__ Delivered on _____ 20__

Shipped via _____
(Method of Shipment, Car No., or Truck No.)

MEETS THE REQUIREMENTS OF THE PERTINENT PROJECT PLANS, SUPPLEMENTARY CONDITIONS AND SPECIFICATIONS OF THE MASSACHUSETTS BAY TRANSPORTATION AUTHORITY, IN ALL RESPECTS, PROCESSING, PRODUCT TESTING AND INSPECTION CONTROL OF RAW MATERIALS ARE IN CONFORMANCE WITH ALL APPLICABLE SPECIFICATIONS, DRAWINGS AND/OR STANDARDS OF ALL ARTICLES FURNISHED.

All records and documents pertinent to this certificate and not submitted herewith will be maintained available by the undersigned for a period of not less than three years from date of final payment by the MBTA.

(Manufacturer of Supplier)

Signed by _____

Title _____ NOTARY STAMP

Notarized Signature of Person having Legal Authority to bind the Supplier

INSTRUCTIONS

1. The above is a suitable sample of an acceptable certificate.
2. Certificate is to be submitted in triplicate to the Engineer prior to, or on delivery of, material.
3. The following regulation is applicable to all projects involving Federal Funds.

Section 1001 of Title 18 of the United States Code (Criminal Code and Criminal Procedure) is applicable to this statement. (Section 1001 of Title 18, among other things, provides that whoever knowingly and willfully makes or uses a document or writing containing any false, fictitious or fraudulent statement or entry, in any matter within the jurisdiction of any Department or Agency of the United States shall be fined not more than \$10,000 or imprisoned not more than five years, or both).

END OF SECTION

SUPPLEMENTARY CONDITIONS

FOREWORD

Further Supplementing the Authority's Standard Specifications, Section 00700 - General Conditions, the following Supplementary Conditions will apply.

References to Article Numbers in the following Supplementary Conditions unless otherwise stated are to be the aforesaid Standard Specifications, Section 00700 - General Conditions. In case of conflict between these Supplementary Conditions and the aforesaid Standard Specifications, Section 00700 - General Conditions, these Supplementary Conditions will take precedence and shall govern.

The Supplementary Conditions are included herein to augment the Standard Specifications, Section 00700 - General Conditions, with additional information which is applicable to this project.

The enforcement of the requirements of any of the following Supplementary Conditions of the General Conditions shall not be construed as waiving any of the rights of the Authority contained in any of the other conditions of the Contract.

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1. PART 3 - CONTROL OF WORK

A. 3.6. – ADJACENT CONTRACTS

This Article is supplemented as follows:

- E. Adjacent contracts that the Contractor requires coordination with shall include:
- Fitchburg Rail Line Double Tracking from Acton to Ayer
 - Fitchburg Rail Line Communications and Bridges Improvements Project
 - Fitchburg Rail Line Track alignment and Signal upgrade Project
 - Littleton Station Renewal Project
 - Wachusett Extension Project
 - Ongoing Right of Way Maintenance performed by the operating Railroad (MBCR)

The Contractor shall attend coordination meetings, review schedules and coordinate demands for flagging, maintenance and protection of rail traffic provided by the operating railroad to minimize the impact to rail traffic and activities.

2. PART 5 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

A. 5.8 - RELATIONS WITH RAILROAD AND RESPONSIBILITY FOR DAMAGE TO RAILROAD

This Article is supplemented as follows:

- E. The Contractor shall perform the work in such a manner that the Authority and the operating Railroad can operate train service over the site with the following requirements:
1. Rail service is presently being operated on the existing tracks along the work area of this Contract. It is the responsibility of the Contractor to make the necessary arrangements for performing all work specified herein within the time(s) allotted by the Authority and the operating Railroad and to assure that adequate protection for rail traffic is provided as necessary and/or as directed by the Authority. Timetable schedules for rail traffic shall be maintained at all times.
 2. All occupancy of track or that area within the clearance line of rail equipment by Contractor with either on-track or off-track equipment shall be under the exclusive control and jurisdiction of the Engineer. Prior to any construction activity, the Contractor shall appoint a representative, approved by the Authority, to become familiar with the operating rules, timetable and road characteristics of the operating railroad. All other employees of the Contractor shall be made familiar with the operating rules, timetable, and road characteristics by said representative. No Contractor employee shall be allowed to operate on and occupy any track without proper authorization issued by the Authority. Any unauthorized occupancy of track by the Contractor's employees, subcontractor, agents or others acting on behalf of the Contractor, shall not be tolerated and shall be sufficient cause to permit the Engineer to bar such Contractor's employees, or others, from the job.

B. 5.10 – PROTECTION AND RESTORATION OF PROPERTY

1. Add the following new paragraphs:

M. The Contractor shall be required to schedule and coordinate his work in such a manner as to allow continuous operating and maintenance of the Operation Railroad. These include, but are not limited to; maintaining passenger service of commuter rail trains, including unscheduled train movements, freight trains, track and signal systems, and communications systems.

3. PART 6 - PROSECUTION AND PROGRESS

A. 6.1 – SUBLETTING OR ASSIGNMENT OF CONTRACT

1. Paragraph B is supplemented by the following:

The following items are hereby designated as “specialty items”

- Traffic Officers Services
- Rodent Control
- Site Utilities
- Electric Company
- Demolition
- Signage Systems
- Landscaping
- Roofing Systems
- Electrical Work
- Plumbing Systems

B. 6.2 - PROSECUTION OF WORK

This Article is supplemented as follows:

1. Add the following new paragraphs:

F. The Contractor shall provide and use sufficient materials, methods, and labor working all shifts and days including Saturdays, and Holidays as necessary to complete the entire Contract within the milestone dates specified above. No additional compensation will be paid to the Contractor for work required to be performed after the normal weekday hours of 7:00 a.m. to 3:30 p.m.

G. The Contractor shall provide sufficient workers, equipment, and materials necessary to complete the work within the Contract Time without interfering with railroad operations. The Contractor will be restricted to the times determined by the Engineer which will not interfere with train operations for all work within fifteen (15) feet of any railroad track.

C. 6.4 – LIMITATIONS OF OPERATIONS

1. Add the following new paragraphs:

B. The Authority has determined certain limitations are required regarding Contractor’s activities while working on the project. The Contractor shall include all costs in his bid to reflect these limitations and no additional payments will be made to the Contractor for these limitations. These limitations are as follows:

1. Equipment and material access locations to the job sites shall be approved by the Engineer.
2. The Contractor must make arrangements for storage of equipment and supplies through the Engineer with regard to location and abide by the rules and regulations set forth by the Authority.
3. Public ways shall be maintained clean and clear of all spillage from trucks hauling concrete, excess excavation material, fill, and other construction materials to and from the construction site. All concrete, demolition materials, excavation, and other materials hauled to and from the site shall be contained in an enclosed vehicle which will prevent spillage onto streets.
4. The Contractor shall make maximum effort to minimize the amount of traffic to and from the site, which may include scheduling of deliveries, maximizing loads per delivery or other measures as may be required to avoid public nuisance.
5. The Contractor is prohibited from using or allowing any explosive gases, when trains are in operation except as may be permitted in Section 01550 - Hot Work. Propane and gasoline tanks shall be prohibited from any areas where trains are in operation.
6. The Authority reserves the right to delay or suspend the Contractor's access to the site because of operational requirements, adverse weather conditions, or emergency track repairs. The Contractor shall also reasonably expect to have access to and construction activities on portions of the site (within the railroad right of way) delayed by railroad operations. Regularly scheduled commuter rail train movement schedules can be found on the MBTA website WWW.MBTA.COM. The Contractor should expect delays for all construction activities that "foul" the operating track at any time. No additional compensation shall be made for delays resulting from railroad operations, and the Contractor shall make allowances for this in his Bid Price.
7. The Contractor shall be subject to the noise restrictions in accordance with the latest version of the Town of Acton Zoning Bylaws.
8. When work is performed at night the Contractor shall use full cutoff lighting as defined by the Illuminating Engineering Society of North America (IESNA) or in accordance with Town of Acton Bylaws whichever is more restrictive.

4. MINIMUM STATE WAGE RATES

- A. The minimum wage rates to be used for this Contract are shown on the schedules on the following pages. The rates shown on these schedules are the minimum to be paid during the life of the Contract. It is, therefore, the responsibility of bidders to inform themselves as to the local labor conditions such as the length of the work day and work week, overtime compensation, health and welfare contributions, labor supply and prospective changes or adjustment of rates. In the event of conflict between the schedules for any classifications, the greater amount for the classification shall prevail as the minimum wage rate.
- B. If the Contractor finds it necessary during the progress of the work to secure a minimum wage rate for some additional classification, he shall make a request for such additional classification to the Authority, who in turn will obtain the additional classification and corresponding minimum wage rate from the State Department of Labor and Industries and advise the Contractor of the same. These additional classifications and minimum wage rates are then to be considered a part of the Contract, and the Contractor shall have no claim for additional compensation because of the additional classification and minimum wage rates.
- C. Where a question arises as to the classification in the schedule of the Department of Labor and Industries in which any employee is to be included, the decision is to be made by the State Department of Labor and Industries, through their duly authorized representative.
- D. Within three days from the date of the first advertisement or call for bids, two or more employers of labor, or two or more members of a labor organization, or the awarding officer or official, or five or more residents of the town or towns where the public works are to be constructed, may appeal to the associate commissioners for a wage determination, or a classification of employment as made by the Commissioner, by serving on the Commissioner a written notice to that effect. Thereupon the Commissioner shall immediately cause the associate commissioners to hold a public hearing on the Commissioner's action appealed from. The associate commissioners shall render their decision not later than three (3) days after the closing of the hearing. The decision of a majority of the associate commissioners shall be final, and notice thereof shall be given forthwith to the awarding official or public body. (Section 27A, Chapter 149, General Laws, Commonwealth of Massachusetts).
- E. Payments by employers to health and welfare plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided, (Section 26, Chapter 149, General Laws, Commonwealth of Massachusetts).
- F. The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans as provided in the previous section, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to health and welfare plan where such payments are included in said rates of wages shall pay the amount of said payments directly to each employee engaged in said construction. (Section 27, Chapter 149, General Laws, as amended).
- G. The Contractor's attention is directed to further minimum wage provisions under Paragraph 3 of the Supplementary Conditions. In cases of conflict, the higher rate shall apply.

Mass.Gov

Labor and Workforce Development

Home > Workers and Unions > Wage and Employment Related Programs > Prevailing Wage Program > Attachments
for Prevailing Wage Schedules >

Notice to Drivers of BITUMINOUS CONCRETE

NOTICE: TO AWARDING AUTHORITIES AND CONTRACTORS

ISSUED: SEPTEMBER 1, 2006

DRIVERS WHO HAUL BITUMINOUS CONCRETE (ASPHALT)

The Massachusetts Supreme Judicial Court recently affirmed that drivers who haul bituminous concrete to public construction projects are not covered by the Prevailing Wage Law while off-site, including time spent over-the-road and picking-up materials. These drivers are covered by the Prevailing Wage Law only while on-site at the public construction project. In *Teamsters Joint Council No. 10 v. Department of Labor, et al.*, 447 Mass. 100 (2006), the SJC upheld a 2001 administrative decision limiting the applicability of prevailing wage rates to the time bituminous drivers spend at the public construction site. This most recent decision of the SJC followed a 1989 ruling that had upheld an earlier Department of Labor (and Industries') policy that had deemed this category of drivers to be "teamsters" under the Law and, therefore, entitled to prevailing wage rates. See *Construction Industries of Massachusetts v. Commissioner of Labor and Industries*, 406 Mass. 162 (1989). However, the earlier court case had left open the question of whether this entitled these bituminous drivers to prevailing wage rates for their over-the-road time as well as their on-site time. This most recent decision has now answered that question.

All of the requirements of the Prevailing Wage Law, including certified weekly payroll requirements, apply to bituminous drivers for all time spent at the public construction site.

DRIVERS WHO HAUL READY-MIX CONCRETE (CEMENT)

Drivers who haul ready-mix concrete to public construction projects are not covered by the Prevailing Wage Law while off-site, including time spent over-the-road and picking-up materials. These drivers are covered by the Prevailing Wage Law while on-site at the public construction project. This applicability determination was established by a 2001 administrative decision of the Department of Labor's Division of Occupational Safety.

All of the requirements of the Prevailing Wage Law, including certified weekly payroll requirements, apply to ready-mix drivers for all time spent at the public construction site.

Please feel free to contact the Division of Occupational Safety at [617-626-6953](tel:617-626-6953) if you have any questions. Questions about enforcement of the Prevailing Wage Law may be directed to the Attorney General's Fair Labor and Business Practices Division at [617-727-3465](tel:617-727-3465)

**WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE**

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. This is required to be done on a weekly basis. Once collected, the awarding authority is also required to preserve those records for three years from the date of completion of the project.

Each such contractor or subcontractor shall furnish to the awarding authority directly within 15 days after completion of its portion of the work, a statement, executed by the contractor, subcontractor or by any authorized officer thereof who supervised the payment of wages, this form.

STATEMENT OF COMPLIANCE

_____, 20____

I, _____, _____
(Name of signatory party) (Title)

do hereby state:

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

_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

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 _____

09/11

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM



Company's Name:		Address:		Phone No.:		Payroll No.:														
Employer's Signature:		Title:		Contract No.:		Work Week Ending:														
Awarding Authority's Name:		Public Works Project Name:		Public Works Project Location:		Min. Wage Rate Sheet No.:														
General / Prime Contractor's Name:		Subcontractor's Name:		"Employer" Hourly Fringe Benefit Contributions																
Employee Name & Complete Address	Employee is OSHA 10 Certified (?)	Work Classification:	Appr. Rate (%)	Worked							Hourly Base Wage (B)	Health & Welfare Insurance (C)	ERISA Pension Plan (D)	Supp. Unemp. (E)	Total Hourly Prev. Wage (F)	Project Gross Wages (A x F)		Check No. (H)		
				Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.						All Other Hours (A)	Total Gross Wages (G)			

NOTE: Pursuant to MGL Ch. 149 s.27B, every contractor and subcontractor is required to submit a "true and accurate" copy of their weekly payroll records directly to the awarding authority. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Date received by awarding authority
/ /



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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

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>	12/01/2011	\$29.85	\$8.56	\$7.27	0.00	\$45.68
	06/01/2012	\$30.15	\$8.56	\$7.27	0.00	\$45.98
	08/01/2012	\$30.15	\$8.91	\$7.27	0.00	\$46.33
	12/01/2012	\$30.45	\$8.91	\$8.00	0.00	\$47.36
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$29.92	\$8.56	\$7.27	0.00	\$45.75
	06/01/2012	\$30.22	\$8.56	\$7.27	0.00	\$46.05
	08/01/2012	\$30.22	\$8.91	\$7.27	0.00	\$46.40
	12/01/2012	\$30.52	\$8.91	\$8.00	0.00	\$47.43
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$30.04	\$8.56	\$7.27	0.00	\$45.87
	06/01/2012	\$30.34	\$8.56	\$7.27	0.00	\$46.17
	08/01/2012	\$30.34	\$8.91	\$7.27	0.00	\$46.52
	12/01/2012	\$30.64	\$9.07	\$8.00	0.00	\$47.71
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$80.43	\$9.80	\$17.12	0.00	\$107.35
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2011	\$30.10	\$7.10	\$11.55	0.00	\$48.75
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>ASBESTOS WORKERS LOCAL 6 (BOSTON)</i>	12/01/2011	\$28.40	\$9.90	\$5.95	0.00	\$44.25
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67

This wage schedule must be posted by the contractor at the work site in accordance with M.G.L. ch. 149, sec. 27. Failure of the employer to pay "prevailing wage rates," which are the "total rates" listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at www.mass.gov/dols or at 617-626-6952. Employees not receiving such rates should report the violation to the Fair Labor Division of the Office of the Attorney General, 100 Cambridge Street, Boston, MA 02108; Tel:



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

Prevailing Wage Rates

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DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 2</i>	12/01/2011	\$30.10	\$7.10	\$11.55	0.00	\$48.75
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2010	\$37.70	\$6.97	\$11.18	0.00	\$55.85

Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2010

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$24.51	\$6.97	11.18	\$0.00	\$42.66
2	65	\$24.51	\$6.97	11.18	\$0.00	\$42.66
3	70	\$26.39	\$6.97	11.18	\$0.00	\$44.54
4	75	\$28.28	\$6.97	11.18	\$0.00	\$46.43
5	80	\$30.16	\$6.97	11.18	\$0.00	\$48.31
6	85	\$32.05	\$6.97	11.18	\$0.00	\$50.20
7	90	\$33.93	\$6.97	11.18	\$0.00	\$52.08
8	95	\$35.82	\$6.97	11.18	\$0.00	\$53.97

Notes:

Apprentice to Journeyworker Ratio:1:5

This wage schedule must be posted by the contractor at the work site in accordance with M.G.L. ch. 149, sec. 27. Failure of the employer to pay "prevailing wage rates," which are the "total rates" listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at www.mass.gov/dols or at 617-626-6952. Employees not receiving such rates should report the violation to the Fair Labor Division of the Office of the Attorney General, 100 Cambridge Street, Boston, MA 02108; Tel:



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Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 1 (LOWELL)</i>	03/01/2012	\$44.46	\$10.18	\$16.65	0.00	\$71.29

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 1 Lowell

Effective Date - 03/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.23	\$10.18	16.65	\$0.00	\$49.06
2	60	\$26.68	\$10.18	16.65	\$0.00	\$53.51
3	70	\$31.12	\$10.18	16.65	\$0.00	\$57.95
4	80	\$35.57	\$10.18	16.65	\$0.00	\$62.40
5	90	\$40.01	\$10.18	16.65	\$0.00	\$66.84
6	95	\$42.24	\$10.18	16.65	\$0.00	\$69.07

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2011	\$32.80	\$7.10	\$12.60	0.00	\$52.50
CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2011	\$31.65	\$7.10	\$12.60	0.00	\$51.35
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2011	\$31.65	\$7.10	\$12.60	0.00	\$51.35

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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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2012	\$33.03	\$9.80	\$15.61	0.00	\$58.44

Apprentice - CARPENTER - Zone 2 Eastern MA

Effective Date - 03/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.52	\$9.80	1.57	\$0.00	\$27.89
2	60	\$19.82	\$9.80	1.57	\$0.00	\$31.19
3	70	\$23.12	\$9.80	10.90	\$0.00	\$43.82
4	75	\$24.77	\$9.80	10.90	\$0.00	\$45.47
5	80	\$26.42	\$9.80	12.47	\$0.00	\$48.69
6	80	\$26.42	\$9.80	12.47	\$0.00	\$48.69
7	90	\$29.73	\$9.80	14.04	\$0.00	\$53.57
8	90	\$29.73	\$9.80	14.04	\$0.00	\$53.57

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING <i>BRICKLAYERS LOCAL 1 (LOWELL)</i>	03/01/2012	\$41.17	\$9.93	\$15.15	0.00	\$66.25
CHAIN SAW OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$40.52	\$10.00	\$12.40	0.00	\$62.92
	06/01/2012	\$41.09	\$10.00	\$12.40	0.00	\$63.49
	12/01/2012	\$41.71	\$10.00	\$12.40	0.00	\$64.11
	06/01/2013	\$42.49	\$10.00	\$12.40	0.00	\$64.89
	12/01/2013	\$43.27	\$10.00	\$12.40	0.00	\$65.67
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$27.95	\$10.00	\$12.40	0.00	\$50.35
	06/01/2012	\$28.34	\$10.00	\$12.40	0.00	\$50.74
	12/01/2012	\$28.79	\$10.00	\$12.40	0.00	\$51.19
	06/01/2013	\$29.34	\$10.00	\$12.40	0.00	\$51.74
	12/01/2013	\$29.89	\$10.00	\$12.40	0.00	\$52.29
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2012	\$44.01	\$7.80	\$14.60	0.00	\$66.41
	07/01/2012	\$44.51	\$7.80	\$15.10	0.00	\$67.41
	01/01/2013	\$45.01	\$7.80	\$15.60	0.00	\$68.41

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Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 - BRIDGES/TANKS						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.01	\$7.80	0.00	\$0.00	\$29.81
2	55	\$24.21	\$7.80	3.25	\$0.00	\$35.26
3	60	\$26.41	\$7.80	3.54	\$0.00	\$37.75
4	65	\$28.61	\$7.80	3.84	\$0.00	\$40.25
5	70	\$30.81	\$7.80	12.83	\$0.00	\$51.44
6	75	\$33.01	\$7.80	13.13	\$0.00	\$53.94
7	80	\$35.21	\$7.80	13.42	\$0.00	\$56.43
8	90	\$39.61	\$7.80	14.01	\$0.00	\$61.42
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.26	\$7.80	0.00	\$0.00	\$30.06
2	55	\$24.48	\$7.80	3.38	\$0.00	\$35.66
3	60	\$26.71	\$7.80	3.69	\$0.00	\$38.20
4	65	\$28.93	\$7.80	4.00	\$0.00	\$40.73
5	70	\$31.16	\$7.80	13.26	\$0.00	\$52.22
6	75	\$33.38	\$7.80	13.56	\$0.00	\$54.74
7	80	\$35.61	\$7.80	13.87	\$0.00	\$57.28
8	90	\$40.06	\$7.80	14.49	\$0.00	\$62.35

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: ADZEMAN LABORERS - ZONE 2	12/01/2011	\$31.80	\$7.10	\$12.45	0.00	\$51.35

Apprentice - LABORER Demo (Group 1)

Effective Date - 12/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.08	\$7.10	12.45	\$0.00	\$38.63
2	70	\$22.26	\$7.10	12.45	\$0.00	\$41.81
3	80	\$25.44	\$7.10	12.45	\$0.00	\$44.99
4	90	\$28.62	\$7.10	12.45	\$0.00	\$48.17

Notes:

Apprentice to Journeyworker Ratio:1:5

DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS - ZONE 2	12/01/2011	\$32.80	\$7.10	\$12.45	0.00	\$52.35
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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - LABORER Demo (Group 3)						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.68	\$7.10	12.45	\$0.00	\$39.23
2	70	\$22.96	\$7.10	12.45	\$0.00	\$42.51
3	80	\$26.24	\$7.10	12.45	\$0.00	\$45.79
4	90	\$29.52	\$7.10	12.45	\$0.00	\$49.07
Notes:						
Apprentice to Journeyworker Ratio:1:5						
DEMO: BURNERS LABORERS - ZONE 2	12/01/2011	\$32.55	\$7.10	\$12.45	0.00	\$52.10

Apprentice - LABORER Demo (Group 2)

Effective Date - 12/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.53	\$7.10	12.45	\$0.00	\$39.08
2	70	\$22.79	\$7.10	12.45	\$0.00	\$42.34
3	80	\$26.04	\$7.10	12.45	\$0.00	\$45.59
4	90	\$29.30	\$7.10	12.45	\$0.00	\$48.85

Notes:

Apprentice to Journeyworker Ratio:1:5

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Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE 2	12/01/2011	\$32.80	\$7.10	\$12.45	0.00	\$52.35

Apprentice - LABORER Demo (Group 3)

Effective Date - 12/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.68	\$7.10	12.45	\$0.00	\$39.23
2	70	\$22.96	\$7.10	12.45	\$0.00	\$42.51
3	80	\$26.24	\$7.10	12.45	\$0.00	\$45.79
4	90	\$29.52	\$7.10	12.45	\$0.00	\$49.07

Notes:

Apprentice to Journeyworker Ratio:1:5

DEMO: JACKHAMMER OPERATOR LABORERS - ZONE 2	12/01/2011	\$32.55	\$7.10	\$12.45	0.00	\$52.10
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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - LABORER Demo (Group 2)						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.53	\$7.10	12.45	\$0.00	\$39.08
2	70	\$22.79	\$7.10	12.45	\$0.00	\$42.34
3	80	\$26.04	\$7.10	12.45	\$0.00	\$45.59
4	90	\$29.30	\$7.10	12.45	\$0.00	\$48.85
Notes:						
Apprentice to Journeyworker Ratio:1:5						
DEMO: WRECKING LABORER LABORERS - ZONE 2	12/01/2011	\$31.80	\$7.10	\$12.45	0.00	\$51.35

Apprentice - LABORER Demo (Group 1)						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.08	\$7.10	12.45	\$0.00	\$38.63
2	70	\$22.26	\$7.10	12.45	\$0.00	\$41.81
3	80	\$25.44	\$7.10	12.45	\$0.00	\$44.99
4	90	\$28.62	\$7.10	12.45	\$0.00	\$48.17
Notes:						
Apprentice to Journeyworker Ratio:1:5						

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Contract Number: G67CN01 **City/Town:** ACTON
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Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$53.62	\$9.80	\$17.12	0.00	\$80.54
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$38.30	\$9.80	\$17.12	0.00	\$65.22
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$57.45	\$9.80	\$17.12	0.00	\$84.37
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$80.43	\$9.80	\$17.12	0.00	\$107.35
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2012	\$42.37	\$13.00	\$13.87	0.00	\$69.24
	09/01/2012	\$43.05	\$13.00	\$13.89	0.00	\$69.94
	03/01/2013	\$43.77	\$13.00	\$13.91	0.00	\$70.68
	09/01/2013	\$44.45	\$13.00	\$13.93	0.00	\$71.38
	03/01/2014	\$45.17	\$13.00	\$13.95	0.00	\$72.12
	09/01/2014	\$45.84	\$13.00	\$13.97	0.00	\$72.81
	03/01/2015	\$46.55	\$13.00	\$14.00	0.00	\$73.55
	09/01/2015	\$47.51	\$13.00	\$14.03	0.00	\$74.54
	03/01/2016	\$48.47	\$13.00	\$14.05	0.00	\$75.52

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ELECTRICIAN - Local 103						
Effective Date - 03/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$16.95	\$13.00	7.81	\$0.00	\$37.76
2	40	\$16.95	\$13.00	7.81	\$0.00	\$37.76
3	45	\$19.07	\$13.00	10.26	\$0.00	\$42.33
4	45	\$19.07	\$13.00	10.26	\$0.00	\$42.33
5	50	\$21.19	\$13.00	10.59	\$0.00	\$44.78
6	55	\$23.30	\$13.00	10.92	\$0.00	\$47.22
7	60	\$25.42	\$13.00	11.24	\$0.00	\$49.66
8	65	\$27.54	\$13.00	11.58	\$0.00	\$52.12
9	70	\$29.66	\$13.00	11.90	\$0.00	\$54.56
10	75	\$31.78	\$13.00	12.23	\$0.00	\$57.01
Effective Date - 09/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.22	\$13.00	7.82	\$0.00	\$38.04
2	40	\$17.22	\$13.00	7.82	\$0.00	\$38.04
3	45	\$19.37	\$13.00	10.27	\$0.00	\$42.64
4	45	\$19.37	\$13.00	10.27	\$0.00	\$42.64
5	50	\$21.53	\$13.00	10.60	\$0.00	\$45.13
6	55	\$23.68	\$13.00	10.93	\$0.00	\$47.61
7	60	\$25.83	\$13.00	11.25	\$0.00	\$50.08
8	65	\$27.98	\$13.00	11.59	\$0.00	\$52.57
9	70	\$30.14	\$13.00	11.91	\$0.00	\$55.05
10	75	\$32.29	\$13.00	12.25	\$0.00	\$57.54

This wage schedule must be posted by the contractor at the work site in accordance with M.G.L. ch. 149, sec. 27. Failure of the employer to pay "prevailing wage rates," which are the "total rates" listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at www.mass.gov/dols or at 617-626-6952. Employees not receiving such rates should report the violation to the Fair Labor Division of the Office of the Attorney General, 100 Cambridge Street, Boston, MA 02108; Tel:



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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Notes: App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80 Apprentice to Journeyworker Ratio:2:3***						
ELEVATOR CONSTRUCTOR <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2012	\$52.45	\$8.78	\$6.96	0.00	\$68.19

Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.23	\$8.78	0.00	\$0.00	\$35.01
2	55	\$28.85	\$8.78	6.96	\$0.00	\$44.59
3	65	\$34.09	\$8.78	6.96	\$0.00	\$49.83
4	70	\$36.72	\$8.78	6.96	\$0.00	\$52.46
5	80	\$41.96	\$8.78	6.96	\$0.00	\$57.70

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2012	\$38.59	\$8.78	\$6.96	0.00	\$54.33
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
FIELD ENG. INST. PERSON-BLDG, SITE, HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2012	\$37.90	\$10.00	\$12.40	0.00	\$60.30
	11/01/2012	\$38.51	\$10.00	\$12.40	0.00	\$60.91
	05/01/2013	\$39.12	\$10.00	\$12.40	0.00	\$61.52
	11/01/2013	\$39.88	\$10.00	\$12.40	0.00	\$62.28
	05/01/2014	\$40.65	\$10.00	\$12.40	0.00	\$63.05

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JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2012	\$39.29	\$10.00	\$12.40	0.00	\$61.69
	11/01/2012	\$39.91	\$10.00	\$12.40	0.00	\$62.31
	05/01/2013	\$40.53	\$10.00	\$12.40	0.00	\$62.93
	11/01/2013	\$41.30	\$10.00	\$12.40	0.00	\$63.70
	05/01/2014	\$42.07	\$10.00	\$12.40	0.00	\$64.47
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2012	\$21.07	\$10.00	\$12.40	0.00	\$43.47
	11/01/2012	\$21.43	\$10.00	\$12.40	0.00	\$43.83
	05/01/2013	\$21.79	\$10.00	\$12.40	0.00	\$44.19
	11/01/2013	\$22.25	\$10.00	\$12.40	0.00	\$44.65
	05/01/2014	\$22.70	\$10.00	\$12.40	0.00	\$45.10
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2012	\$42.37	\$13.00	\$13.87	0.00	\$69.24
	09/01/2012	\$43.05	\$13.00	\$13.89	0.00	\$69.94
	03/01/2013	\$43.77	\$13.00	\$13.91	0.00	\$70.68
	09/01/2013	\$44.45	\$13.00	\$13.93	0.00	\$71.38
	03/01/2014	\$45.17	\$13.00	\$13.95	0.00	\$72.12
	09/01/2014	\$45.84	\$13.00	\$13.97	0.00	\$72.81
	03/01/2015	\$46.55	\$13.00	\$14.00	0.00	\$73.55
	09/01/2015	\$47.51	\$13.00	\$14.03	0.00	\$74.54
FIRE ALARM REPAIR / MAINTENANCE <i>LOCAL 103</i> / COMMISSIONING <i>ELECTRICIANS</i>	03/01/2012	\$31.78	\$13.00	\$12.23	0.00	\$57.01
	09/01/2012	\$32.29	\$13.00	\$12.25	0.00	\$57.54
	03/01/2013	\$32.83	\$13.00	\$12.26	0.00	\$58.09
	09/01/2013	\$33.34	\$13.00	\$12.28	0.00	\$58.62
	03/01/2014	\$33.88	\$13.00	\$12.30	0.00	\$59.18
	09/01/2014	\$34.38	\$13.00	\$12.31	0.00	\$59.69
	03/01/2015	\$34.91	\$13.00	\$12.33	0.00	\$60.24
	09/01/2015	\$35.63	\$13.00	\$12.35	0.00	\$60.98
	03/01/2016	\$36.35	\$13.00	\$12.37	0.00	\$61.72

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Prevailing Wage Rates

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JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$33.23	\$10.00	\$12.40	0.00	\$55.63
	06/01/2012	\$33.70	\$10.00	\$12.40	0.00	\$56.10
	12/01/2012	\$34.23	\$10.00	\$12.40	0.00	\$56.63
	06/01/2013	\$34.88	\$10.00	\$12.40	0.00	\$57.28
	12/01/2013	\$35.54	\$10.00	\$12.40	0.00	\$57.94
FLAGGER & SIGNALER <i>LABORERS - ZONE 2</i>	12/01/2011	\$20.50	\$7.10	\$11.55	0.00	\$39.15
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	03/01/2012	\$37.20	\$9.80	\$16.61	0.00	\$63.61

Apprentice - FLOORCOVERER - Local 2168 Zone 1

Effective Date - 03/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.60	\$9.80	1.79	\$0.00	\$30.19
2	55	\$20.46	\$9.80	1.79	\$0.00	\$32.05
3	60	\$22.32	\$9.80	11.24	\$0.00	\$43.36
4	65	\$24.18	\$9.80	11.24	\$0.00	\$45.22
5	70	\$26.04	\$9.80	13.03	\$0.00	\$48.87
6	75	\$27.90	\$9.80	13.03	\$0.00	\$50.73
7	80	\$29.76	\$9.80	14.82	\$0.00	\$54.38
8	85	\$31.62	\$9.80	14.82	\$0.00	\$56.24

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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JOANNE F. GOLDSTEIN
Secretary

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DEVAL L. PATRICK
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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67
GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$27.95	\$10.00	\$12.40	0.00	\$50.35
	06/01/2012	\$28.34	\$10.00	\$12.40	0.00	\$50.74
	12/01/2012	\$28.79	\$10.00	\$12.40	0.00	\$51.19
	06/01/2013	\$29.34	\$10.00	\$12.40	0.00	\$51.74
	12/01/2013	\$29.89	\$10.00	\$12.40	0.00	\$52.29
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 2)</i>	01/01/2012	\$33.51	\$7.80	\$14.60	0.00	\$55.91
	07/01/2012	\$34.51	\$7.80	\$14.60	0.00	\$56.91
	01/01/2013	\$35.51	\$7.80	\$14.60	0.00	\$57.91

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 DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

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 Massachusetts General Laws, Chapter 149, Sections 26 to 27H

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 Secretary

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 Director

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TIMOTHY P. MURRAY
 Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - GLAZIER - Local 35 Zone 2						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.76	\$7.80	0.00	\$0.00	\$24.56
2	55	\$18.43	\$7.80	3.25	\$0.00	\$29.48
3	60	\$20.11	\$7.80	3.54	\$0.00	\$31.45
4	65	\$21.78	\$7.80	3.84	\$0.00	\$33.42
5	70	\$23.46	\$7.80	12.83	\$0.00	\$44.09
6	75	\$25.13	\$7.80	13.13	\$0.00	\$46.06
7	80	\$26.81	\$7.80	13.42	\$0.00	\$48.03
8	90	\$30.16	\$7.80	14.01	\$0.00	\$51.97
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.26	\$7.80	0.00	\$0.00	\$25.06
2	55	\$18.98	\$7.80	3.25	\$0.00	\$30.03
3	60	\$20.71	\$7.80	3.54	\$0.00	\$32.05
4	65	\$22.43	\$7.80	3.84	\$0.00	\$34.07
5	70	\$24.16	\$7.80	12.83	\$0.00	\$44.79
6	75	\$25.88	\$7.80	13.13	\$0.00	\$46.81
7	80	\$27.61	\$7.80	13.42	\$0.00	\$48.83
8	90	\$31.06	\$7.80	14.01	\$0.00	\$52.87

Notes:
 Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67

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Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - HOIST/PORT. ENG.- Local 4						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$21.74	\$10.00	0.00	\$0.00	\$31.74
2	60	\$23.71	\$10.00	12.40	\$0.00	\$46.11
3	65	\$25.69	\$10.00	12.40	\$0.00	\$48.09
4	70	\$27.66	\$10.00	12.40	\$0.00	\$50.06
5	75	\$29.64	\$10.00	12.40	\$0.00	\$52.04
6	80	\$31.62	\$10.00	12.40	\$0.00	\$54.02
7	85	\$33.59	\$10.00	12.40	\$0.00	\$55.99
8	90	\$35.57	\$10.00	12.40	\$0.00	\$57.97

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Effective Date - 06/01/2012						
1	55	\$22.05	\$10.00	0.00	\$0.00	\$32.05
2	60	\$24.05	\$10.00	12.40	\$0.00	\$46.45
3	65	\$26.06	\$10.00	12.40	\$0.00	\$48.46
4	70	\$28.06	\$10.00	12.40	\$0.00	\$50.46
5	75	\$30.07	\$10.00	12.40	\$0.00	\$52.47
6	80	\$32.07	\$10.00	12.40	\$0.00	\$54.47
7	85	\$34.08	\$10.00	12.40	\$0.00	\$56.48
8	90	\$36.08	\$10.00	12.40	\$0.00	\$58.48

Notes:

Apprentice to Journeyworker Ratio:1:6

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (DUCTWORK) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2012	\$40.79	\$9.82	\$17.34	2.04	\$69.99
	08/01/2012	\$42.04	\$9.82	\$17.34	2.08	\$71.28
	02/01/2013	\$43.29	\$9.82	\$17.34	2.11	\$72.56
HVAC (ELECTRICAL CONTROLS) <i>ELECTRICIANS LOCAL 103</i>	03/01/2012	\$42.37	\$13.00	\$13.87	0.00	\$69.24
	09/01/2012	\$43.05	\$13.00	\$13.89	0.00	\$69.94
	03/01/2013	\$43.77	\$13.00	\$13.91	0.00	\$70.68
	09/01/2013	\$44.45	\$13.00	\$13.93	0.00	\$71.38
	03/01/2014	\$45.17	\$13.00	\$13.95	0.00	\$72.12
	09/01/2014	\$45.84	\$13.00	\$13.97	0.00	\$72.81
	03/01/2015	\$46.55	\$13.00	\$14.00	0.00	\$73.55
	09/01/2015	\$47.51	\$13.00	\$14.03	0.00	\$74.54
	03/01/2016	\$48.47	\$13.00	\$14.05	0.00	\$75.52
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2012	\$40.79	\$9.82	\$17.34	2.04	\$69.99
	08/01/2012	\$42.04	\$9.82	\$17.34	2.08	\$71.28
	02/01/2013	\$43.29	\$9.82	\$17.34	2.11	\$72.56
HVAC (TESTING AND BALANCING - WATER) <i>PIPEFITTERS LOCAL 537</i>	03/01/2012	\$46.84	\$8.75	\$14.39	0.00	\$69.98
	09/01/2012	\$48.09	\$8.75	\$14.39	0.00	\$71.23
	03/01/2013	\$49.34	\$8.75	\$14.39	0.00	\$72.48
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	03/01/2012	\$46.84	\$8.75	\$14.39	0.00	\$69.98
	09/01/2012	\$48.09	\$8.75	\$14.39	0.00	\$71.23
	03/01/2013	\$49.34	\$8.75	\$14.39	0.00	\$72.48
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	12/01/2011	\$30.10	\$7.10	\$11.55	0.00	\$48.75
INSULATOR (PIPES & TANKS) <i>ASBESTOS WORKERS LOCAL 6 (BOSTON)</i>	09/01/2011	\$40.66	\$10.40	\$11.20	0.00	\$62.26
	09/01/2012	\$42.06	\$10.40	\$11.20	0.00	\$63.66
	09/01/2013	\$43.66	\$10.40	\$11.20	0.00	\$65.26
	09/01/2014	\$45.66	\$10.40	\$11.20	0.00	\$67.26

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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

JOANNE F. GOLDSTEIN
Secretary
HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor
TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston						
Effective Date - 09/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.33	\$10.40	8.30	\$0.00	\$39.03
2	60	\$24.40	\$10.40	8.88	\$0.00	\$43.68
3	70	\$28.46	\$10.40	9.46	\$0.00	\$48.32
4	80	\$32.53	\$10.40	10.04	\$0.00	\$52.97
Effective Date - 09/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.03	\$10.40	8.30	\$0.00	\$39.73
2	60	\$25.24	\$10.40	8.88	\$0.00	\$44.52
3	70	\$29.44	\$10.40	9.46	\$0.00	\$49.30
4	80	\$33.65	\$10.40	10.04	\$0.00	\$54.09
Notes: Steps are 1 year						
Apprentice to Journeyworker Ratio:1:4						
IRONWORKER/WELDER	04/02/2012	\$33.58	\$7.70	\$18.35	0.00	\$59.63
IRONWORKERS LOCAL 7 (LAWRENCE AREA)	09/16/2012	\$34.58	\$7.70	\$18.35	0.00	\$60.63
	03/16/2013	\$35.83	\$7.70	\$18.35	0.00	\$61.88

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - IRONWORKER - Local 7 Lawrence

Effective Date - 04/02/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.15	\$7.70	18.35	\$0.00	\$46.20
2	70	\$23.51	\$7.70	18.35	\$0.00	\$49.56
3	75	\$25.19	\$7.70	18.35	\$0.00	\$51.24
4	80	\$26.86	\$7.70	18.35	\$0.00	\$52.91
5	85	\$28.54	\$7.70	18.35	\$0.00	\$54.59
6	90	\$30.22	\$7.70	18.35	\$0.00	\$56.27

Effective Date - 09/16/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.75	\$7.70	18.35	\$0.00	\$46.80
2	70	\$24.21	\$7.70	18.35	\$0.00	\$50.26
3	75	\$25.94	\$7.70	18.35	\$0.00	\$51.99
4	80	\$27.66	\$7.70	18.35	\$0.00	\$53.71
5	85	\$29.39	\$7.70	18.35	\$0.00	\$55.44
6	90	\$31.12	\$7.70	18.35	\$0.00	\$57.17

Notes:

Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
LABORER LABORERS - ZONE 2	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00

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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - LABORER - Zone 2						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$17.61	\$7.10	11.55	\$0.00	\$36.26
2	70	\$20.55	\$7.10	11.55	\$0.00	\$39.20
3	80	\$23.48	\$7.10	11.55	\$0.00	\$42.13
4	90	\$26.42	\$7.10	11.55	\$0.00	\$45.07

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER LABORERS - ZONE 2	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00
LABORER: CEMENT FINISHER TENDER LABORERS - ZONE 2	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS - ZONE 2	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00
LABORER: MASON TENDER LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
LABORER: MULTI-TRADE TENDER LABORERS - ZONE 2	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00
LABORER: TREE REMOVER LABORERS - ZONE 2	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines.						
LASER BEAM OPERATOR LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25

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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	03/01/2012	\$35.52	\$10.18	\$16.04	0.00	\$61.74

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

Effective Date - 03/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.76	\$10.18	16.04	\$0.00	\$43.98
2	60	\$21.31	\$10.18	16.04	\$0.00	\$47.53
3	70	\$24.86	\$10.18	16.04	\$0.00	\$51.08
4	80	\$28.42	\$10.18	16.04	\$0.00	\$54.64
5	90	\$31.97	\$10.18	16.04	\$0.00	\$58.19

Notes:
Steps are 800 hrs.

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	03/01/2012	\$46.60	\$10.18	\$17.25	0.00	\$74.03
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Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile						
Effective Date - 03/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.30	\$10.18	17.25	\$0.00	\$50.73
2	60	\$27.96	\$10.18	17.25	\$0.00	\$55.39
3	70	\$32.62	\$10.18	17.25	\$0.00	\$60.05
4	80	\$37.28	\$10.18	17.25	\$0.00	\$64.71
5	90	\$41.94	\$10.18	17.25	\$0.00	\$69.37

Notes:

Apprentice to Journeyworker Ratio:1:3

MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 4	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
MECHANICS MAINTENANCE OPERATING ENGINEERS LOCAL 4	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
MILLWRIGHT (Zone 2) MILLWRIGHTS LOCAL 1121 - Zone 2	04/01/2011	\$31.71	\$8.67	\$15.61	0.00	\$55.99

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Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - MILLWRIGHT - Local 1121 Zone 2						
Effective Date - 04/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$15.86	\$8.67	11.64	\$0.00	\$36.17
2	55	\$17.44	\$8.67	11.64	\$0.00	\$37.75
3	60	\$19.03	\$8.67	13.23	\$0.00	\$40.93
4	65	\$20.61	\$8.67	13.23	\$0.00	\$42.51
5	70	\$22.20	\$8.67	14.02	\$0.00	\$44.89
6	75	\$23.78	\$8.67	14.02	\$0.00	\$46.47
7	80	\$25.37	\$8.67	14.82	\$0.00	\$48.86
8	85	\$26.95	\$8.67	14.82	\$0.00	\$50.44

Notes:

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
OILER (OTHER THAN TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4	12/01/2011	\$21.28	\$10.00	\$12.40	0.00	\$43.68
	06/01/2012	\$21.56	\$10.00	\$12.40	0.00	\$43.96
	12/01/2012	\$21.90	\$10.00	\$12.40	0.00	\$44.30
	06/01/2013	\$22.32	\$10.00	\$12.40	0.00	\$44.72
	12/01/2013	\$22.74	\$10.00	\$12.40	0.00	\$45.14

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Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
OILER (TRUCK CRANES, GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$24.51	\$10.00	\$12.40	0.00	\$46.91
	06/01/2012	\$24.85	\$10.00	\$12.40	0.00	\$47.25
	12/01/2012	\$25.24	\$10.00	\$12.40	0.00	\$47.64
	06/01/2013	\$25.72	\$10.00	\$12.40	0.00	\$48.12
	12/01/2013	\$26.21	\$10.00	\$12.40	0.00	\$48.61
OTHER POWER DRIVEN EQUIPMENT - CLASS II <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
PAINTER (BRIDGES/TANKS) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2012	\$44.01	\$7.80	\$14.60	0.00	\$66.41
	07/01/2012	\$44.51	\$7.80	\$15.10	0.00	\$67.41
	01/01/2013	\$45.01	\$7.80	\$15.60	0.00	\$68.41

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Contract Number: G67CN01 **City/Town:** ACTON
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Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 - BRIDGES/TANKS						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.01	\$7.80	0.00	\$0.00	\$29.81
2	55	\$24.21	\$7.80	3.25	\$0.00	\$35.26
3	60	\$26.41	\$7.80	3.54	\$0.00	\$37.75
4	65	\$28.61	\$7.80	3.84	\$0.00	\$40.25
5	70	\$30.81	\$7.80	12.83	\$0.00	\$51.44
6	75	\$33.01	\$7.80	13.13	\$0.00	\$53.94
7	80	\$35.21	\$7.80	13.42	\$0.00	\$56.43
8	90	\$39.61	\$7.80	14.01	\$0.00	\$61.42
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.26	\$7.80	0.00	\$0.00	\$30.06
2	55	\$24.48	\$7.80	3.38	\$0.00	\$35.66
3	60	\$26.71	\$7.80	3.69	\$0.00	\$38.20
4	65	\$28.93	\$7.80	4.00	\$0.00	\$40.73
5	70	\$31.16	\$7.80	13.26	\$0.00	\$52.22
6	75	\$33.38	\$7.80	13.56	\$0.00	\$54.74
7	80	\$35.61	\$7.80	13.87	\$0.00	\$57.28
8	90	\$40.06	\$7.80	14.49	\$0.00	\$62.35

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

This wage schedule must be posted by the contractor at the work site in accordance with M.G.L. ch. 149, sec. 27. Failure of the employer to pay "prevailing wage rates," which are the "total rates" listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at www.mass.gov/dols or at 617-626-6952. Employees not receiving such rates should report the violation to the Fair Labor Division of the Office of the Attorney General, 100 Cambridge Street, Boston, MA 02108; Tel:



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

JOANNE F. GOLDSTEIN
 Secretary

HEATHER E. ROWE
 Director

DEVAL L. PATRICK
 Governor

TIMOTHY P. MURRAY
 Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Painter (Spray or Sandblast, New) *	01/01/2012	\$34.91	\$7.80	\$14.60	0.00	\$57.31
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	07/01/2012	\$35.41	\$7.80	\$15.10	0.00	\$58.31
	01/01/2013	\$35.91	\$7.80	\$15.60	0.00	\$59.31

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.46	\$7.80	0.00	\$0.00	\$25.26
2	55	\$19.20	\$7.80	3.25	\$0.00	\$30.25
3	60	\$20.95	\$7.80	3.54	\$0.00	\$32.29
4	65	\$22.69	\$7.80	3.84	\$0.00	\$34.33
5	70	\$24.44	\$7.80	12.83	\$0.00	\$45.07
6	75	\$26.18	\$7.80	13.13	\$0.00	\$47.11
7	80	\$27.93	\$7.80	13.42	\$0.00	\$49.15
8	90	\$31.42	\$7.80	14.01	\$0.00	\$53.23
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.71	\$7.80	0.00	\$0.00	\$25.51
2	55	\$19.48	\$7.80	3.38	\$0.00	\$30.66
3	60	\$21.25	\$7.80	3.69	\$0.00	\$32.74
4	65	\$23.02	\$7.80	4.00	\$0.00	\$34.82
5	70	\$24.79	\$7.80	13.26	\$0.00	\$45.85
6	75	\$26.56	\$7.80	13.56	\$0.00	\$47.92
7	80	\$28.33	\$7.80	13.87	\$0.00	\$50.00
8	90	\$31.87	\$7.80	14.49	\$0.00	\$54.16

Notes:

Apprentice to Journeyworker Ratio:1:1

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Prevailing Wage Rates

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JOANNE F. GOLDSTEIN
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HEATHER E. ROWE
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DEVAL L. PATRICK
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TIMOTHY P. MURRAY
 Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER (SPRAY OR SANDBLAST, REPAINT) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2012	\$32.97	\$7.80	\$14.60	0.00	\$55.37
	07/01/2012	\$33.47	\$7.80	\$15.10	0.00	\$56.37
	01/01/2013	\$33.97	\$7.80	\$15.60	0.00	\$57.37

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.49	\$7.80	0.00	\$0.00	\$24.29
2	55	\$18.13	\$7.80	3.25	\$0.00	\$29.18
3	60	\$19.78	\$7.80	3.54	\$0.00	\$31.12
4	65	\$21.43	\$7.80	3.84	\$0.00	\$33.07
5	70	\$23.08	\$7.80	12.83	\$0.00	\$43.71
6	75	\$24.73	\$7.80	13.13	\$0.00	\$45.66
7	80	\$26.38	\$7.80	13.42	\$0.00	\$47.60
8	90	\$29.67	\$7.80	14.01	\$0.00	\$51.48
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.74	\$7.80	0.00	\$0.00	\$24.54
2	55	\$18.41	\$7.80	3.38	\$0.00	\$29.59
3	60	\$20.08	\$7.80	3.69	\$0.00	\$31.57
4	65	\$21.76	\$7.80	4.00	\$0.00	\$33.56
5	70	\$23.43	\$7.80	13.26	\$0.00	\$44.49
6	75	\$25.10	\$7.80	13.56	\$0.00	\$46.46
7	80	\$26.78	\$7.80	13.87	\$0.00	\$48.45
8	90	\$30.12	\$7.80	14.49	\$0.00	\$52.41

Notes:

Apprentice to Journeyworker Ratio:1:1

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Prevailing Wage Rates

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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER (TRAFFIC MARKINGS) <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.35	\$7.10	\$11.55	0.00	\$48.00
PAINTER / TAPER (BRUSH, NEW) *	01/01/2012	\$33.51	\$7.80	\$14.60	0.00	\$55.91
* 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>	07/01/2012	\$34.01	\$7.80	\$15.10	0.00	\$56.91
	01/01/2013	\$34.51	\$7.80	\$15.60	0.00	\$57.91

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.76	\$7.80	0.00	\$0.00	\$24.56
2	55	\$18.43	\$7.80	3.25	\$0.00	\$29.48
3	60	\$20.11	\$7.80	3.54	\$0.00	\$31.45
4	65	\$21.78	\$7.80	3.84	\$0.00	\$33.42
5	70	\$23.46	\$7.80	12.83	\$0.00	\$44.09
6	75	\$25.13	\$7.80	13.13	\$0.00	\$46.06
7	80	\$26.81	\$7.80	13.42	\$0.00	\$48.03
8	90	\$30.16	\$7.80	14.01	\$0.00	\$51.97
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.01	\$7.80	0.00	\$0.00	\$24.81
2	55	\$18.71	\$7.80	3.38	\$0.00	\$29.89
3	60	\$20.41	\$7.80	3.69	\$0.00	\$31.90
4	65	\$22.11	\$7.80	4.00	\$0.00	\$33.91
5	70	\$23.81	\$7.80	13.26	\$0.00	\$44.87
6	75	\$25.51	\$7.80	13.56	\$0.00	\$46.87
7	80	\$27.21	\$7.80	13.87	\$0.00	\$48.88
8	90	\$30.61	\$7.80	14.49	\$0.00	\$52.90

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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 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

JOANNE F. GOLDSTEIN
 Secretary

HEATHER E. ROWE
 Director

DEVAL L. PATRICK
 Governor

TIMOTHY P. MURRAY
 Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER / TAPER (BRUSH, REPAINT) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2012	\$31.57	\$7.80	\$14.60	0.00	\$53.97
	07/01/2012	\$32.07	\$7.80	\$15.10	0.00	\$54.97
	01/01/2013	\$32.57	\$7.80	\$15.60	0.00	\$55.97

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT						
Effective Date - 01/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$15.79	\$7.80	0.00	\$0.00	\$23.59
2	55	\$17.36	\$7.80	3.25	\$0.00	\$28.41
3	60	\$18.94	\$7.80	3.54	\$0.00	\$30.28
4	65	\$20.52	\$7.80	3.84	\$0.00	\$32.16
5	70	\$22.10	\$7.80	12.83	\$0.00	\$42.73
6	75	\$23.68	\$7.80	13.13	\$0.00	\$44.61
7	80	\$25.26	\$7.80	13.42	\$0.00	\$46.48
8	90	\$28.41	\$7.80	14.01	\$0.00	\$50.22
Effective Date - 07/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.04	\$7.80	0.00	\$0.00	\$23.84
2	55	\$17.64	\$7.80	3.38	\$0.00	\$28.82
3	60	\$19.24	\$7.80	3.69	\$0.00	\$30.73
4	65	\$20.85	\$7.80	4.00	\$0.00	\$32.65
5	70	\$22.45	\$7.80	13.26	\$0.00	\$43.51
6	75	\$24.05	\$7.80	13.56	\$0.00	\$45.41
7	80	\$25.66	\$7.80	13.87	\$0.00	\$47.33
8	90	\$28.86	\$7.80	14.49	\$0.00	\$51.15

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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JOANNE F. GOLDSTEIN
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HEATHER E. ROWE
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DEVAL L. PATRICK
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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PANEL & PICKUP TRUCKS DRIVER <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$29.68	\$8.56	\$7.27	0.00	\$45.51
	06/01/2012	\$29.98	\$8.56	\$7.27	0.00	\$45.81
	08/01/2012	\$29.68	\$8.91	\$7.27	0.00	\$45.86
	12/01/2012	\$30.28	\$9.07	\$8.00	0.00	\$47.35
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$38.30	\$9.80	\$17.12	0.00	\$65.22
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2011	\$38.30	\$9.80	\$17.12	0.00	\$65.22

Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$22.98	\$8.08	17.12	\$0.00	\$48.18
2	65	\$24.90	\$8.08	17.12	\$0.00	\$50.10
3	70	\$26.81	\$8.08	17.12	\$0.00	\$52.01
4	75	\$28.73	\$8.08	17.12	\$0.00	\$53.93
5	80	\$30.64	\$8.08	17.12	\$0.00	\$55.84
6	85	\$32.56	\$8.08	17.12	\$0.00	\$57.76
7	90	\$34.47	\$8.08	17.12	\$0.00	\$59.67
8	95	\$36.39	\$8.08	17.12	\$0.00	\$61.59

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER <i>PIPEFITTERS LOCAL 537</i>	03/01/2012	\$46.84	\$8.75	\$14.39	0.00	\$69.98
	09/01/2012	\$48.09	\$8.75	\$14.39	0.00	\$71.23
	03/01/2013	\$49.34	\$8.75	\$14.39	0.00	\$72.48

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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PIPEFITTER - Local 537						
Effective Date - 03/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$18.74	\$8.75	6.50	\$0.00	\$33.99
2	45	\$21.08	\$8.75	14.39	\$0.00	\$44.22
3	60	\$28.10	\$8.75	14.39	\$0.00	\$51.24
4	70	\$32.79	\$8.75	14.39	\$0.00	\$55.93
5	80	\$37.47	\$8.75	14.39	\$0.00	\$60.61
Effective Date - 09/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$19.24	\$8.75	6.50	\$0.00	\$34.49
2	45	\$21.64	\$8.75	14.39	\$0.00	\$44.78
3	60	\$28.85	\$8.75	14.39	\$0.00	\$51.99
4	70	\$33.66	\$8.75	14.39	\$0.00	\$56.80
5	80	\$38.47	\$8.75	14.39	\$0.00	\$61.61

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

Apprentice to Journeyworker Ratio:**

PIPELAYER LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
PLUMBERS & GASFITTERS PLUMBERS & GASFITTERS LOCAL 12	03/01/2012	\$46.81	\$9.32	\$13.29	0.00	\$69.42
	09/01/2012	\$48.06	\$9.32	\$13.29	0.00	\$70.67
	03/01/2013	\$49.31	\$9.32	\$13.29	0.00	\$71.92

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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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PLUMBER - Local 12						
Effective Date - 03/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$16.38	\$9.32	4.97	\$0.00	\$30.67
2	40	\$18.72	\$9.32	5.61	\$0.00	\$33.65
3	55	\$25.75	\$9.32	7.53	\$0.00	\$42.60
4	65	\$30.43	\$9.32	8.81	\$0.00	\$48.56
5	75	\$35.11	\$9.32	10.09	\$0.00	\$54.52
Effective Date - 09/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$16.82	\$9.32	4.97	\$0.00	\$31.11
2	40	\$19.22	\$9.32	5.61	\$0.00	\$34.15
3	55	\$26.43	\$9.32	7.53	\$0.00	\$43.28
4	65	\$31.24	\$9.32	8.81	\$0.00	\$49.37
5	75	\$36.05	\$9.32	10.09	\$0.00	\$55.46

Notes:
** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic\$51.54 Step5 with lic\$57.49

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) PIPEFITTERS LOCAL 537	03/01/2012	\$46.84	\$8.75	\$14.39	0.00	\$69.98
	09/01/2012	\$48.09	\$8.75	\$14.39	0.00	\$71.23
	03/01/2013	\$49.34	\$8.75	\$14.39	0.00	\$72.48
PNEUMATIC DRILL/TOOL OPERATOR LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
POWDERMAN & BLASTER LABORERS - ZONE 2	12/01/2011	\$30.35	\$7.10	\$11.55	0.00	\$49.00

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JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$27.95	\$10.00	\$12.40	0.00	\$50.35
	06/01/2012	\$28.34	\$10.00	\$12.40	0.00	\$50.74
	12/01/2012	\$28.79	\$10.00	\$12.40	0.00	\$51.19
	06/01/2013	\$29.34	\$10.00	\$12.40	0.00	\$51.74
	12/01/2013	\$29.89	\$10.00	\$12.40	0.00	\$52.29
READY-MIX CONCRETE DRIVER <i>TEAMSTERS LOCAL 170</i>	05/01/2010	\$22.04	\$6.50	\$5.44	0.00	\$33.98
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
RESIDENTIAL WOOD FRAME (All Other Work) <i>CARPENTERS -ZONE 2 (Residential Wood)</i>	04/01/2011	\$24.24	\$8.67	\$15.51	0.00	\$48.42
RESIDENTIAL WOOD FRAME CARPENTER **	05/01/2011	\$24.24	\$6.34	\$6.23	0.00	\$36.81

** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. *CARPENTERS -ZONE 2 (Residential Wood)*

As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.

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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - CARPENTER (Residential Wood Frame) - Zone 2						
Effective Date - 05/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$14.54	\$6.34	0.00	\$0.00	\$20.88
2	60	\$14.54	\$6.34	6.23	\$0.00	\$27.11
3	65	\$15.76	\$6.34	6.23	\$0.00	\$28.33
4	70	\$16.97	\$6.34	6.23	\$0.00	\$29.54
5	75	\$18.18	\$6.34	6.23	\$0.00	\$30.75
6	80	\$19.39	\$6.34	6.23	\$0.00	\$31.96
7	85	\$20.60	\$6.34	6.23	\$0.00	\$33.17
8	90	\$21.82	\$6.34	6.23	\$0.00	\$34.39

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR LABORERS - ZONE 2	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
ROLLER/SPREADER/MULCHING MACHINE OPERATING ENGINEERS LOCAL 4	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
ROOFER (Inc. Roofer Waterproofing & Roofer Damproofing) ROOFERS LOCAL 33	02/01/2012	\$35.56	\$10.50	\$10.70	0.00	\$56.76
	08/01/2012	\$36.56	\$10.50	\$10.70	0.00	\$57.76
	02/01/2013	\$37.56	\$10.50	\$10.70	0.00	\$58.76

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HEATHER E. ROWE
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DEVAL L. PATRICK
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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ROOFER - Local 33						
Effective Date - 02/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.78	\$10.50	3.38	\$0.00	\$31.66
2	60	\$21.34	\$10.50	10.70	\$0.00	\$42.54
3	65	\$23.11	\$10.50	10.70	\$0.00	\$44.31
4	75	\$26.67	\$10.50	10.70	\$0.00	\$47.87
5	85	\$30.23	\$10.50	10.70	\$0.00	\$51.43
Effective Date - 08/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.28	\$10.50	3.38	\$0.00	\$32.16
2	60	\$21.94	\$10.50	10.70	\$0.00	\$43.14
3	65	\$23.76	\$10.50	10.70	\$0.00	\$44.96
4	75	\$27.42	\$10.50	10.70	\$0.00	\$48.62
5	85	\$31.08	\$10.50	10.70	\$0.00	\$52.28

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.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE	02/01/2012	\$35.81	\$10.50	\$10.70	0.00	\$57.01
ROOFERS LOCAL 33	08/01/2012	\$36.81	\$10.50	\$10.70	0.00	\$58.01
	02/01/2013	\$37.81	\$10.50	\$10.70	0.00	\$59.01

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DEVAL L. PATRICK
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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ROOFER (Slate/Tile/Precast Concrete) - Local 33						
Effective Date - 02/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.91	\$10.50	3.38	\$0.00	\$31.79
2	60	\$21.49	\$10.50	10.70	\$0.00	\$42.69
3	65	\$23.28	\$10.50	10.70	\$0.00	\$44.48
4	75	\$26.86	\$10.50	10.70	\$0.00	\$48.06
5	85	\$30.44	\$10.50	10.70	\$0.00	\$51.64
Effective Date - 08/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.41	\$10.50	3.38	\$0.00	\$32.29
2	60	\$22.09	\$10.50	10.70	\$0.00	\$43.29
3	65	\$23.93	\$10.50	10.70	\$0.00	\$45.13
4	75	\$27.61	\$10.50	10.70	\$0.00	\$48.81
5	85	\$31.29	\$10.50	10.70	\$0.00	\$52.49

Notes:

Apprentice to Journeyworker Ratio:**

SHEETMETAL WORKER	02/01/2012	\$40.79	\$9.82	\$17.34	2.04	\$69.99
SHEETMETAL WORKERS LOCAL 17 - A	08/01/2012	\$42.04	\$9.82	\$17.34	2.08	\$71.28
	02/01/2013	\$43.29	\$9.82	\$17.34	2.11	\$72.56

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - SHEET METAL WORKER - Local 17-A						
Effective Date - 02/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$16.32	\$9.82	3.74	\$0.00	\$29.88
2	40	\$16.32	\$9.82	3.74	\$0.00	\$29.88
3	45	\$18.36	\$9.82	7.45	\$1.07	\$36.70
4	45	\$18.36	\$9.82	7.45	\$1.07	\$36.70
5	50	\$20.40	\$9.82	8.17	\$1.15	\$39.54
6	50	\$20.40	\$9.82	8.42	\$1.16	\$39.80
7	60	\$24.47	\$9.82	9.60	\$1.32	\$45.21
8	65	\$26.51	\$9.82	10.32	\$1.40	\$48.05
9	75	\$30.59	\$9.82	11.76	\$1.57	\$53.74
10	85	\$34.67	\$9.82	12.69	\$1.72	\$58.90
Effective Date - 08/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$16.82	\$9.82	3.74	\$0.00	\$30.38
2	40	\$16.82	\$9.82	3.74	\$0.00	\$30.38
3	45	\$18.92	\$9.82	7.45	\$1.08	\$37.27
4	45	\$18.92	\$9.82	7.45	\$1.08	\$37.27
5	50	\$21.02	\$9.82	8.17	\$1.17	\$40.18
6	50	\$21.02	\$9.82	8.42	\$1.18	\$40.44
7	60	\$25.22	\$9.82	9.60	\$1.34	\$45.98
8	65	\$27.33	\$9.82	10.32	\$1.42	\$48.89
9	75	\$31.53	\$9.82	11.76	\$1.59	\$54.70
10	85	\$35.73	\$9.82	12.69	\$1.75	\$59.99

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Notes: Steps are 6 mos. Apprentice to Journeyworker Ratio: 1:4						
SIGN ERECTOR <i>PAINTERS LOCAL 35 - ZONE 2</i>	06/01/2009	\$24.81	\$7.07	\$5.90	0.00	\$37.78

Apprentice - SIGN ERECTOR - Local 35 Zone 2

Effective Date - 06/01/2009

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$12.41	\$7.07	0.00	\$0.00	\$19.48
2	55	\$13.65	\$7.07	2.40	\$0.00	\$23.12
3	60	\$14.89	\$7.07	2.40	\$0.00	\$24.36
4	65	\$16.13	\$7.07	2.40	\$0.00	\$25.60
5	70	\$17.37	\$7.07	5.90	\$0.00	\$30.34
6	75	\$18.61	\$7.07	5.90	\$0.00	\$31.58
7	80	\$19.85	\$7.07	5.90	\$0.00	\$32.82
8	85	\$21.09	\$7.07	5.90	\$0.00	\$34.06
9	90	\$22.33	\$7.07	5.90	\$0.00	\$35.30

Notes:
Steps are 4 mos.
Apprentice to Journeyworker Ratio: 1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$30.14	\$8.56	\$7.27	0.00	\$45.97
	06/01/2012	\$30.44	\$8.56	\$7.27	0.00	\$46.27
	08/01/2012	\$30.44	\$8.91	\$7.27	0.00	\$46.62
	12/01/2012	\$30.74	\$8.91	\$8.00	0.00	\$47.65

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$30.43	\$8.56	\$7.27	0.00	\$46.26
	06/01/2012	\$30.73	\$8.56	\$7.27	0.00	\$46.56
	08/01/2012	\$30.73	\$8.91	\$7.27	0.00	\$46.91
	12/01/2012	\$31.03	\$8.91	\$8.00	0.00	\$47.94
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550</i>	03/01/2012	\$51.58	\$8.42	\$11.60	0.00	\$71.60
	09/01/2012	\$52.58	\$8.42	\$11.60	0.00	\$72.60
	03/01/2013	\$53.58	\$8.42	\$11.60	0.00	\$73.60

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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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - SPRINKLER FITTER - Local 550						
Effective Date - 03/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$18.05	\$8.42	7.85	\$0.00	\$34.32
2	40	\$20.63	\$8.42	7.85	\$0.00	\$36.90
3	45	\$23.21	\$8.42	7.85	\$0.00	\$39.48
4	50	\$25.79	\$8.42	7.85	\$0.00	\$42.06
5	55	\$28.37	\$8.42	7.85	\$0.00	\$44.64
6	60	\$30.95	\$8.42	7.85	\$0.00	\$47.22
7	65	\$33.53	\$8.42	7.85	\$0.00	\$49.80
8	70	\$36.11	\$8.42	7.85	\$0.00	\$52.38
9	75	\$38.69	\$8.42	7.85	\$0.00	\$54.96
10	80	\$41.26	\$8.42	7.85	\$0.00	\$57.53
Effective Date - 09/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$18.40	\$8.42	7.85	\$0.00	\$34.67
2	40	\$21.03	\$8.42	7.85	\$0.00	\$37.30
3	45	\$23.66	\$8.42	7.85	\$0.00	\$39.93
4	50	\$26.29	\$8.42	7.85	\$0.00	\$42.56
5	55	\$28.92	\$8.42	7.85	\$0.00	\$45.19
6	60	\$31.55	\$8.42	7.85	\$0.00	\$47.82
7	65	\$34.18	\$8.42	7.85	\$0.00	\$50.45
8	70	\$36.81	\$8.42	7.85	\$0.00	\$53.08
9	75	\$39.44	\$8.42	7.85	\$0.00	\$55.71
10	80	\$42.06	\$8.42	7.85	\$0.00	\$58.33

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DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

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Massachusetts General Laws, Chapter 149, Sections 26 to 27H

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Notes:						
Steps are 850 hours						
Apprentice to Journeyworker Ratio:1:1						
STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2012	\$31.78	\$13.00	\$12.23	0.00	\$57.01
	09/01/2012	\$32.29	\$13.00	\$12.25	0.00	\$57.54
	03/01/2013	\$32.83	\$13.00	\$12.26	0.00	\$58.09
	09/01/2013	\$33.34	\$13.00	\$12.28	0.00	\$58.62
	03/01/2014	\$33.88	\$13.00	\$12.30	0.00	\$59.18
	09/01/2014	\$34.38	\$13.00	\$12.31	0.00	\$59.69
	03/01/2015	\$34.91	\$13.00	\$12.33	0.00	\$60.24
	09/01/2015	\$35.63	\$13.00	\$12.35	0.00	\$60.98
	03/01/2016	\$36.35	\$13.00	\$12.37	0.00	\$61.72

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DEPARTMENT OF LABOR STANDARDS

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TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103						
Effective Date - 03/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$12.71	\$13.00	9.27	\$0.00	\$34.98
2	40	\$12.71	\$13.00	9.27	\$0.00	\$34.98
3	45	\$14.30	\$13.00	9.51	\$0.00	\$36.81
4	45	\$14.30	\$13.00	9.51	\$0.00	\$36.81
5	50	\$15.89	\$13.00	9.76	\$0.00	\$38.65
6	55	\$17.48	\$13.00	10.01	\$0.00	\$40.49
7	60	\$19.07	\$13.00	10.26	\$0.00	\$42.33
8	65	\$20.66	\$13.00	10.50	\$0.00	\$44.16
9	70	\$22.25	\$13.00	10.75	\$0.00	\$46.00
10	75	\$23.84	\$13.00	11.00	\$0.00	\$47.84
Effective Date - 09/01/2012						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$12.92	\$13.00	9.28	\$0.00	\$35.20
2	40	\$12.92	\$13.00	9.28	\$0.00	\$35.20
3	45	\$14.53	\$13.00	9.53	\$0.00	\$37.06
4	45	\$14.53	\$13.00	9.53	\$0.00	\$37.06
5	50	\$16.15	\$13.00	9.77	\$0.00	\$38.92
6	55	\$17.76	\$13.00	10.02	\$0.00	\$40.78
7	60	\$19.37	\$13.00	10.27	\$0.00	\$42.64
8	65	\$20.99	\$13.00	10.52	\$0.00	\$44.51
9	70	\$22.60	\$13.00	10.77	\$0.00	\$46.37
10	75	\$24.22	\$13.00	11.02	\$0.00	\$48.24

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Prevailing Wage Rates

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JOANNE F. GOLDSTEIN
Secretary

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Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Notes:						
Apprentice to Journeyworker Ratio:1:1						
TERRAZZO FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	03/01/2012	\$45.50	\$10.18	\$17.25	0.00	\$72.93

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 03/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.75	\$10.18	17.25	\$0.00	\$50.18
2	60	\$27.30	\$10.18	17.25	\$0.00	\$54.73
3	70	\$31.85	\$10.18	17.25	\$0.00	\$59.28
4	80	\$36.40	\$10.18	17.25	\$0.00	\$63.83
5	90	\$40.95	\$10.18	17.25	\$0.00	\$68.38

Notes:
Steps are 800 hrs.

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2011	\$33.05	\$7.10	\$12.60	0.00	\$52.75
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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - TEST BORING DRILLER (Laborers Foundation & Marine)						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.83	\$7.10	12.60	\$0.00	\$39.53
2	70	\$23.14	\$7.10	12.60	\$0.00	\$42.84
3	80	\$26.44	\$7.10	12.60	\$0.00	\$46.14
4	90	\$29.75	\$7.10	12.60	\$0.00	\$49.45
Notes:						
Apprentice to Journeyworker Ratio:1:3						
TEST BORING DRILLER HELPER LABORERS - FOUNDATION AND MARINE	12/01/2011	\$31.77	\$7.10	\$12.60	0.00	\$51.47
TEST BORING LABORER LABORERS - FOUNDATION AND MARINE	12/01/2011	\$31.65	\$7.10	\$12.60	0.00	\$51.35

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TIMOTHY P. MURRAY
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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - TEST BORING LABORER (Laborers Foundation & Marine)						
Effective Date - 12/01/2011						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$18.99	\$7.10	12.60	\$0.00	\$38.69
2	70	\$22.16	\$7.10	12.60	\$0.00	\$41.86
3	80	\$25.32	\$7.10	12.60	\$0.00	\$45.02
4	90	\$28.49	\$7.10	12.60	\$0.00	\$48.19

Notes:

Apprentice to Journeyworker Ratio:1:3

TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.16	\$10.00	\$12.40	0.00	\$61.56
	06/01/2012	\$39.72	\$10.00	\$12.40	0.00	\$62.12
	12/01/2012	\$40.34	\$10.00	\$12.40	0.00	\$62.74
	06/01/2013	\$41.11	\$10.00	\$12.40	0.00	\$63.51
	12/01/2013	\$41.89	\$10.00	\$12.40	0.00	\$64.29
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$30.72	\$8.56	\$7.27	0.00	\$46.55
	06/01/2012	\$31.02	\$8.56	\$7.27	0.00	\$46.85
	08/01/2012	\$31.02	\$8.91	\$7.27	0.00	\$47.20
	12/01/2012	\$31.32	\$8.91	\$8.00	0.00	\$48.23
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2011	\$44.08	\$7.10	\$13.00	0.00	\$64.18
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2011	\$46.08	\$7.10	\$13.00	0.00	\$66.18
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2011	\$36.15	\$7.10	\$13.00	0.00	\$56.25

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Prevailing Wage Rates

DEVAL L. PATRICK
Governor
TIMOTHY P. MURRAY
Lt. Governor

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

JOANNE F. GOLDSTEIN
Secretary
HEATHER E. ROWE
Director

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2011	\$38.15	\$7.10	\$13.00	0.00	\$58.25
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2011	\$30.14	\$8.56	\$7.27	0.00	\$45.97
	06/01/2012	\$30.44	\$8.56	\$7.27	0.00	\$46.27
	08/01/2012	\$30.44	\$8.91	\$7.27	0.00	\$46.62
	12/01/2012	\$30.74	\$8.91	\$8.00	0.00	\$47.65
WAGON DRILL OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2011	\$29.60	\$7.10	\$11.55	0.00	\$48.25
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2011	\$39.52	\$10.00	\$12.40	0.00	\$61.92
	06/01/2012	\$40.09	\$10.00	\$12.40	0.00	\$62.49
	12/01/2012	\$40.71	\$10.00	\$12.40	0.00	\$63.11
	06/01/2013	\$41.49	\$10.00	\$12.40	0.00	\$63.89
	12/01/2013	\$42.27	\$10.00	\$12.40	0.00	\$64.67
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2012	\$46.81	\$9.32	\$13.29	0.00	\$69.42
	09/01/2012	\$48.06	\$9.32	\$13.29	0.00	\$70.67
	03/01/2013	\$49.31	\$9.32	\$13.29	0.00	\$71.92
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$27.11	\$6.70	\$1.50	0.00	\$35.31
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$38.41	\$6.70	\$1.00	0.00	\$46.11
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$31.63	\$6.70	\$2.50	0.00	\$40.83
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$24.85	\$6.70	\$1.50	0.00	\$33.05
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$38.41	\$6.70	\$5.00	0.00	\$50.11
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$33.89	\$6.70	\$2.75	0.00	\$43.34

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Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$24.85	\$6.70	\$1.00	0.00	\$32.55
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$20.34	\$6.70	\$0.75	0.00	\$27.79
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/29/2011	\$45.19	\$6.70	\$7.86	0.00	\$59.75

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 08/29/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$27.11	\$6.70	2.11	\$0.00	\$35.92
2	65	\$29.37	\$6.70	2.36	\$0.00	\$38.43
3	70	\$31.63	\$6.70	2.86	\$0.00	\$41.19
4	75	\$33.89	\$6.70	3.36	\$0.00	\$43.95
5	80	\$36.15	\$6.70	3.86	\$0.00	\$46.71
6	85	\$38.41	\$6.70	4.36	\$0.00	\$49.47
7	90	\$40.67	\$6.70	5.36	\$0.00	\$52.73

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/18/2011	\$25.94	\$4.18	\$2.78	0.00	\$32.90
	07/16/2012	\$26.33	\$4.18	\$2.79	0.00	\$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/18/2011	\$24.42	\$4.18	\$2.73	0.00	\$31.33
	07/16/2012	\$24.78	\$4.18	\$2.74	0.00	\$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/18/2011	\$24.42	\$4.18	\$2.73	0.00	\$31.33
	07/16/2012	\$24.78	\$4.18	\$2.74	0.00	\$31.70

This wage schedule must be posted by the contractor at the work site in accordance with M.G.L. ch. 149, sec. 27. Failure of the employer to pay "prevailing wage rates," which are the "total rates" listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at www.mass.gov/dols or at 617-626-6952. Employees not receiving such rates should report the violation to the Fair Labor Division of the Office of the Attorney General, 100 Cambridge Street, Boston, MA 02108; Tel:



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

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

Awarding Authority: MBTA
Contract Number: G67CN01 **City/Town:** ACTON
Description of Work: FITCHBURG COMMUTER RAIL IMPROVEMENTS - Construct two 800 foot long, high level platforms; two head houses, elevator, platform canopies, pedestrian bridge, lighting, signage, parking lot improvements.
Job Location: 10 Central St., SOUTH ACTON STATION

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> This classification applies only to the trimming of branches on and around utility lines.	02/01/2009	\$16.59	\$2.42	\$0.00	0.00	\$19.01
TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> This classification applies only to the trimming of branches on and around utility lines.	02/01/2009	\$14.64	\$2.42	\$0.00	0.00	\$17.06

Additional Apprentices Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. 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) unless otherwise specified.

- * Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
- ** Multiple ratios are listed in the comment field.
- *** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
- **** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

This wage schedule must be posted by the contractor at the work site in accordance with M.G.L. ch. 149, sec. 27. Failure of the employer to pay "prevailing wage rates," which are the "total rates" listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at www.mass.gov/dols or at 617-626-6952. Employees not receiving such rates should report the violation to the Fair Labor Division of the Office of the Attorney General, 100 Cambridge Street, Boston, MA 02108; Tel:

**5. U.S.A. DOT
Federal Transit
Administration
Contract Requirements**

U.S.A. DOT Federal Transit Administration Contract Requirements

- A. General
- B. Disadvantaged Business Enterprise
- C. Title VI of the Civil Rights Act of 1964
- D. Energy Conservation
- E. Cargo Preference
- F. Audit and Inspection
- G. Environmental, Resource Conservation,
Energy Requirements, Seismic Safety, Clean Water and
Recycled Products
- H. Notice of Federal Regulations
- I. Record Retention
- J. ADA
- K. Buy America Certification
- L. Fly America
- M. No Obligation by the Federal Government
- N. Program Fraud and False or Fraudulent Statements and Related Acts
- O. Termination
- P. Remedies/Breach of Contract
- Q. Integrity Certification
- R. Lobbying
- S. Nondiscrimination
- T. Liquidated Damages
- U. Labor Provisions
- V. Interests of Members of Congress
- W. Debarred Bidders
- X. Insurance / Bonding
- Y. Project Signs
- Z. Certified Payroll - Construction Projects
- AA. Disadvantaged Business Enterprise
- BB. DBE Obligation
- CC. Minimum Federal Wage Rates
- DD. Equal Employment Opportunity (EEO)

Standard Federal Equal Employment Opportunity
Construction Contract Specification

Appx. No.1 - Notice of Requirement for Affirmative Action to Ensure Equal
Employment Opportunity

A. GENERAL

1. 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.
2. Except as otherwise provided for in each Section, the Contractor shall insert in each Subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier Subcontract or purchase order that may in turn be made. The Required Contract Provisions 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 these Required Contract Provisions.
3. A breach of the following clauses of the Required Contract Provisions shall be sufficient grounds for termination of the Contract.

B. DISADVANTAGED BUSINESS ENTERPRISE

THE (CONTRACTOR OR SUBCONTRACTOR AND ITS THIRD PARTY CONTRACTORS) SHALL NOT DISCRIMINATE ON THE BASIS OF RACE, COLOR, NATIONAL ORIGIN, AGE, OR SEX IN THE PERFORMANCE OF THIS (CONTRACT OR AGREEMENT). THE REQUIREMENTS OF 49 C.F.R. PART 23 AND THE AUTHORITY'S U.S. DOT-APPROVED DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM (WHERE REQUIRED) ARE INCORPORATED IN THIS (CONTRACT AGREEMENT) BY REFERENCE. FAILURE BY THE (CONTRACTOR OR SUBCONTRACTOR AND ITS THIRD PARTY CONTRACTORS) TO CARRY OUT THESE REQUIREMENTS IS A MATERIAL BREACH OF THE (CONTRACT OR AGREEMENT), WHICH MAY RESULT IN THE TERMINATION OF THIS (CONTRACT OR AGREEMENT) OR SUCH OTHER REMEDY AS THE AUTHORITY DEEMS APPROPRIATE.

This section is in addition to and not a replacement of any other portion of the language of this Contract dealing with Disadvantaged Business Enterprises, Equal Opportunity, or Affirmative Action.

1. **The Contractor shall provide information and reports requested by the Authority pertaining to its obligations under this Section, or other similar requirements of this Contract, and will permit access to Contract- related records, accounts and other relevant sources of information as necessary to determine the Engineer's compliance with the obligation hereunder.**
2. **The Contractor shall comply with all regulations relative to nondiscrimination in federally assisted programs of the U.S. Department of Transportation and the Authority as they may be amended from time to time and which are hereby incorporated by reference and made a part of this Contract.**

***** (THIRD PARTY CONTRACTING REFERS TO CONTRACTING BY AUTHORITY USING FEDERAL ASSISTANCE).**

C. TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

The Contractor agrees to comply with, and assure the compliance by its subcontractors and third party contractors under this Project, with all requirements of Title VI of the Civil Rights Act of 1964, 42 U.S.C. § 2000d; U.S. DOT regulations, "Nondiscrimination in Federally Assisted Programs of the Department of Transportation -- Effectuation of Title VI of the Civil Rights Act," 49 C.F.R. Part 21.

D. ENERGY CONSERVATION

The Contractor, Subcontractors and its third party contractors shall comply with mandatory standards and policies relating to energy efficiency that are contained in applicable State energy conservation plans issued in compliance with Energy Policy and Conservation Act, U.S.C. §§ 6321 et seq.

E. CARGO PREFERENCE - USE OF UNITED STATES FLAG VESSELS

As required by 46 C.F.R. PART 381, the Contractor agrees --

1. TO UTILIZE PRIVATELY OWNED UNITED STATES-FLAG COMMERCIAL VESSELS TO SHIP AT LEAST 50 PERCENT OF THE GROSS TONNAGE (COMPUTED SEPARATELY FOR DRY BULK CARRIERS, DRY CARGO LINERS, AND TANKERS) INVOLVED, WHENEVER SHIPPING ANY EQUIPMENT, MATERIALS, OR COMMODITIES PURSUANT TO THIS CONTRACT TO THE EXTENT SUCH VESSELS ARE AVAILABLE AT FAIR AND REASONABLE RATES FOR UNITED STATES-FLAG COMMERCIAL VESSELS.
2. TO FURNISH WITHIN 20 DAYS FOLLOWING THE DATE OF LOADING FOR SHIPMENTS ORIGINATING WITHIN THE UNITED STATES, OR WITHIN 30 WORKING DAYS FOLLOWING THE DATE OF LOADING FOR SHIPMENTS ORIGINATING OUTSIDE THE UNITED STATES, A LEGIBLE COPY OF A RATED, "ON-BOARD" COMMERCIAL OCEAN BILL-OF-LADING IN ENGLISH FOR EACH SHIPMENT OF CARGO DESCRIBED IN PARAGRAPH (1) ABOVE TO THE CONTRACTOR (THROUGH THE PRIME CONTRACTOR IN THE CASE OF SUBCONTRACTOR BILLS-OF-LADING) AND TO THE DIVISION OF NATIONAL CARGO, OFFICE OF MARKET DEVELOPMENT, MARITIME ADMINISTRATION, 400 SEVENTH STREET, S.W., WASHINGTON, D.C. 20590, MARKED WITH APPROPRIATE IDENTIFICATION OF THE PROJECT.
3. TO INSERT THE SUBSTANCE OF THE PROVISIONS OF THIS CLAUSE IN ALL SUBCONTRACTS ISSUED PURSUANT TO THIS CONTRACT.

F. AUDIT AND INSPECTION

Inspection by Federal Officials. The Contractor agrees to permit the Secretary of Transportation (Secretary) and the Comptroller General of the United States, or their authorized representatives, to inspect all Project work, materials, payrolls, and other data, and to audit the books, records, and accounts of the Contractor and its subcontractors pertaining to the Project. The Contractor agrees to require each third party contractor whose contract award is not based on competitive bidding procedures as defined by the Secretary to permit the Secretary of Transportation and the Comptroller General of the United States, or their duly authorized representatives, to inspect all work, materials, payrolls, and other data and records involving that contract, and to audit the books, records, and accounts involving that contract as it affects the Project.

G. ENVIRONMENTAL, RESOURCE CONSERVATION, and ENERGY REQUIREMENTS

The Authority recognizes that many Federal and State statutes imposing environmental, resource conservation, and energy requirements may apply to the Project. Some, but not all, of the major Federal laws that may affect the Project include: the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321 et seq. the Clean Air Act, as amended, 42 U.S.C. 7401 et seq. and scattered sections of 29 U.S.C.; the Clean Water Act, as amended, scattered sections of 33 U.S.C. and 12 U.S.C.; the Resource Conservation

and Recovery Act, as amended, 42 U.S.C. §§ 6901 et seq.; and the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9601 et seq. The Authority also recognizes that the Environmental Protection Agency (EPA), the Federal Highway Administration (FHWA) and other agencies of the Federal Government have issued and are expected in the future to issue requirements in the form of regulations, guidelines, standards, orders, or other directives that may affect the Project. Accordingly, the Authority agrees to adhere to, and impose on its contractors and subcontractors, any such Federal requirements, as the Federal Government may now or in the future promulgate. Listed below are requirements of particular concern to FTA. The Authority expressly understands that this list does not constitute the Authority's entire obligation to meet Federal requirements.

1. **Environmental Protection**

The Contractor, Subcontractor and its third party contractors agree to comply with applicable requirements of the National Environmental Policy Act of 1969, as amended, 42 U.S.C. §§ 4321 et seq.; section 14 of the Federal Transit Act, as amended, 49 U. S.C. app. §§ 1610, Council on Environmental Quality regulations, 40 C.F.R. Part 1500 et seq.; and joint FHWA/FTA regulations, "Environmental Impact and Related Procedures," at 23 C.F.R. Part 771 and 49 C.F.R. Part 622.

2. **Air Quality**

The Contractor, Subcontractors and its third party contractors agree to comply with applicable requirements of EPA regulations, "Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 21 U.S.C. of the Federal Transit Act," 40 C.F.R. Part 51, Subpart T; and "Determining Conformity of Federal Actions to State or Federal Implementation Plans," 40 C.F.R. Part 93. To support the requisite air quality conformity finding for the Project, the Contractor, Subcontractors and its third party contractors agree to implement each air quality mitigation and control measure incorporated in the Project. The Authority agrees that any Project identified in an applicable State Implementation Plan (SIP) as a Transportation Control Measure, will be wholly consistent with the description of the design concept and scope of the Project set forth in the SIP.

EPA also imposes requirements pertaining to the Clean Air Act, as amended that may apply to transit operators, particularly operators of large transit bus fleets. Thus, the Authority should be aware that the following EPA regulations, among others, may apply to its Project: "Control of Air Pollution from Motor Vehicles and Motor Vehicle Engines, " 40 C.F.R. Part 85; "Control of Air Pollution from New and In-Use Motor Vehicles and New and In-Use-Motor Vehicle Engines: Certification and Test Procedures," 40 C.F.R. Part 86; and "Fuel Economy of Motor Vehicles," 40 C-F.R. Part 600.

3. **Use of Public Lands**

No publicly owned land from a park, recreation area, or wildlife or waterfowl refuge of national, State, or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State, or local significance may be used for the Project unless specific findings required by 49 U.S.C. § 303 are made by U.S. DOT.

4. **Historic Preservation**

The Authority agrees to assist the Federal Government and comply with section 106 of the National Historic Preservation Act, 16 U, S.C. § 470f, involving historic and archaeological preservation by:

- a. Consulting the State Historic Preservation Officer on the conduct of investigations, in accordance with Advisory Council on Historic Preservation regulations, "Protection of Historic and Cultural Properties," 36 C.F.R. Part 800, to identify properties and resources listed in or eligible for inclusion in the National Register of Historic Places that may be affected by the Project, and notifying the Federal Government (FTA) of the existence of any such properties; and
- b. Complying with all Federal requirements to avoid or mitigate adverse effects upon such properties.

5. **Energy Conservation**

The Contractor, Subcontractors and its third party contractors shall comply with mandatory standards and policies relating to energy efficiency that are contained in applicable State energy conservation plans issued in compliance with the Energy Policy and Conservation Act, 42 U.S.C. §§ 6321 et seq.

6. **Mitigation of Adverse Environmental Effects**

Should the proposed Project cause adverse environmental effects, the Authority agrees to take all reasonable steps to minimize such effects pursuant to 49 U.S.C. app. § 1610, all other applicable statutes, and the procedures set forth in 23 C.F.R. Part 771 and 49 C.F.R. Part 622. The Authority agrees to undertake all environmental mitigation measures that may be identified as commitments in applicable Environmental documents (such as environmental assessments, environmental impact statements, memoranda of agreement, and statements required by 49 U.S.C. § 303) and with any conditions imposed by the Federal Government as part of a finding of no significant impact or a record of decision; all such mitigation measures are incorporated in and made part of this Contract, the December 1993 FTA Grant Agreement with the MBTA (Agreement), by reference. As soon as the Federal Government and the Authority reach agreement on any mitigation measures that have been deferred, those measures will then be incorporated into this Agreement. Such mitigation measures may not be modified or withdrawn without the express written approval of the Federal Government.

7. The Contractor, Subcontractors and its third party contractors with all applicable standards, orders, or requirements issued under section 306 of Clear Air Act (42 U.S.C. 1857(h), section 508 of the Clear Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15) (Contracts, Subcontracts, and subgrants of amounts in excess of \$100,000).

8. **Seismic Safety**

The contractor agrees that any new building or addition to an existing building will be designed and constructed in accordance with the standards for Seismic Safety required in Department of Transportation Seismic Safety Regulations 49 CFR Part 41 and will certify to compliance to the extent required by the regulation. The contractor also agrees to ensure that all work performed under this contract including work performed by a subcontractor is in compliance with the standards required by the Seismic Safety Regulations and the certification of compliance issued on the project.

9. **Clean Water**

(1) The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The Contractor agrees to report each violation to the Purchaser and understands and agrees that the Purchaser will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

10. **Recovered Materials**

The contractor agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247.

H. NOTICE OF FEDERAL REQUIREMENTS

The Contractor is advised that Federal requirements applicable to this contract as set forth in federal law, regulations, policies, and related administrative practices may change during the performance of this contract. Any such changes shall also apply to this contract.

The following provisions included, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the following contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1E, dated June 19, 2003, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any Authority requests, which would cause the Authority to be in violation of the FTA terms and conditions.

The Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives. These include without limitation those listed directly or by reference in the Master Agreement (Form FTA MA (8) dated October 1, 2001 between the Authority and the FTA, as they may be amended or promulgated from time to time during this term of this contract. The Contractor's failure to comply shall constitute a material breach of contract.

I. RECORD RETENTION

Retention of all required records for 6 years after the MBTA makes final payment and all other pending matters are closed. [Refer to Authority's General Conditions Article 5.27].

J. ADA - Access Requirements for Individuals with Disabilities

The Contractor agrees to comply with, and assure that any subcontractor and third party contractors, under this Project comply with all applicable requirements of the Americans with Disabilities Act Of 1990 (ADA), 42 U.S.C. §§ 12101 et seq.; section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794; section 16 of the Federal Transit Act, as amended, 49 U.S.C. app. §1612; and the following regulations and any amendments thereto:

1. U.S. DOT regulations, "Transportation Services for Individuals with Disabilities (ADA), 49 C.F.R. Part 37;
2. U.S. DOT regulations, "Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance," 49 C.F.R. Part 27;

3. U.S. DOT regulations, "Americans With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles," 49 C.F.R. Part 38;
4. Department of Justice (DOJ) regulations, "Nondiscrimination on the Basis of Disability in State and Local Government Services," 28 C.F.R., Part 35;
5. DOJ regulations, "Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities," 28 C.F.R. Part 36.
6. General Services Administration regulations, "Accommodations for the Physically Handicapped," 41 C.F.R. Subpart 101-19;
7. Equal Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630;
8. Federal Communications Commission regulations, "Telecommunications Relay Services and Related Customer Premises Equipment for the Hearing and Speech Disabled," 47 C.F.R. Part 64, Subpart F; and
9. FTA regulations, "Transportation for Elderly and Handicapped Persons," 49 C.F.R. Part 609.

K. BUY AMERICA CERTIFICATION

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 CFR Part 661, which provide that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7, and include microcomputer equipment, software, and small purchases (currently less than \$100,000) made with capital, operating, or planning funds.

A bidder or offeror must submit to the FTA Authority the appropriate Buy America certification (below) with all bids on FTA-funded contracts, except those subject to a general waiver. Bids or offers that are not accompanied by a completed Buy America certification must be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors. *[For Certification Forms, refer to Bid Form].*

L. FLY AMERICA

The Contractor agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and subrecipients of Federal funds and their contractors are required to use U.S. Flag air carriers for U.S Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

M. NO OBLIGATION BY THE FEDERAL GOVERNMENT

- (1) The Purchaser and Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the

express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the Purchaser, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.

- (2) The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

N. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS AND RELATED ACTS

- (1) The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 *et seq.* and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.
- (2) The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. § 5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, to the extent the Federal Government deems appropriate.
- (3) The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

O. TERMINATION

Termination for cause and convenience by the grantee for subgrantee including the manner by which it will be affected and the basis for settlement, (all contracts in excess of \$10,000). *[Refer to Authority's General Conditions and Supplementary Conditions].*

P. REMEDIES / BREACH OF CONTRACT

Administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate. *[Refer to Authority's General Conditions and Supplementary Conditions].*

Q. INTEGRITY CERTIFICATION

1. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion. *[Refer to Bid Form]*

a. Instructions for Certification - Primary Covered Transactions: (Applicable to all Federal contracts - 49 C.F.R. Part 29).

1. By signing and submitting this Proposal, the prospective participant is providing the certification set out below.
2. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of this prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
4. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
5. The terms "covered transaction," "debarred", "suspended," "ineligible," "lower tier covered," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntary excluded," as used in this clause, have the meanings set out in this Definitions and Coverage Sections of rules implementing Executive Order 12549. You may contact the department or agency to which this Proposal is submitted for assistance in obtaining a copy of those regulations.
6. The prospective primary participant agrees by submitting this Proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this agreement.
7. The Prospective primary 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 lowered tier covered transactions.
8. A participation in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement of the "List of Parties Excluded From Federal Procurement of Nonprocurement" (Nonprocurement List) which is compiled by the General Services Administration.

9. 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 a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
 10. 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 - Primary Covered Transactions [*Refer to Bid Form*]
- a. **The prospective primary participant certifies to the best of its knowledge and belief, that it and its principle:**
 1. Are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any federal department or agency;
 2. Have not within a 3 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 of 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 (1b) of this certification.
 4. Have not within a 3 year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default
 - b. **Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.**
 - c. **Instructions for Certification - Lower Tier Covered Transactions: (Applicable to all subcontracts, purchase orders and other tier transactions of \$25,000 or more -49 C.F.R. 29).**
 1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
 2. 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.
 3. 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.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, have meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
 5. 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.
 6. The prospective lower tier participant further agrees by submitting this proposal that it will include in 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.
 7. A participation in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
 8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
 9. Except for transactions authorized under paragraph (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.
- d. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.**
- e. 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.**

R. LOBBYING CERTIFICATION

Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 104-65 [to be codified at 2 U.S.C. § 1601, et seq.] - Contractors who apply or bid for an award of \$100,000 or more shall file the certification required by 49 CFR part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress,

or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to the recipient. [*Refer to Bid Form*].

S. NONDISCRIMINATION - Pursuant to Department of Labor regulations at 41 C.F.R. §§ 60-1.4(b) (1) and 60-1.4(c):

1. DURING THE PERFORMANCE OF THIS CONTRACT, THE CONTRACTOR AGREES AS FOLLOWS:
 - a. THE CONTRACTOR WILL NOT DISCRIMINATE AGAINST ANY EMPLOYEE OR APPLICANT FOR EMPLOYMENT BECAUSE OF RACE, COLOR, RELIGION, SEX, AGE, DISABILITY, OR NATIONAL ORIGIN. THE CONTRACTOR WILL TAKE AFFIRMATIVE ACTION TO ENSURE THAT APPLICANTS ARE EMPLOYED, AND THAT EMPLOYEES ARE TREATED DURING EMPLOYMENT WITHOUT REGARD TO THEIR RACE, COLOR, RELIGION, SEX, AGE, DISABILITY OR NATIONAL ORIGIN. SUCH ACTION SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING: 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. THE CONTRACTOR AGREES CONSPICUOUS PLACES, AVAILABLE TO EMPLOYEES AND APPLICANTS FOR EMPLOYMENT, NOTICES TO BE PROVIDED, SETTING FORTH THE PROVISIONS OF THIS NONDISCRIMINATION CLAUSE.
 - b. THE CONTRACTOR WILL, IN ALL SOLICITATIONS OR ADVERTISEMENTS FOR EMPLOYEES PLACED BY OR ON BEHALF OF THE CONTRACTOR, STATE THAT ALL QUALIFIED APPLICANTS WILL RECEIVE CONSIDERATION FOR EMPLOYMENT WITHOUT REGARD TO RACE, COLOR, RELIGION, SEX, AGE, DISABILITY, OR NATIONAL ORIGIN.
 - c. THE CONTRACTOR WILL SEND TO EACH LABOR UNION OR REPRESENTATIVE OF WORKERS WITH WHICH IT HAS A COLLECTIVE BARGAINING AGREEMENT OR OTHER CONTRACT OR UNDERSTANDING, A NOTICE TO BE PROVIDED ADVISING THE LABOR UNION OR WORKERS REPRESENTATIVE OF THE CONTRACTOR'S COMMITMENTS UNDER SECTION 202 OF EXECUTIVE ORDER NO. 11246 OF SEPTEMBER 24, 1965, AND SHALL POST COPIES OF THE NOTICE IN CONSPICUOUS PLACES AVAILABLE TO EMPLOYEES AND APPLICANTS FOR EMPLOYMENT.
 - d. THE CONTRACTOR WILL COMPLY WITH ALL PROVISIONS OF EXECUTIVE ORDER NO. 11246 OF SEPTEMBER 24, 1965, AND OF THE RULES, REGULATIONS, AND RELEVANT ORDERS OF THE SECRETARY OF LABOR.
 - e. THE CONTRACTOR WILL FURNISH ALL INFORMATION AND REPORTS REQUIRED BY EXECUTIVE ORDER NO. 11246 OF SEPTEMBER 24, 1965, AND BY THE RULES, REGULATIONS, AND ORDERS OF THE SECRETARY OF LABOR, OR PURSUANT THERETO, AND WILL PERMIT ACCESS TO ITS BOOKS, RECORDS AND ACCOUNTS BY THE SECRETARY OF LABOR AND THE FEDERAL TRANSIT ADMINISTRATION (FTA) FOR PURPOSES OF INVESTIGATION TO ASCERTAIN COMPLIANCE WITH SUCH RULES, REGULATIONS, AND ORDERS.

- f. IN THE EVENT OF THE CONTRACTOR'S NONCOMPLIANCE WITH THE NONDISCRIMINATION CLAUSES OF THIS AGREEMENT OR WITH ANY OF SUCH RULES, REGULATIONS, OR ORDERS, THIS AGREEMENT MAY BE CANCELED, TERMINATED, OR SUSPENDED IN WHOLE OR IN PART AND THE CONTRACTOR MAY BE DECLARED INELIGIBLE FOR FURTHER FEDERAL OR FEDERALLY ASSISTED CONTRACTS IN ACCORDANCE WITH PROCEDURES AUTHORIZED IN EXECUTIVE ORDER NO. 11246 OF SEPTEMBER 24, 1965, AND SUCH OTHER SANCTIONS MAY BE IMPOSED AND REMEDIES INVOKED AS PROVIDED IN EXECUTIVE ORDER NO. 11246 OF SEPTEMBER 24, 1965, OR BY RULE, REGULATION, OR ORDER OF THE SECRETARY OF LABOR, OR AS OTHERWISE PROVIDED BY LAW.

- g. THE CONTRACTOR WILL INCLUDE THE PROVISIONS OF PARAGRAPHS(a) THROUGH (g) OF THIS SUBSECTION IN EVERY SUBCONTRACT OR PURCHASE ORDER UNLESS EXEMPTED BY RULES, REGULATIONS, OR ORDERS OF THE SECRETARY OF LABOR ISSUED PURSUANT TO SECTION 204 OF EXECUTIVE ORDER NO. 11246 OF SEPTEMBER 24, 1965, SO THAT SUCH PROVISIONS SHALL BE BINDING UPON EACH SUBCONTRACTOR OR VENDOR. THE CONTRACTOR WILL TAKE SUCH ACTION WITH RESPECT TO ANY SUBCONTRACT OR PURCHASE ORDER AS THE SECRETARY OF LABOR OR FTA MAY DIRECT AS A MEANS OF ENFORCING SUCH PROVISIONS, INCLUDING SANCTIONS FOR NONCOMPLIANCE; PROVIDED, HOWEVER, THAT IF A CONTRACTOR BECOMES INVOLVED IN, OR IS THREATENED WITH, LITIGATION WITH A SUBCONTRACTOR OR VENDOR AS A RESULT OF SUCH DIRECTION, THE CONTRACTOR MAY REQUEST THE UNITED STATES TO ENTER INTO SUCH LITIGATION TO PROTECT THE INTERESTS OF THE UNITED STATES.

T. LIQUIDATED DAMAGES

[Refer to Authority's General Conditions].

U. LABOR PROVISIONS.

1. Labor Provisions - Construction

a. Minimum Wages

- (1) All laborers and mechanics employed (or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction 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 the 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 (a) (1) (iv) of 29 CFR Sec. 5.5; 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. 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 Sec. 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 (a) (1) (ii) of 29 CFR Sec. 5.5 and the Davis-Bacon Poster (WH-132) 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.

- (2) The Contracting Office shall require that any class of laborers or mechanics 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 Office shall approve an additional classification and wage rate and fringe benefits therefor, only when the following criteria have been met:
 - (a) The work to be performed by the classification requested is not performed by a classification in the wage determination: and
 - (b) The classification is utilized in the area by the construction industry: and
 - (c) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administration of the Wage and hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 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 a 30 day period that additional time is necessary.
- (4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.
- (5) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraph (a) (1) (B) or (C) of 29 CFR Sec. 5.5 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.
- (6) 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.

- (7) 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.
- (8) (A) The contracting officer shall require that any class of laborers or mechanics 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 therefor only when the following criteria have been met:
- (a) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
 - (b) The classification is utilized in the area by the construction industry; and
 - (c) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (B) 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, 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.
- (C) 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 Administrator for determination. The Administrator, or an authorized representative, will issue a determination with 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.
- (D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(v) (B) or (C) 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.

2. **Withholding**

DOT 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 of 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 (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the Department of Transportation may, after written notice to the Contractor, sponsor, applicant, or owner, take such 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 (or under the United States Housing Act of 1937, or under the Housing Act of 1949 in the construction or development of the project). Such records shall contain the name, address, and social security number of each 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 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 Sec. 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 has been communicated in writing to the labors or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices and 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. The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the Department of Transportation if the Department of Transportation is a party to the Contract, but if the Department of Transportation is not such a party, the Contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Department of Transportation. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under Sec. 5.5 (a) (3) (I) of regulations, 29 CFR Part 5. This information may be submitted in any form desired. Optional form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- c. 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:
- (1) That the payroll for the payroll period contains the information required to be maintained under Sec. 5.5 (a) (3) (I) of regulations, 29 CFR Part 5 and that such information is correct and complete.

- (2) 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.
 - (3) 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.
- d. 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 (a) (3) (ii) (b) of 29 CFR Sec. 5.5.
 - e. 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.
 - f. The Contractor or subcontractor shall make the records required under paragraph (a) (3) (I) of 29 CFR Sec. 5.5 available for inspection, copying, or transcription by authorized representatives of the Department of Transportation 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 Federal Agency may, after written notice to the Contractor, sponsor, applicant, or owner, 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 Sec. 5.12.

4. **Apprentices and Trainees - Apprentices**

- a. 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, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training, or with a State Apprenticeship and Training 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 the payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above shall not be paid less than the applicable wage determination for the work actually performed. In addition, any apprentice performing work on the job site in excess of the ration permitted under the registered program shall not be paid 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 subcontractors registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice level of progress, expressed as a percentage of the

journeyman's hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits, in accordance with the provisions of the apprentice program. If the apprentice program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training or a State Apprenticeship Agency recognized by the Bureau, 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** Except as provided in 29 CFR Sec. 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, evidence 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's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provision of the trainee program. If the trainees 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's 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 not be paid 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 ration 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.

5. **Compliance with Copeland Act Requirements**

The Contractor shall comply with the requirements of the 29 CFR Part 3, which are incorporated by reference.

6. **Subcontracts**

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses 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 the 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**

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 Sec. 5.12 (a) (1).

- a. 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 Sec. 5.12(a) (1).
- b. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S. C. Sec. 1001.

11. **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 work week in which he or she is employed on such work to work in excess of eight hours in any calendar day or in excess of forty hours in such work week unless such laborer or mechanic receives compensation at a rate of pay for all hours worked in excess of eight hours, in any calendar day or in excess of forty hours in such work week, whichever is greater.

12. **Violation: Liability for Unpaid Wages: Liquidated Damages**

In the event of any violation of the clause set forth in subparagraph (b) (1) 29 CFR Sec. 5.5, 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 subparagraph (b) (1) of 29 CFR Sec. 5.5 in the sum of \$10 for each calendar day or which such individual was required or permitted to work in excess of eight hours or in excess of the standard work week of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (b) (1) or 29 CFR Sec. 5.

13. **Withholding for Unpaid Wages and Liquidated Damages**

The Department of Transportation or the recipient 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 monies 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 subparagraph (b) (2) of 29 CFR Sec. 5.5.

14. **Nonconstruction Contracts**

In addition to the clauses contained in 29 CFR Sec. 5.5 (b) (10) through (14), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR Sec. 5.1., the recipient shall insert a clause requiring that the Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the Contract for all laborers and mechanics, including guards and watchmen, working on the Contract. Such records shall contain the names and address of each employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the recipient shall require the Contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Transportation and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during work hours on the job.

15. **Subcontracts**

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph 1 through 12 of this paragraph 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 subparagraph 1 through 14 of this paragraph.

16. **Certified Payroll - Construction Projects (11/7/77)**

The Authority shall obtain from each Contractor and subcontractor a certified copy of each weekly payroll within seven days after the regular payroll date. Following a review by the Authority for compliance with State and Federal Labor Laws, the payroll copy shall be retained at the project site for later review by the Federal Transportation Administration. The Contractor must use the Department of Labor Form WH-347 (pages 1 and 2), which provides all the necessary payroll information and certifications or they will be in violation of compliance. A copy of this form is attached as pages 68 and 69 of this Section.

17. **Disadvantaged Business Enterprise Policy.** It is the policy of the Department of Transportation that minority business enterprises, as defined in 49 CFR Part 26, shall have the opportunity to participate in the performance of contracts financed in whole or in part with federal funds under this agreement. Consequently, the MBE requirements of 49 CFR Part 26 apply to this agreement.

18. **DBE Obligation.** The Authority and its contractors agree to ensure that minority business enterprises as defined in 49 CFR Part 26 have the opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with federal funds provided under this

Agreement. In this regard the Authority and its contractors shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 to ensure that disadvantaged business enterprises have the maximum opportunity to compete for and perform contracts. The Authority and its contractors shall not discriminate on the basis of race, color, national origin or sex in the award and performance of DOT assisted contracts.

V. INTERESTS OF MEMBERS OF CONGRESS

Interest of Members of Congress. No Member of or delegate to the Congress of the United States shall be admitted to any share or part of this Project or to any benefit there from.

W. DEBARRED BIDDERS - DEBARMENT AND SUSPENSION

The Authority agrees to obtain certifications on debarment and suspension from its third party contractors and subcontractors and otherwise comply with U.S. DOT regulations, "Government wide Debarment and Suspension (Nonprocurement) and Government wide Requirements for Drug-Free Work place (Grants)," 49 C.F.R. Part 29.

1. Executive Order 12549 provides that, to the extent permitted by law, Executive departments and agencies shall participate in a Government wide system for nonprocurement debarment and suspension. A person who is debarred or suspended shall be excluded from Federal financial and non-financial assistance and benefits under Federal programs and activities. Debarment or suspension of a participant in a program by one agency shall have government wide effect.
2. These regulations implement section 3 of Executive Order 12549 and the guidelines promulgated by the Office of Management and Budget under section 6 of the Executive Order by:
 - a. Prescribing the programs and activities that are covered by the government wide system;
 - b. Prescribing the government wide criteria and government wide minimum due process procedures that each agency shall use;
 - c. Providing for the listing of debarred and suspended participants declared ineligible and participants who have voluntarily excluded themselves from participation in covered transactions;
 - d. Setting forth the consequences of a debarment, suspension, determination of ineligibility, or voluntary exclusion; and
 - e. Offering such guidance as necessary for the effective implementation and administration of the government wide system.
3. Although these regulations cover the listing of ineligible participants and the effect of such listing, they do not prescribe policies and procedures governing declarations of ineligibility.

X. INSURANCE /BONDING - INSURANCE DURING CONSTRUCTION

At a minimum, the Contractor agrees to comply with the insurance requirements normally imposed by its State and local governments. *[Refer to General Conditions, Supplementary Conditions and Contract Bond Forms]*

Y. PROJECT SIGNS

The Contractor agrees to cause to be erected at the site of construction, and maintained during construction, signs satisfactory to U.S. DOT identifying the Project and indicating that the Government is participating in the development of the Project. *[Refer to Division 1, General Requirements]*

Z. CERTIFIED PAYROLL - CONSTRUCTION PROJECTS

The Authority shall obtain from each Contractor and subcontractor a certified copy of each weekly payroll within seven days after the regular payroll date. Following a review by the Authority for compliance with State and Federal Labor Laws, the payroll copy shall be retained at the project site for later review by the Federal Transportation Administration. The Contractor must use the Department of Labor Form WH-347 (pages 1 and 2) which provides all the necessary payroll information and certifications or they will be in violation of compliance. A copy of this form is attached at the end of this Section.

AA. DISADVANTAGED BUSINESS ENTERPRISE

Policy. It is the policy of the Department of Transportation that minority business enterprises, as defined in 49 CFR Part 26, shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with federal funds under this agreement. Consequently, the DBE requirements of 49 CFR Part 26 apply to this agreement.

BB. DBE OBLIGATION.

The Authority and its contractors agree to ensure that disadvantaged business enterprises as defined in 49 CFR Part 26 have the opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with federal funds provided under this Agreement. In this regard the Authority and its contractors shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 to ensure that disadvantaged business enterprises have the opportunity to compete for and perform contracts. The Authority and its contractors shall not discriminate on the basis of race, color, national origin or sex in the award and performance of DOT assisted contracts

CC. MINIMUM FEDERAL WAGE RATES

Minimum wages to be paid on this construction project have been established by Wage Predetermination Decisions of the U. S. Secretary of Labor. These wage rates must be prominently posted at the construction site.

1. Wage Determination Decision

Wage predetermination decisions of the U. S. Secretary of Labor are incorporated herein as follows:

- a. MA 120001 4/20/2012 MA1.
- b. Superseded General Number: MA20100001 with Modification Nos. 0 through 1 for Middlesex County (see pages SC-29 (a) through SC-29 (v)).

General Decision Number: MA120001 04/20/2012 MA1

Superseded General Decision Number: MA20100001

State: Massachusetts

Construction Type: Building

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

BUILDING CONSTRUCTION PROJECTS (does not include single family homes and apartments up to and including 4 stories)

Modification Number Publication Date

0 01/06/2012

1 04/20/2012

* ASBE0006-001 09/01/2011

BARNSTABLE (Brewster, Chatham, Dennis, Eastham, Harwich, Orleans, Provincetown, Truro, Wellfleet and Yarmouth); BRISTOL (Easton); ESSEX; MIDDLESEX; AND NORFOLK (Avon, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Holbrook, Hull, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Quincy, Randolph, Sharon, Stoughton, Walpole, Wellesley, Westwood, and Weymouth); AND SUFFOLK COUNTIES

	Rates	Fringes
Insulator/asbestos worker Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems.....	\$ 32.53	21.83

* ASBE0006-002 12/01/2011

BARNSTABLE (Brewster, Chatham, Dennis, Eastham, Harwich, Orleans, Provincetown, Truro, Wellfleet and Yarmouth); BRISTOL (Easton); ESSEX; MIDDLESEX; NORFOLK (Avon, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Holbrook, Hull, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Quincy, Randolph, Sharon Stoughton, Walpole, Wellesley, Westwood, and Weymouth) AND SUFFOLK COUNTIES

	Rates	Fringes
HAZARDOUS MATERIAL HANDLER (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)....	\$25.00	16.05

* ASBE0006-010 09/01/2011

BARNSTABLE (Barnstable, Bourne, Falmouth, Mashpee and Sandwich); BRISTOL (Acushnet, Attleboro city, Berkeley, Dartmouth, Dighton, Fairhaven, Fall river City, Freetown, Marion, Mansfield, New Bedford City, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Somerset, Swansea, Taunton City and Westport); DUKES; NANTUCKET; NORFOLK (Bellingham, Franklin, Plainville, and Wrentham); PLYMOUTH (Lakeville, Mattapoisett, Middleboro, Rochester and Wareham)

	Rates	Fringes
Insulator/asbestos worker (Includes the application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.)....	\$32.53	21.83

BOIL0029-001 10/01/2009

	Rates	Fringes
BOILERMAKER.....	\$38.25	17.04

BRMA0001-008 03/01/2010

FOXBORO CHAPTER

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

	Rates	Fringes
Bricklayer, Cement Mason, Plasterer.....	\$43.86	24.15

BRMA0001-009 03/01/2010

LOWELL CHAPTER

MIDDLESEX (Acton, Asby, Ayer, Bedford, Billerica, Boxboro, Carlisle, Chemsford, Dracut, Dunstable, Ft. Denvens, Groton, Littleton, Lowell, North Acton, Pepperell, Shirley, South Acton, Tewksbury, Townsend, Tyngsboro, West Acton, Westford, Wilmington)

	Rates	Fringes
Bricklayer and plasterer.....	\$43.86	24.15

BRMA0001-010 03/01/2010

LOWELL CHAPTER

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

	Rates	Fringes
BRICKLAYER.....	\$43.86	24.15

* BRMA0003-001 03/01/2012

	Rates	Fringes
Marble & Tile Finisher.....	\$35.52	26.26
Marble, Tile & Terrazzo Workers.....	\$46.60	27.65
TERRAZZO FINISHER.....	\$45.50	27.48

* BRMA0003-003 03/01/2012

BOSTON CHAPTER

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

	Rates	Fringes
BRICKLAYER.....	\$46.56	27.87

* BRMA0003-006 03/01/2012

LYNN CHAPTER

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

	Rates	Fringes
Bricklayer, cement mason and plasterer.....	\$46.56	27.87

* BRMA0003-007 03/01/2012

WALTHAM CHAPTER

MIDDLESEX (Belmont, Burlington, Concord, Lexington, Lincoln, Stoneham, Sudbury, Waltham, Watertown, Wayland, Weston, Winchester, Woburn)

	Rates	Fringes
Bricklayer and plasterer.....	\$46.56	27.87

* BRMA0003-008 03/01/2012

NEWTON CHAPTER

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

	Rates	Fringes
Bricklayer, cement mason and plasterer.....	\$46.56	27.87

* BRMA0003-009 03/01/2012

NEW BEDFORD

BARNSTABLE; BRISTOL (Acushnet, Dartmouth, Fairhaven, Fall River, Freetown, New Bedford, Somerset, Swansea, Westport); DUKES; and NANTUCKET COUNTIES

	Rates	Fringes
Bricklayer, cement mason and plasterer.....	\$46.56	27.87

* BRMA0003-010 03/01/2012

QUINCY CHAPTER

NORFOLK COUNTY (Avon, Braintree, Cohasset, Holbrook, Quincy, Randolph, Stoughton, Weymouth)

	Rates	Fringes
Bricklayer, cement mason and plasterer.....	\$46.56	27.87

CARP0026-001 03/01/2011

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

	Rates	Fringes
CARPENTER.....	\$32.05	24.68

CARP0033-001 03/01/2011

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

	Rates	Fringes
CARPENTER.....	\$37.25	25.18

CARP0056-011 08/01/2011

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

	Rates	Fringes
PILEDRIVERMAN.....	\$38.30	27.52

CARP0056-012 08/01/2011

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

	Rates	Fringes
PILEDRIVERMAN.....	\$38.30	27.52

CARP0056-013 08/01/2011

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

	Rates	Fringes
PILEDRIVERMAN.....	\$38.30	27.52

CARP0424-003 03/01/2011

NORFOLK COUNTY (Braintree, Cohasset, Scituate, Weymouth, Quincy)

	Rates	Fringes
CARPENTER.....	\$32.05	24.68

CARP0624-005 03/01/2011

BARNSTABLE; BRISTOL (Except Attleboro & North Attleboro); DUKES; NANTUCKET; AND NORFOLK (Avon, Holbrook, Randolph, Stoughton) COUNTIES

	Rates	Fringes
CARPENTER.....	\$32.05	24.68

CARP1121-001 05/02/2010

	Rates	Fringes
MILLWRIGHT.....	\$29.78	18.61

CARP2168-001 09/01/2011

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

	Rates	Fringes
FLOOR LAYER: Carpet.....	\$35.95	23.46

CARP2168-004 09/01/2011

BRISTOL; ESSEX; MIDDLESEX (Except Belmont, Cambridge, Everett, Malden, Medford, Somerville);
Remainder of Norfolk County

	Rates	Fringes
FLOOR LAYER: Carpet.....	\$35.95	23.46

CARP2168-005 09/01/2011

BARNSTABALE; DUKES; AND NANTUCKET

	Rates	Fringes
FLOOR LAYER: Carpet.....	\$35.95	23.46

* ELEC0096-001 12/01/2011

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

	Rates	Fringes
ELECTRICIAN.....	\$36.75	14%+14.91
Teledata System Installer.....	\$25.86	3% +15.85

ELEC0099-001 06/01/2011

BRISTOL (Attleboro, North Attleboro, Seekonk)

	Rates	Fringes
ELECTRICIAN.....	\$34.08	20.17
Teledata System Installer.....	\$25.56	15.97

ELEC0103-001 09/01/2011

ESSEX; MIDDLESEX (Excluding Ashby, Ashland, Ayer, Ft. Devens, Groton, Hopkinton, Hudson, Marlboro, Pepperell, Shirley, Stow, Townsend); NORFOLK (Excluding Avon, Holbrook, Plainville, Randolph, Stoughton) SUFFOLK

	Rates	Fringes
Teledata System Installer.....	\$31.42	21.62

ELEC0103-002 09/01/2011

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

	Rates	Fringes
ELECTRICIAN.....	\$41.89	22.06

ELEC0103-004 09/01/2011

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

	Rates	Fringes
ELECTRICIAN.....	\$41.89	22.06

ELEC0103-005 09/01/2011

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

	Rates	Fringes
ELECTRICIAN.....	\$41.89	22.06

ELEC0104-001 08/31/2009

	Rates	Fringes
Line Construction:		
Cableman.....	\$34.89	7.50+A
Equipment Operator.....	\$34.89	11.50+A
Groundman.....	\$22.58	7.50+A
Lineman.....	\$41.05	14.43+A

A. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day and Columbus Day, provided the employee has been employed 5 working days prior to any one of the listed holidays.

* ELEC0223-005 09/01/2011

BARNSTABLE; BRISTOL (Except Attleboro, North Attleboro, Seekonk); DUKES; NANTUCKET AND NORFOLK (Avon, Halbrook, Plainville, Randolph, Stoughton)

	Rates	Fringes
ELECTRICIAN.....	\$35.13	30.5%

* ELEC0223-006 09/01/2011

BARNSTABLE; BRISTOL (Except Attleboro, North Attleboro, Seekonk); DUKES; NANTUCKET AND NORFOLK (Avon, Halbrook, Plainville, Randolph, Stoughton)

	Rates	Fringes
Teledata System Installer.....	\$29.86	26.5% +7.70

* ELEV0004-001 01/01/2012

	Rates	Fringes
ELEVATOR MECHANIC.....	\$50.83	23.535

FOOTNOTE FOR ELEVATOR MECHANICS:

A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.

Eight paid holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day and Christmas Day.

ENGI0004-001 12/01/2011

	Rates	Fringes
Power equipment operators:		
Group 1.....	\$39.52	23.24
Group 2.....	\$39.16	23.24
Group 3.....	\$27.95	23.24
Group 4.....	\$33.23	23.24
Group 5.....	\$21.28	23.24
Group 6.....	\$24.51	23.24

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 HOURLY PREMIUM FOR BOOM LENGTHS (Including Jib):

Over 150 ft. +2.12
Over 185 ft. +3.72
Over 210 ft. +5.23
Over 250 ft. +7.92
Over 295 ft. +10.97
Over 350 ft. +12.76

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Crane; shovel; truck crane; cherry picker; dragline; trench hoe; backhoe; three drum machine; derrick; pile driver; elevator tower; hoist; gradall; shovel dozer; front end loader; fork lift; suger; boring machine; rotary drill; post hole hammer; post hole digger; pumpcrete machine; asphalt plant (on site); concrete batching and/or mixing plant (on site); crusher plant (on site); paving concrete mixer; timber jack

Group 2: Sonic or vibratory hammer; grader; scraper; tandem scraper; concrete pump; bulldozer; tractor; york rake; mulching machine; portable steam boiler; portable steam generator; roller; spreader; tamper (self propelled or tractor drawn); asphalt paver; mechanic - maintenance; paving screed machine; stationary steam boiler; paving concrete finishing machine; cal truck; ballast regulator; switch tamper; rail anchor machine; tire truck

Group 3: Pumps (1-3 grouped); compressor; welding machine (1-3 grouped); generator; concrete vibrator; heater (power driven 1- 5); well point system (operating); syphon-pulsometer; concrete mixer; valves controlling permanent plant air or steam; conveyor; Jackson type tamper; single diaphragm pump; lighting plant

Group 4: Assistant engineer (fireman)

Group 5: Oiler (other than truck cranes and gradalls)

Group 6: Oiler (on truck cranes and gradalls) stant engineer (on truck crane and gradall)

 IRON0007-006 03/16/2011

AREA 1: BRISTOL (Easton); ESSEX (Beverly Gloucester, Lynn, Lynnfield, Manchester, Marblehead Nahant, Salem, Saugus, Swampscott); MIDDLESEX (Arlington, Bedford, Belmont, Burlington, Cambridge, Concord, Everett, Framingham, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Except Medway); SUFFOLK

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

	Rates	Fringes
Ironworkers:		
AREA 1.....	\$36.28	26.41
AREA 2.....	\$31.87	26.41

 IRON0007-010 03/16/2011

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

	Rates	Fringes
IRONWORKER.....	\$36.28	26.41

* IRON0037-005 01/02/2012

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

	Rates	Fringes
IRONWORKER.....	\$31.75	21.72

LABO0014-001 06/01/2011

	Rates	Fringes
Plasterer tender		

BARNSTABLE, BRISTOL, DUKES, ESSEX, NANTUCKET, MIDDLESEX (with the exception of Arlington, Belmont, Burlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Somerville, Stoneham, Wakefield, Winchester, Winthrop and Woburn); NORFOLK (with the exception of Brookline Dedham and Milton) COUNTIES.	\$28.60	19.00
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SUFFOLK COUNTY (Boston, Chelsea, Revere, Winthrop, Deer Island, Nut Island); MIDDLESEX COUNTY (Arlington, Belmont, Burlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Somerville, Stoneham, Wakefield, Winchester, Winthrop and Woburn only); NORFOLK COUNTY (Brookline, Dedham, and Milton)....	\$31.05	19.90
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LABO0022-009 06/01/2010

SUFFOLK COUNTY (Boston, Chelsea, Revere, Winthrop, Deer & Nut Islands); MIDDLESEX COUNTY (Arlington, Belmont, Burlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Somerville, Stoneham, Wakefield, Winchester, Winthrop, and Woburn only); NORFOLK COUNTY (Brookline, Dedham, and Milton only)

	Rates	Fringes
Laborers:		
Group 1.....	\$29.80	18.75
Group 2.....	\$30.05	18.75
Group 3.....	\$30.55	18.75
Group 4.....	\$30.80	18.75
Group 5.....	\$30.55	18.75
Group 6.....	\$31.80	18.75
Group 7.....	\$23.15	18.75

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; Carpenter Tenders

GROUP 2: Jackhammer operator; pavement breaker; asphalt raker carbide core drilling machine; chain saw operator; pipelayer; barco type jumping tampers; laser beam; concrete pump; mason tender; motorized mortar mixer; ride-on motorized buggy; fence and beam rail erector

GROUP 3: Air track, block paver; rammer; curb setter, hydraulic and similar self-powered drills

GROUP 4: Blaster; powderman

GROUP 5: Pre-cast floor and roof plank erector

GROUP 6: Asbestos removal laborers/haz-mat laborers

GROUP 7: Flaggers

LABO0022-010 06/01/2010

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

	Rates	Fringes
Laborers:		
Group 1.....	\$27.85	17.35
Group 2.....	\$28.10	17.35
Group 3.....	\$28.60	17.35

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SUPPLEMENTARY CONDITIONS
00800 - 29(m)

Group 4.....	\$28.85	17.35
Group 5.....	\$28.60	17.35
Group 6.....	\$29.85	17.35

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; Carpenter Tenders

GROUP 2: Jackhammer operator; pavement breaker; asphalt raker carbide core drilling machine; chain saw operator; pipelayer; barco type jumping tampers; laser beam; concrete pump; mason tender; motorized mortar mixer; ride-on motorized buggy; fence and beam rail erector

GROUP 3: Air track, block paver; hammer; curb setter, hydraulic and similar self-powered drills

GROUP 4: Blaster; powderman

GROUP 5: Pre-cast floor and roof plank erector

GROUP 6: Asbestos removal laborers/haz-mat laborers

LABO1421-004 06/01/2011

BARNSTABLE, BRISTOL, DUKES, ESSEX, MIDDLESEX, NANTUCKET NORFOLK AND SUFFOLK COUNTIES

	Rates	Fringes
Laborers: (Wrecking)		
Group 1.....	\$31.05	19.75
Group 2.....	\$31.80	19.75
Group 3.....	\$32.05	19.75
Group 4.....	\$27.05	19.75
Group 5.....	\$30.15	19.75
Group 6.....	\$31.05	19.75

Group 1: Adzeman, Wrecking Laborer.

Group 2: Burners, Jackhammers.

Group 3: Small Backhoes, Loaders on tracks, Bobcat Type Loaders, Hydraulic "Brock" Type Hammer Operators, Concrete Cutting Saws.

Group 4: Yardman (Salvage Yard Only).

Group 5: Yardman, Burners, Sawyers.

Group 6: Asbestos, Lead Paint, Toxic and Hazardous Waste.

PAIN0011-007 06/01/2010

BARNSTABLE, BRISTOL, DUKES, AND NANTUCKET COUNTIES

	Rates	Fringes
GLAZIER.....	\$32.03	15.40+A

FOOTNOTE:

A. PAID HOLIDAY: LABOR DAY (provided employee has worked any part of the week prior to Labor Day and any part of the week after Labor Day)

PAIN0035-004 07/01/2011

BARNSTABLE; BRISTOL; ESSEX; NANTUCKET; DUKES; COUNTIES; REMAINDER OF NORFOLK; MIDDLESEX AND SUFFOLK COUNTIES

	Rates	Fringes
Painters:		
NEW CONSTRUCTION:		
Brush, Taper.....	\$33.01	21.90
Spray, Sandblast.....	\$34.41	21.90
REPAINT:		
Brush, Taper.....	\$31.07	21.90
Spray, Sandblast.....	\$32.47	21.90

PAIN0035-013 01/01/2011

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

	Rates	Fringes
Painters:		
NEW CONSTRUCTION:		
Brush, Taper.....	\$38.30	21.40
Spray, Sandblast.....	\$39.70	21.40
REPAINT:		
Brush, Taper.....	\$36.36	21.40
Spray, Sandblast.....	\$37.76	21.40

PAIN0035-020 07/01/2011

ESSEX; MIDDLESEX; NORFOLK; SUFFOLK

	Rates	Fringes
GLAZIER.....	\$38.80	21.90

* PLAS0534-001 01/01/2012

ESSEX; MIDDLESEX; NORFOLK AND SUFFOLK COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$35.00	30.66

PLAS0534-004 07/01/2011

MIDDLESEX; NORFOLK AND SUFFOLK COUNTIES

	Rates	Fringes
PLASTERER.....	\$35.00	29.66

* PLUM0004-001 03/01/2012

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

	Rates	Fringes
Plumbers and Pipefitters.....	\$39.61	23.41

PLUM0012-005 09/01/2011

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham, West Newbury); MIDDLESEX (Acton, Arlington, Ashford, Ayer-except west of Greenville Branch of Boston & Maine Rail Road, Bedford, Belmont, Billerica, Boxboro, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Framingham, Hudson, Holliston, Hopkinton, Lexington, Lincoln, Littleton, Lowell, Malden, Marlboro, Maynard, Medford, Melrose, Natick, Newton, North Reading, Pepperell, Reading, Sherborn, Somerville, Stoneham, Stow, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Westford, Wilmington, Winchester and Woburn), NORFOLK (Bellingham, Braintree, Brookline, Canton,

Cohasset, Dedham, Dover, Foxboro, Franklin, Medford, Medway, Millis, Milton, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth and Wrentham); PLYMOUTH (Hingham, Hull, Scituate); SUFFOLK; WORCHESTER (Hopedale and Southboro)

	Rates	Fringes
PLUMBER.....	\$46.01	23.31

PLUM0051-004 09/01/2011

BARNSTABLE; BRISTOL; DUKES; NANTUCKET; AND NORFOLK (Avon, Holbrook, Randolph, Stoughton) COUNTIES

	Rates	Fringes
Plumbers and Pipefitters.....	\$34.51	25.57

* PLUM0537-005 09/01/2011

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham, West Newbury); MIDDLESEX (Acton, Arlington, Ashford, Ayer-except west of Greenville Branch of Boston & Maine Rail Road, Bedford, Belmont, Billerica, Boxboro, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Framingham, Hudson, Holliston, Hopkinton, Lexington, Lincoln, Littleton, Lowell, Malden, Marlboro, Maynard, Medford, Melrose, Natick, Newton, North Reading, Pepperell, Reading, Sherborn, Somerville, Stoneham, Stow, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Westford, Wilmington, Winchester and Woburn), NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklin, Medford, Medway, Millis, Milton, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth and Wrentham); PLYMOUTH (Hingham, Hull, Scituate); SUFFOLK; WORCHESTER (Hopedale and Southboro)

	Rates	Fringes
PIPEFITTER.....	\$43.81	22.06

ROOF0033-001 08/01/2011

	Rates	Fringes
Roofers: All Tear-off and/or removal of any types of roofing and all spudding, sweeping, vacuuming and/or cleanup of any and all areas of any type where a roof is to be relaid.....	\$35.56	20.87

* SFMA0550-001 03/01/2012

BRISTOL (Portion within 35 mile radius from Boston City Hall; ESSEX; MIDDLESEX (Except Ashby, Townsend, and portions of Pepperell and Shirley beyond 35 mile radius from Boston City Hall); NORFOLK; PLYMOUTH (Portion within 35 mile radius of Boston City Hall); SUFFOLK

	Rates	Fringes
SPRINKLER FITTER.....	\$51.58	20.68

SFMA0669-001 04/01/2011

BARNSTABLE; BRISTOL (Beyond 35 mile radius of Boston City Hall); DUKES; MIDDLESEX (Ashby, Townsend, portions of Pepperell and Shirley beyond 35 mile radius of Boston City Hall); NANTUCKET; PLYMOUTH (Beyond 35 mile radius of Boston City Hall)

	Rates	Fringes
SPRINKLER FITTER.....	\$36.13	18.65

SFMA0676-001 01/01/2010

BRISTOL (Seekonk, Swansea, and Somerset)

	Rates	Fringes
SPRINKLER FITTER.....	\$39.50	17.85

A. PAID HOLIDAYS: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

* SHEE0017-003 02/01/2012

BRISTOL (Attleboro, Berkley, Easton, Mansfield, North Attleboro, Norton, Raynham, Taunton); ESSEX;
MIDDLESEX; NORFOLK; PLYMOUTH (except except Marion, Mattapoisett, Rochester, Wareham);
SUFFOLK

	Rates	Fringes
Sheet metal worker.....	\$40.79	28.83

* SHEE0017-007 02/01/2012

BARNSTABLE; BRISTOL (Acushnet, Assonet, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, New
Bedford, Rehoboth, Seekonk, Somerset, Swansea, Westport); DUKES; AND NANTUCKET

	Rates	Fringes
Sheet metal worker.....	\$40.79	28.83

* TEAM0379-001 01/01/2012

	Rates	Fringes
Truck drivers:		
Group 1.....	\$29.62	15.99+A+B
Group 2.....	\$29.85	15.99+A+B
Group 3.....	\$29.92	15.99+A+B
Group 4.....	\$30.04	15.99+A+B
Group 5.....	\$30.14	15.99+A+B
Group 6.....	\$30.43	15.99+A+B
Group 7.....	\$30.72	15.99+A+B

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

Group 1: Station wagons; panel trucks; and pickup trucks

Group 2: Two axle equipment; & forklift operator

Group 3: Three axle equipment and tireman

Group 4: Four and Five Axle equipment

Group 5: Specialized earth moving equipment under 35 tons other than conventional type trucks; low
bed; vachual; mechanics, paving restoration equipment

Group 6: Specialized earth moving equipment over 35 tons

Group 7: Trailers for earth moving equipment (double hookup)

FOOTNOTES:

- A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day
- B. PAID VACATION: Employees with 4 months to 1 year of service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 – 10 years of service; and 3 weeks vacation for more than 10 years of service

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

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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 union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows 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. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rate.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

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

DD. EQUAL EMPLOYMENT OPPORTUNITY (EEO)

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS
(EXECUTIVE ORDER NO. 11246):**

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 SUBCONTRACTOR AT ANY TIER, SUBCONTRACTS A PORTION OF THE WORK INVOLVING ANY CONSTRUCTION TRADE, IT SHALL PHYSICALLY INCLUDE IN EACH SUBCONTRACT IN EXCESS OF \$10,000 THE PROVISIONS OF THESE SPECIFICATIONS 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 C.F.R. § 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 MAKE GOOD FAITH EFFORTS TO ACHIEVE THE PLAN GOALS AND TIMETABLES.

4. THE CONTRACTOR SHALL IMPLEMENT THE SPECIFIC AFFIRMATIVE ACTION STANDARDS PROVIDED IN PARAGRAPHS (7) (a) THROUGH (p) OF THESE SPECIFICATIONS. THE GOALS SET FORTH IN THE SOLICITATION FROM WHICH THIS CONTRACT RESULTED ARE EXPRESSED AS PERCENTAGES OF THE TOTAL HOURS OF EMPLOYMENT AND TRAINING OF MINORITY AND FEMALE UTILIZATION THE CONTRACTOR SHOULD REASONABLY BE ABLE TO ACHIEVE IN EACH CONSTRUCTION TRADE IN WHICH IT HAS EMPLOYEES IN THE COVERED AREA. COVERED CONSTRUCTION CONTRACTORS PERFORMING CONSTRUCTION WORK IN GEOGRAPHICAL AREAS WHERE THEY DO NOT HAVE A FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION CONTRACT SHALL APPLY THE MINORITY AND FEMALE GOALS ESTABLISHED FOR THE GEOGRAPHICAL AREA WHERE THE WORK IS BEING PERFORMED. GOALS ARE PUBLISHED PERIODICALLY IN THE FEDERAL REGISTER IN NOTICE FORM, AND SUCH NOTICES MAY BE OBTAINED FROM ANY OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS OFFICE OR FROM FEDERAL PROCUREMENT CONTRACTING OFFICERS. THE CONTRACTOR IS EXPECTED TO MAKE SUBSTANTIALLY UNIFORM PROGRESS TOWARD ITS GOAL 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 NO. 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 IN ALL FACILITIES AT WHICH THE CONTRACTOR'S EMPLOYEES ARE ASSIGNED TO WORK. THE CONTRACTOR, WHERE POSSIBLE, WILL ASSIGN TWO OR MORE WOMEN TO EACH CONSTRUCTION PROJECT. THE CONTRACTOR SHALL SPECIFICALLY ENSURE THAT ALL FOREMEN, SUPERINTENDENTS, AND OTHER ON-SITE SUPERVISORY PERSONNEL ARE AWARE OF AND CARRY OUT THE CONTRACTOR'S OBLIGATION TO MAINTAIN SUCH A WORKING

ENVIRONMENT, WITH SPECIFIC ATTENTION TO MINORITY OR FEMALE INDIVIDUALS WORKING AT SUCH SITES OR IN SUCH FACILITIES.

- b. ESTABLISH AND MAINTAIN A CURRENT LIST OF MINORITY AND FEMALE RECRUITMENT SOURCES, PROVIDE WRITTEN NOTICE 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 EFFORT'S TO MEET ITS OBLIGATIONS.
- e. DEVELOP ON-THE-JOB 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 (7) (b) ABOVE.
- f. DISSEMINATE THE CONTRACTOR'S EEO POLICY BY PROVIDING NOTICE OF THE POLICY TO UNIONS AND TRAINING PROGRAMS AND REQUESTING THEIR COOPERATION IN ASSISTING THE CONTRACTOR IN MEETING ITS EEO OBLIGATIONS; BY INCLUDING IT IN ANY POLICY MANUAL AND COLLECTIVE BARGAINING AGREEMENT; BY PUBLICIZING IT IN THE COMPANY NEWSPAPER, ANNUAL REPORT, ETC.; BY SPECIFIC REVIEW OF THE POLICY WITH ALL MANAGEMENT PERSONNEL AND WITH ALL MINORITY AND FEMALE EMPLOYEES AT LEAST ONCE A YEAR; AND BY POSTING THE COMPANY EEO POLICY ON BULLETIN BOARDS ACCESSIBLE TO ALL EMPLOYEES AT EACH LOCATION WHERE CONSTRUCTION WORK IS PERFORMED.
- g. REVIEW, AT LEAST ANNUALLY, THE COMPANY'S EEO POLICY AND AFFIRMATIVE ACTION OBLIGATIONS UNDER THESE SPECIFICATIONS WITH ALL EMPLOYEES HAVING 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 FOREMAN, ETC., PRIOR TO THE INITIATION OF CONSTRUCTION WORK AT ANY JOB SITE. A WRITTEN RECORD SHALL BE MADE AND MAINTAINED IDENTIFYING THE TIME AND PLACE OF THESE MEETINGS, PERSONS ATTENDING, SUBJECT MATTER DISCUSSED, AND DISPOSITION OF THE SUBJECT MATTER.

- h. DISSEMINATE THE CONTRACTOR'S EEO POLICY EXTERNALLY BY INCLUDING IT IN ANY ADVERTISING IN THE NEWS MEDIA, SPECIFICALLY INCLUDING MINORITY AND FEMALE NEWS MEDIA, AND PROVIDING WRITTEN NOTIFICATION TO AND DISCUSSING THE CONTRACTOR'S EEO POLICY WITH OTHER CONTRACTORS AND SUBCONTRACTORS WITH WHOM THE CONTRACTOR DOES OR ANTICIPATES DOING BUSINESS.
 - I. DIRECT 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 NOTICE 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 THE CONTRACTOR'S WORK FORCE.
 - k. VALIDATE ALL TESTS AND OTHER SELECTION REQUIREMENTS WHERE THERE IS AN OBLIGATION TO DO SO UNDER 41 C.F.R. 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 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 SEXES.
 - o. DOCUMENT AND MAINTAIN A RECORD OF ALL SOLICITATIONS OF OFFERS FOR SUBCONTRACTS FROM MINORITY AND FEMALE CONSTRUCTION CONTRACTORS AND SUPPLIERS, INCLUDING CIRCULATION OF SOLICITATIONS TO MINORITY AND FEMALE CONTRACTOR ASSOCIATIONS AND OTHER BUSINESS ASSOCIATIONS.
 - p. CONDUCT A REVIEW, AT LEAST ANNUALLY, OF ALL SUPERVISORS' ADHERENCE TO AND PERFORMANCE UNDER THE CONTRACTOR'S EEO POLICIES AND AFFIRMATIVE ACTION OBLIGATIONS.
8. CONTRACTORS ARE ENCOURAGED TO PARTICIPATE IN VOLUNTARY ASSOCIATIONS THAT ASSIST IN FULFILLING ONE OR MORE OF THEIR AFFIRMATIVE ACTION OBLIGATIONS SET FORTH IN PARAGRAPHS (7) (a) THROUGH (p). THE EFFORTS OF A CONTRACTOR

ASSOCIATION, JOINT CONTRACTOR-UNION, CONTRACTOR-COMMUNITY, OR OTHER SIMILAR GROUP OF WHICH THE CONTRACTOR IS A MEMBER AND PARTICIPANT, MAY BE ASSERTED AS FULFILLING ANY ONE OR MORE OF ITS OBLIGATIONS UNDER PARAGRAPHS (7) (a) THROUGH (p) OF THESE SPECIFICATIONS, PROVIDED THAT THE CONTRACTOR ACTIVELY PARTICIPATES IN THE GROUP, MAKES EVERY EFFORT TO ASSURE THAT THE GROUP HAS A POSITIVE IMPACT ON THE EMPLOYMENT OF MINORITIES AND WOMEN IN THE INDUSTRY, ENSURES THAT THE CONCRETE BENEFITS OF THE PROGRAM ARE REFLECTED IN THE CONTRACTOR'S MINORITY AND FEMALE WORK FORCE PARTICIPATION, MAKES A GOOD FAITH EFFORT TO MEET ITS INDIVIDUAL GOALS AND TIMETABLES, AND CAN PROVIDE ACCESS TO DOCUMENTATION THAT 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 (EVEN THOUGH THE CONTRACTOR HAS ACHIEVED ITS GOAL 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 OR 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 NO. 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 NO. 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 NO. 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 C.F.R. § 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

MAY BE REQUIRED BY THE GOVERNMENT AND TO KEEP RECORDS. RECORDS SHALL AT LEAST INCLUDE FOR EACH EMPLOYEE THE NAME, ADDRESS, TELEPHONE NUMBERS, CONSTRUCTION TRADE, UNION AFFILIATION IF ANY, EMPLOYEE IDENTIFICATION NUMBER WHEN ASSIGNED, SOCIAL SECURITY NUMBER, RACE, SEX, STATUS (E.G., MECHANIC, APPRENTICE TRAINEE, HELPER OR LABORER), DATES OF CHANGES IN STATUS, HOURS WORKED PER WEEK IN THE INDICATED TRADE, RATE OF PAY, AND LOCATIONS AT WHICH THE WORK WAS PERFORMED. RECORDS SHALL BE MAINTAINED IN AN EASILY UNDERSTANDABLE AND RETRIEVABLE FORM; HOWEVER, TO THE EXTENT 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 THAT 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 NO. 1

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE
EQUAL EMPLOYMENT OPPORTUNITY
(EXECUTIVE ORDER NO. 11246):**

(1) THE OFFEROR'S OR BIDDER'S ATTENTION IS CALLED TO THE "EQUAL OPPORTUNITY CLAUSE" AND THE "STANDARD FEDERAL EQUAL EMPLOYMENT SPECIFICATIONS" SET FORTH HEREIN.

(2) (a) THE GOALS AND THE TIMETABLES FOR MINORITY AND FEMALE PARTICIPATION, EXPRESSED IN PERCENTAGE TERMS FOR THE CONTRACTOR'S AGGREGATE WORK FORCE IN EACH TRADE ON ALL CONSTRUCTION WORK IN THE COVERED AREA, ARE AS FOLLOWS:

TIMETABLES GOALS FOR MINORITY PARTICIPATION IN EACH TRADE (SEE APPENDIX NO. 2)	GOALS FOR FEMALES PARTICIPATION IN EACH TRADE 6.9%
GOALS FOR EACH YEAR (SEE APPENDIX NO. 2)	GOALS FOR EACH YEAR 6.9%

(b) THESE GOALS ARE APPLICABLE TO ALL THE CONTRACTOR'S CONSTRUCTION WORK (WHETHER OR NOT IT IS FEDERAL OR FEDERALLY ASSISTED) PERFORMED IN THE COVERED AREA. IF THE CONTRACTOR PERFORMS CONSTRUCTION WORK IN A GEOGRAPHICAL AREA LOCATED OUTSIDE THE COVERED AREA, IT SHALL APPLY THE GOALS ESTABLISHED FOR SUCH GEOGRAPHICAL AREA WHERE THE WORK IS ACTUALLY PERFORMED. WITH REGARD TO THIS SECOND AREA, THE CONTRACTOR ALSO IS SUBJECT TO THE GOALS FOR BOTH ITS FEDERALLY INVOLVED AND NON FEDERALLY INVOLVED CONSTRUCTION.

(c) THE CONTRACTOR'S COMPLIANCE WITH THE EXECUTIVE ORDER AND THE REGULATIONS AT 41 C.F.R. PART 60-4 SHALL BE BASED ON ITS IMPLEMENTATION OF THE EQUAL OPPORTUNITY CLAUSE, SPECIFIC AFFIRMATIVE ACTION OBLIGATIONS REQUIRED BY THE SPECIFICATIONS SET FORTH AT 41 C.F.R. . 60-4.3(a), AND ITS EFFORTS TO MEET THE GOALS. THE HOURS OF MINORITY AND FEMALE EMPLOYMENT AND TRAINING MUST BE SUBSTANTIALLY UNIFORM THROUGHOUT THE LENGTH OF THE CONTRACT, AND IN EACH TRADE, AND THE CONTRACTOR SHALL MAKE A GOOD FAITH EFFORT TO EMPLOY MINORITIES AND WOMEN EVENLY ON EACH OF ITS PROJECTS. THE TRANSFER OF MINORITY OR FEMALE EMPLOYEE OR TRAINEES FROM CONTRACTOR TO CONTRACTOR OR FROM PROJECT TO PROJECT FOR THE SOLE PURPOSE OF MEETING THE CONTRACTOR'S GOALS SHALL BE A VIOLATION OF THE CONTRACT, THE EXECUTIVE ORDER, AND THE REGULATIONS IN AT 41 C.F.R. PART 60-4. COMPLIANCE WITH THE GOALS WILL BE MEASURED AGAINST THE TOTAL WORK HOURS PERFORMED.

(3) THE CONTRACTOR SHALL PROVIDE WRITTEN NOTIFICATION TO THE DIRECTOR OF THE OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS WITHIN 10 WORKING DAYS OF AWARD OF ANY CONSTRUCTION SUBCONTRACT IN EXCESS OF \$10,000 AT ANY TIER FOR CONSTRUCTION WORK UNDER THE CONTRACT RESULTING FROM THIS SOLICITATION. THE NOTIFICATION SHALL LIST THE NAME, ADDRESS, AND TELEPHONE NUMBER OF THE SUBCONTRACTOR; ESTIMATED DOLLAR AMOUNT OF THE SUBCONTRACT; ESTIMATED STARTING AND COMPLETION DATES OF THE SUBCONTRACT; AND THE GEOGRAPHICAL AREA IN WHICH THE SUBCONTRACT IS TO BE PERFORMED.

(4) AS USED IN THIS NOTICE, AND IN THE CONTRACT RESULTING FROM THIS SOLICITATION, THE "COVERED AREA" IS (*SEE NOTICE TO BIDDERS*).

APPENDIX NO. 2

THE COMMONWEALTH OF MASSACHUSETTS

SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

- I. FOR PURPOSES OF THIS CONTRACT, "minority" refers to Asian-Americans, Blacks, Spanish Surnamed Americans, North American Indians, and Cape Verdeans. "Commission" refers to the Massachusetts Commission Against Discrimination.
- II. During the performance of this contract, the Contractor and all of (his) Subcontractors (hereinafter collectively referred to as the Contractor), for himself, his assignees, and successors in interest, agree as follows:
 1. 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, age or sex. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, recruitment layoff; termination; rates of pay or other forms of compensation, conditions or privileges of employment; and selection for apprenticeship. The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Commission setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (M.G.L. Chapter 151B).
 2. In connection with the performance of work under this contract, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, or sex. A 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.
 1. As part of his obligation of remedial action under the foregoing section, the Contractor shall maintain on this project a not less than 5 percent ratio of minority employee man hours to total man hours in each job category, 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.
 2. In the hiring of minority journeymen, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the Liaison Committee or the Commission.
- IV.
 1. At the discretion of the Commission there may be established for the life of this 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 this project, herein after

called the administering agency, the Commission and such other representatives as may be designated by the Commission in conjunction with the administrating agency.

2. The Contractor (or his agent, if any, designated by him 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.
 3. The Contractor shall prepare projected manning tables on a quarterly basis. 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 Commission and Liaison Committee.
 4. Records of employment referral orders, prepared by the Contractor, shall be made available to the Commission and to the Liaison Committee on request.
 5. The Contractor shall prepare weekly reports in a form approved by the Commission of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each such week to the Commission and to the Liaison Committee.
- V. If the Contractor shall use any subcontractor on any work performed under this contract, he shall take affirmative action to negotiate with qualified minority subcontractors. This affirmative action shall cover both pre-bid and postbid periods. It shall include notification to the Office of Minority business Assistance (within the Executive Office of Communities and Development) or its designee, when bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids.
- VI. In the employment of journeymen, apprentices, trainees and advanced trainees, the Contractor shall give preference, first, to citizens of the Commonwealth who have served in the Armed Forces of the United States in time of war and have been honorably discharged there from or released from active duty therein, and who are qualified to perform the work to which the employment relates, and, secondly, to citizens of the Commonwealth generally, and, if such cannot be obtained in sufficient numbers, then to citizens of the United States.
- VII. A designee of the Commission and a designee of the Liaison Committee shall each have right of access to the construction site.

VIII. Compliance with Requirements

The Contractor shall comply with the provisions of Executive Order No. 74, as amended by Executive Order No. 116 dated May 1, 1975, and of Chapter 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this contract.

IX. Non-Discrimination

The Contractor, in the performance of all work after award, and prior to completion of the contract work, will not discriminate on grounds of race, color, religious creed, national origin, age or sex in employment practices, in the selection or retention of subcontractors, or in the procurement of materials and rentals of equipment.

X. Solicitations for Sub-Contracts, 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 affirmative action.

XI. Bidders Certification Requirement

For Bidders Certification Requirements, please refer to the Form for Bid included in the Proposal Form for this Contract.

XII. Contractor's Certification

The Contractor's certification form must be signed by all successful low bidder(s) prior to award by the contracting agency.

XIII. Compliance - Information, Reports and Sanctions

1. The Contractor will provide all information and reports required by the administering agency or the Commission on instructions issued by either of them and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the Commission to affect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary affirmative action 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 or the Commission as appropriate and shall set forth what efforts he has made to obtain the information.
2. Whenever the administering agency, the Commission, or the Liaison Committee believes the General Contractor or any Subcontractor may not be operating in compliance with the terms of this Section, the Commission directly, or through its designated agent, shall conduct an appropriate investigation, and may confer with the parties, to determine if such contractor is operating in compliance with the terms of this Section. If the Commission or its agent finds the General Contractor or any subcontractor not in compliance, it shall make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Commission shall make a final report of noncompliance, and recommend to the administering agency the imposition of one or more of the sanctions listed below. If, however, the Commission believes the General Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of noncompliance. Within fourteen days of the receipt of the recommendations of the Commission, the administering agency shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:
 - (a) The recovery by the administering agency from the General Contractor of 1/100 of 1% of the contract award price or \$1000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the administering agency from the General Contractor, to be assessed by the General Contractor as a back charge against the Subcontractor, of 1/10 of 1% of the subcontract price, or \$400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

- (b) The suspension of any payment or part thereof due under the contract until such time as the General Contractor or any Subcontractor is able to demonstrate his compliance with the terms of the contract;
 - (c) The termination, or cancellation, of the contract, in whole or in part, unless the General Contractor or any Subcontractor is able to demonstrate within a specified time his compliance with the terms of the contract;
 - (d) The denial to the General Contractor or any Subcontractor of the right to participate in any future contracts awarded by the administering agency for a period of up to three years.
3. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that he is in compliance with this Section, he may request the administering agency, in consultation with the Commission, to suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination of the Commission, the administering agency, based on the recommendation of the Commission, shall either lift the sanctions or reimpose them.
4. Sanctions enumerated under Sections XIII-2 shall not be imposed by the administering agency except after an adjudicatory proceeding, as that term is used M.G.L. c. 30A, has been conducted. No investigation by the Commission or its agent shall be initiated without prior notice to the Contractor.

XIV. Severability

The provisions of this section are severable, and if any of those 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.

A. Contractor's Certification

A contractor will not be eligible for award of a contract unless such contractor has submitted the following certification, which is deemed a part of the resulting contract:

CONTRACTOR'S CERTIFICATION

Contractor

certifies that:

1. it intends to use the following listed construction trades in the work under the contract
_____ and
2. will comply with the minority manpower ratio and specific affirmative action steps contained herein; and
3. will obtain from each of its subcontractors and submit to the contracting or administering agency prior to the award of any subcontract under this contract the subcontractor certification required by these bid conditions.

(Signature of authorized representative of contractor)

B. Subcontractors' Certification

Prior to the award of any subcontract, regardless of tier, the prospective subcontractor must execute and submit to the Prime Contractor the following certification, which will be deemed a part of the resulting subcontract:

SUBCONTRACTORS' CERTIFICATION

Subcontractor

certifies that:

1. it intends to use the following listed construction trades in the work under the subcontract and
2. will comply with the minority manpower ratio and specific affirmative action steps contained herein; and
3. will obtain from each of the subcontractors prior to the award of any subcontract under this subcontract the subcontractor certification required by these bid conditions.

(Signature of authorized representative of subcontractor)

In order to ensure that the said subcontractors certification becomes a part of all subcontracts under the prime contract, no subcontract shall be executed until an authorized representative of the state agency (or agencies) administering this project has determined, in writing, that the said certification has been incorporated in such subcontract, regardless of tier. Any subcontract executed without such written approval shall be void.

APPENDIX NO. 3

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

DISADVANTAGE BUSINESS ENTERPRISE PARTICIPATION PROVISION

APPENDIX NO. 3

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Please submit with bid package, a separate unavailability certification form for each unavailable DBE.

I. DEFINITIONS

As used in this Disadvantaged Business Enterprise Participation Provision ("Provision"), the following terms shall have the following meanings:

A. Authority

The Massachusetts Bay Transportation Authority, or an officer, employee or agent thereof designated by the Authority for the particular purpose involved;

B. Bidder

Any individual, partnership, joint venture, corporation, or firm submitting a general bid, directly or through an authorized representative, for the Contract;

C. Compliance Monitor

The individual or individuals designated from time to time by the Authority to assist and make recommendations to the Authority with respect to compliance with this Provision;

D. Contract

The contract, executed by the Authority and the Successful Bidder, of which this Provision is a part,

E. Contract Price

The total bid price of the Successful Bidder upon which the Contract is awarded;

F. An Original Affidavit

An original affidavit, in the form annexed to this Provision; to be signed by a Principal of a Disadvantaged Business Enterprise.

G. Original Letter of Intent

An original letter, in the form annexed to this Provision, to be signed by a Principal of a Disadvantaged Business Enterprise with respect to certain work under the Contract;

H. Disadvantaged Business Enterprise

A "Disadvantaged Business" or "DBE" means a small business concern as defined pursuant to Section 8(a) of the Small Business Act (15 U.S.C. s.637 (a)) and Implementing Regulations, which is owned and controlled by one or more socially and economically disadvantaged individuals, or is a Women-Owned Business Enterprise as defined in Paragraph K. of this Appendix 3. For purposes of this Provision, owned and controlled means a business:

1. which is at least 51 percent owned by one or more socially and economically disadvantaged individuals, or in the case of a publicly-owned business, at least 51 percent of the stocks of which is owned by one or more socially and economically disadvantaged individuals; and

2. whose management and daily business operations are controlled by one or more of such individuals.

I. SMALL BUSINESS CONCERN

Means a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

J. SOCIALLY AND ECONOMICALLY DISADVANTAGED INDIVIDUALS

Means those individuals who are citizens of the United States (or lawfully admitted permanent residents)

and who are Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans or Asian-Indian Americans and any other minorities or individuals found to be disadvantaged by the Small Business Administration pursuant to Section 8(a) of the Small Business Act (15 U.S.C. s.637(a)) :

1. **"Black Americans"**, which include persons having origins in any of the Black racial groups of Africa;
2. **"Hispanic Americans,"** which include persons of Mexican, Puerto Rican, Cuban, 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 include persons whose origins are Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, and the Northern Marianas; and
5. **"Asian Indian American,"** which includes persons whose origins are from India, Pakistan, and Bangladesh.
6. Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or culture bias within American society because of their identities as members of groups and without regard to their individual qualities. Personal experiences of substantial and chronic social disadvantage in American society, not in other countries and negative impact on entry into or advancement in the business world because of the disadvantage as defined pursuant to 49CFR Appendix E, Part 26.

The Personal Net Worth of the principal owner of an Economic Disadvantaged Business may not exceed a threshold of \$750,000. In determining net worth, an individual, ownership interest in the disadvantaged firm and the individuals equity in his or her primary place of residence must be excluded from the calculation.

7. Economic disadvantage, economically disadvantaged individuals are socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to the diminished capital and credit opportunities as compared to others in the same or similar line of business who are not socially disadvantaged.

K. A **"Women-Owned Business"** to qualify as a "DBE" means a small business concern as defined pursuant to Section 3 of the Small Business Act and Implementing Regulations, which is owned and controlled by one or more women. For purposes of this provision, owned and controlled means a business:

1. which is at least 51 percent owned by one or more women, or in the case of a publicly-owned business, at least 51 percent of the stocks of which are owned by one or more such individuals; and
2. whose management and daily business operations are controlled by one or more women.

L. Certification Letter

For the purposes of the DBE Provision, this term means the following:

1. A letter from SOMWBA certifying the DBE; or
2. A certification from a local government, state government or federal government entity which is authorized to certify DBE status and which uses the criteria for certification that is equivalent to that used by SOMWBA; or
3. A certification from an agency whose DBE certification process has been approved by FTA; or
4. A certification under Section 8(a) of the Small Business Act (15 U.S.C. s.637 (a)).

M. Business Enterprise List

The Authority currently utilizes the business registry entitled, **The State Office of Minority and Women Business Assistance Directory** which is issued by the State Office of Minority and Women Business Assistance (SOMWBA). For the purpose of this provision the term "Business Enterprise List" or "List" shall mean the SOMWBA directory. The companies listed herein as Minority Business Enterprises are identical to those defined by this Provision as Disadvantaged Business Enterprises.

The inclusion of a firm in this Directory is for informational purposes only and does not constitute endorsement of a Contractor, Manufacturer, or Supplier. The Business Enterprise List is available to be viewed at the Authority's Equal Employment Opportunity/Affirmative Action Office.

N. Business Enterprise Unavailability Certification

A written certification, in the form annexed to this Provision, by a Disadvantaged Business Enterprise as to its unavailability for certain work. A SEPARATE UNAVAILABILITY CERTIFICATION FORM IS TO BE FILED FOR EACH UNAVAILABLE DBE.

O. Notice of Opportunity to Meet with Authority

Upon request, a Bidder may be given an opportunity to meet with the Authority with respect to the Authority's determination of the Bidder's compliance with this Provision.

P. Qualified

A DBE contractor is qualified to do specific work if it meets all of the following criteria:

1. it has or is able to obtain any and all licenses required to do such work;
2. it has the necessary experience, organization, technical qualifications, skills and facilities to do such work;
3. it is able to comply with the performance schedule reasonably needed for such work;
4. it does not have an unsatisfactory record of integrity, judgment and performance;
5. it is able to meet the applicable Equal Employment Opportunity requirements; and
6. it is not otherwise ineligible to perform such work under applicable laws and regulations.

Q. Schedule for Participation by Business Enterprise

A schedule, in the form annexed to this Provision, containing certain information with respect to work to be performed by Disadvantaged Business Enterprises.

R. Successful Bidder

The bidder to which the Contract is awarded. Among responsible and responsive Bidders, the one offering the lowest reasonable price, as determined by the Authority, and meeting the DBE requirements of this Provision, shall be awarded the contract. Additionally the ability to meet other contractual obligations, deemed to be appropriate, will be considered before awarding the contract.

S. Unavailable

A Business Enterprise is unavailable to do specific work if:

1. it does not have the knowledge of the terms and specifications of the Contract needed to formulate a proposal to do such work or to decline an opportunity to formulate such a proposal; and
2. it does not intend, or is unable, to make a proposal because of lack of interest, inability to meet the reasonable and ordinary demands connected with doing such work, unwillingness to meet the specifications of such work, unwillingness to work on this project or in this geographic area, or such other reason as is determined by the Authority to be sufficient;
4. a separate DBE unavailability certification form should be utilized for each unavailable DBE. An unavailability certification form is annexed to this provision.

T. Good Faith Efforts

To demonstrate sufficient reasonable efforts to meet the DBE contract goal, a contractor shall document the steps it has taken to obtain DBE participation, including but not limited to the following;

1. Attendance at a prebid meeting, if any, scheduled by the recipient to inform the Contractor of DBE subcontracting opportunities under a given solicitation.
2. Advertisement in general circulation media, trade association publication, and minority-focus media for at least 20 days before bid or proposals are due. If 20 days are not available, publication for a shorter reasonable time is acceptable.
3. Written notification to DBEs that their interest in the contract is solicited;
4. Efforts made to select portions of the work proposed to be performed by DBEs in order to increase the likelihood of achieving the stated goal.
5. Efforts to negotiate with DBEs for specific subbids including at a minimum.
 - a. the names, addresses, and telephone numbers of DBEs that were contacted;
 - b. a description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed; and
 - c. a statement of why additional agreements with DBEs were not reached;
6. Effort made to assist the DBE contacted in obtaining bonding or insurance required by the contractor or recipient.
7. Concerning each DBE, the contractor contacted but rejected as unqualified, as well as the reasons for the contractor's conclusion;
8. Prime Contractor must document that he/she made adequate good faith efforts to meet the goal, even though he/she did not succeed in obtaining enough DBE participation to do so.
 - a. The dollar amount of the participation of each DBE firm contacted by Prime Contractor;
 - b. Contractor must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
 - c. Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.
 - d. 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 workforce.
 - e. 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. The above list of types of actions is not intended to be a mandatory checklist, nor is it intended to be exclusive or

exhaustive. Pursuant to 49CFR appendix A to Part 26 - Guidance Concerning Good Faith Efforts.

II. UTILIZATION OF DISADVANTAGED BUSINESS ENTERPRISES

A. Affirmative Action Obligation

Each Bidder shall take affirmative action, and shall comply with the requirements of the Provision, to achieve the stated goal for the utilization of Disadvantaged Business Enterprises in their performance of work under this Contract. Nothing in this Provision shall be construed to require the utilization of any Disadvantaged Business Enterprise which is either not Qualified or Unavailable. All determinations of compliance or non-compliance with the requirements of this Provision, and of the appropriate consequences of non-compliance, shall be made by the Authority as provided herein. All such determinations shall be final and binding within the Authority and not subject to further administrative review within the Authority. Nothing in this Provision shall be construed to diminish the responsibility of the Authority pursuant to federal and state laws.

B. Stated Goal

The stated goal is to have portions of the work under the Contract performed by Qualified Disadvantaged Business Enterprises for prices totaling not less than 18 percent of the Contract Price. A contractor may count toward its DBE goal 60 percent of the total bid price for its expenditures of its materials and supplies required under a contract and obtained from a DBE regular dealer, and 100 percent of the total bid price of such expenditures to a DBE manufacturer.

C. Joint Venture

A contractor may count toward its DBE goals a portion of the total dollar value of a contract with a joint venture eligible under the standards of this Section III B (3) equal to the percentage of the ownership and controls of the DBE partner in the joint venture.

D. Business Enterprise Bidder

A bidder which itself is a Disadvantaged Business Enterprise, may subject to compliance with the applicable requirements of this Provision, achieve the stated goal by complying with the limitation on subcontracting provided under "Subletting or Assignment of Contract" in the Standard Specifications.

E. Contractor Assurances

The Prime Contractor or Subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract.

The Contractor, sub recipient 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 49CFR, 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 Authority deems appropriate.

III. BIDDING REQUIREMENTS AND PROCEDURES PRIOR TO CONTRACT AWARD

A. Pre-Bid Conference

At the prebid conference which shall be held with respect to the Contract, the Authority shall be available to review with prospective Bidders the steps they must take to comply with this Provision and to assist prospective Bidders with respect thereto. No action or failure to act of the Authority at the prebid conference shall in any way limit or otherwise affect the terms of this Provision or any portion thereof; however, Bidders shall be deemed to have notice of information made available with respect to this Provision at the prebid conference. The Authority will be available to the prospective Bidders for review of and assistance with the procedures for compliance with this Provision for Contracts that do not require a prebid conference.

B. Bid Submission

Each Bidder, as part of its bid submission, shall submit the following:

1. A completed Schedule for Participation by Disadvantaged Business Enterprises, listing those Qualified DBEs with which the Bidder intends to contract for the performance of portions of the work under the Contract, specifying the agreed price to be paid to each such Disadvantaged Business Enterprise for such work, identifying in detail the contract items or parts thereof to be performed by each such Disadvantaged Business Enterprise, including a proposed timetable for the performance of each such contract item and providing other information as may be required by the Schedule. No work shall be included in the Schedule which the Bidder has reason to believe the listed DBE will subcontract, at any tier, to other than a Disadvantaged Business Enterprise.
2. A completed and signed original Letter of Intent for each DBE listed in the Schedule;
3. For the purpose of this contract, the MBTA will accept only DBEs who are:
 - a. Currently certified by the State Office of Minority and Women Business Assistance (SOMWBA);
4. For out-of-state firms, the bidder must also attach a copy of the criteria utilized by the certifying agency of the out-of-state firm. The certifying agency must have required at a minimum as a condition that:
 - a. Individuals who qualify as disadvantaged must own at least 51% of the business;
 - b. The business has been in existence for at least six months; and
 - c. The majority owners of the DBE control the day to day management and policy decisions of the firm.
5. In the event the work listed on the Schedule is not sufficient to fulfill the stated goal, a statement by the bidder of the reasons why it believes it is in compliance with this Provision is required. In addition, a list of the names, addresses and telephone numbers of the DBEs contacted by the bidder with respect to the performance of work under the

Contract shall be submitted. The listing of a DBE by a Bidder on its Schedule shall constitute a representation by the Bidder that if it is awarded the Contract it will enter into a subcontract with such DBE for the portion of the work and at the price set forth in its bid submission, subject to the terms of this Provision and the Contract. If at the time of bid opening, the MBTA determines that the low bidder has failed to include in its bid package the most recent certification letter or original affidavit for any DBE listed on its DBE Schedule of participation, the bidder will have five days from the date of notification of this failure to present the missing certification letter or original affidavit to the MBTA.

C. Responsiveness of Bid

The total price for work to be performed by a DBE indicated in each Bidder's Bid Schedule for Participation must be sufficient to fulfill the stated goal unless the Bidder shall demonstrate to the satisfaction of the Authority that:

1. It has made every reasonable effort to contact and negotiate with DBEs in an attempt to subcontract work, including every reasonable effort to select the portions of the work proposed to be subcontracted, in order to achieve the stated goal;
2. It was unable, notwithstanding such efforts, to achieve the stated goal because DBEs were not Qualified or were Unavailable; and
3. It included in its Schedule such proposed agreements as could be made with such efforts.

The Authority may reject as non-responsive any bid which it determines fails to comply with the applicable requirements of this Provision unless the Authority allows the bid to be amended pursuant to Section III E. Nothing herein shall relieve any Bidder or any contractor performing any work under the Contract from any of the terms, conditions or requirements of the Contract or modify the Authority's rights reserved under "Consideration of Proposals" in the Standard Specifications.

D. Determination of Responsiveness of Bids

1. Investigation and Recommendation by Compliance Monitor

If the apparent low responsive (without regard to the requirements of this provision) and responsible bidder submits a bid which does not meet the DBE stated goal, the bidder will be notified by the Compliance Monitor within 3 days after the bid opening to meet with the compliance monitor at the offices of the Authority or such other place as the compliance monitor may designate. The purpose of this meeting shall be for the Compliance Monitor to consider whether to recommend that the Bidder's bid be determined to be in compliance with the requirements of this Provision or to be non-responsive. At this meeting the Bidder shall have an opportunity to present information and arguments pertinent to its compliance with the applicable requirement. At this meeting, the Bidder shall produce in writing the following information:

- a. a detailed statement of the efforts made to contact and negotiate with DBEs, including (i) the names, addresses and telephone numbers of DBEs who were contacted; (ii) a description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed; and (iii) a

detailed statement of the reasons why additional prospective agreements with DBEs, if needed to meet the stated goal, were not reached;

- b. a detailed statement of the efforts made to select portions of the work proposed to be performed by DBEs in order to increase the likelihood of achieving the stated goal;
- c. as to each DBE contacted, but which the Bidder considers to be not Qualified, a detailed statement of the reasons for the Bidder's conclusion and
- d. as to each DBE contacted, but which the Bidder considers to be Unavailable, either (I) a DBE Unavailability Certification signed by the DBE, or (ii) a statement from the Bidder that the DBE refused to give such written certification after reasonable request, and a detailed statement from the Bidder of the reasons for the Bidder's conclusion that the DBE was Unavailable.

The Compliance Monitor may require the Bidder to produce such additional information as the Compliance Monitor deems appropriate and may obtain whatever other and further information, from whatever other sources, deemed appropriate. Not later than five (5) days after the initial meeting with the Bidder, the Compliance Monitor shall make a written recommendation to the Authority, which shall include a statement of the facts and reasons upon which it is based.

2. Determination by Authority

Following receipt of the Compliance Monitor's recommendation, the Authority shall send to the Bidder a Notice of Opportunity to meet with the Authority, enclosing a copy of the Compliance Monitor's recommendation. Such Notice shall indicate the date, time and place at which the Bidder may, if it so requests in writing, meet with the Authority and have an opportunity to present pertinent arguments and information relating to the determination by the Authority of the Bidder's compliance with this Provision. The Authority may request such further information from the Bidder as it deems appropriate, and may rely upon any factual conclusion reported by the Compliance Monitor which is not contradicted by the Bidder. The Authority may also conduct informal conferences, to which the Bidder shall be invited, in which other parties invited by the Authority may offer information relevant to the issues on which its determination will be based. As soon as practicable, the Authority shall make a determination in writing and setting forth the facts and reasons upon which it is based, whether the bid of such Bidder complies with the requirements of this Provision or is non-responsive. A copy of such determination shall be sent to the Bidder. Such determination shall not affect the power of the Authority to reject the Bidder's bid for any other reasons.

3. Consideration of Other Bids

If the Authority deems it advisable in the interests of expediting the award of the Contract, the procedures set forth in this Section III (D) may be carried out with respect to the bids of one or more additional Bidders at the same time as, or subsequent to, that of the apparent low responsive and responsible Bidder, with each such procedure separately conducted. The Authority shall make its determination in the order of price rank in accordance with Section I (R).

4. Failure of Bidder to Participate

Failure of any Bidder to participate in any proceeding applicable with respect to its bid, after written request by the Compliance Monitor or the Authority, may result in a determination that its bid is non-responsive.

E. Amendment of Schedule for Participation by Disadvantaged Business Enterprise

A Bidder may amend its Schedule for Participation by DBEs only when directed to do so by the Authority. A Contractor must demonstrate good faith in its attempts to subcontract work, including having made every reasonable effort to select the portions of the work proposed to be subcontracted, in order to achieve the stated goal.

IV. REQUIREMENTS AND PROCEDURES SUBSEQUENT TO CONTRACT AWARD

A. Proposal, Execution and Compliance with Subcontractors

The Successful Bidder shall, in the manner prescribed in Art. 6.01A of the Standard Specifications, propose for the Authority's approval, subcontracts corresponding in all respects to the proposed agreements listed on the Successful Bidder's Schedule for Participation by Disadvantaged Business Enterprises included in its bid submission, or on its amended Schedule, if it has been directed to amend its Schedule.

Upon approval by the Authority, the Successful Bidder shall enter into each such approved subcontract and shall thereafter neither terminate any such subcontract nor reduce the scope of the work to be performed by, or decrease the price to be paid to, the DBE there under without in each instance the prior written approval of the Authority. The Authority retains the right to approve or disapprove any subcontract with a DBE proposed under this Provision for the same reasons and in the same manner that the Authority may approve or disapprove any other subcontract proposed to it.

If the Authority disapproves a subcontract required to be proposed under this Provision for reasons related to its Form, the Successful Bidder shall propose for approval another subcontract with the same DBE for the same work and at the same price, in a form acceptable to the Authority. If the Authority disapproves a subcontract required to be proposed under this Provision for any other reason, the Successful Bidder shall be excused from proposing that subcontract and shall be subject to the provisions of Section IV (B) (4).

B. Substitution of Subcontractor

1. Excuse from Entering Subcontractor

If, prior to execution of a subcontract required by this Provision, the Successful Bidder submits a written request to the Authority and demonstrates to the satisfaction of the Authority that; (a) as a result of a change in circumstances beyond its control of which it was not aware and could not reasonably have been aware until subsequent to the date of award of the Contract, (b) a DBE which is to enter into such subcontract has become not Qualified, or that the DBE has unreasonably refused to execute the subcontract; the Successful Bidder shall be excused from executing such subcontract.

2. Rightful Termination of Subcontracts

If, after execution of a subcontract required by this Provision, the Successful Bidder submits a written request to the Authority that; (a) as a result of a change in circumstances beyond its control of which it was not aware and could not reasonably have been aware until subsequent to the date of execution of such subcontract; (b) a DBE which entered into such subcontract is found to be unqualified or has committed and failed to remedy a material breach of the subcontract, the Successful Bidder shall be entitled to exercise such rights as may be available to it to terminate the subcontract.

3. Determination of Excuse or Rightful Termination

If the Successful Bidder at any time submits a written request to the Authority under the provisions of either Section IV (B) (1) or Section IV (B) (2), the Authority, as soon as practicable, shall determine whether the Successful Bidder has made the requisite demonstration, and shall not determine that such determination has not been made without first providing the Successful Bidder, upon notice, an opportunity to present pertinent information and arguments.

4. Alternative Subcontracts

If the Successful Bidder is excused from proposing a subcontract under Section IV(A) or from executing a subcontract under Section IV (B) (1), or rightfully terminates a subcontract under Section IV(B) (2), and without such subcontract the Successful Bidder will not achieve the stated goal, the Successful Bidder shall within 15 days of written notification from the Authority make every reasonable effort to propose and enter into an alternative subcontract or subcontracts for the same work to be performed by another Qualified Disadvantaged Business Enterprise(s) for a contract price or prices totaling not less than the contract price under the excused or terminated subcontract, less all amounts previously paid there under. The Successful Bidder shall be deemed to satisfy the requirements of this Section IV (B) (4) if, within 15 days:

- a. it shall propose and enter each such alternative subcontract for the same work; or
- b. it demonstrates to the satisfaction of the Authority that it has made every reasonable effort to contact and negotiate with DBEs in an attempt to subcontract the work because DBEs were (i) not Qualified; (ii) Unavailable; or (iii) although Qualified and not Unavailable, unwilling or unable to propose a price for such work equal to or less than the greater of the price originally scheduled for such work (less all amounts previously paid therefor), or the price stated in another bona fide proposal, of which such DBEs had knowledge, submitted by another DBE(s) to which the Successful Bidder proposes to subcontract such work; or
- c. it shall propose and enter into subcontracts with another Qualified DBE(s), for prices totaling the price originally scheduled for such work (less all amounts not previously paid therefore) for the performance of other work not included in its Schedule or amended Schedule.

In any situation covered by this Section IV (B) (4), the Compliance Monitor shall promptly meet with the Successful Bidder and provide it an opportunity to demonstrate compliance with these requirements. The Compliance Monitor shall, as promptly as

practicable, recommend to the Authority whether the Successful Bidder should be determined to be in compliance with these requirements. The Compliance Monitor may require the Successful Bidder to produce such information as the Compliance Monitor deems appropriate and may obtain whatever other and further information from whatever sources the Compliance Monitor deems appropriate. A copy of the Compliance Monitor's recommendation shall be sent promptly to the Successful Bidder. The Compliance Monitor shall not make his recommendation under this paragraph without giving the Successful Bidder notice and an opportunity to present pertinent information and arguments.

C. Continued Compliance

1. The Authority shall monitor the Compliance of the Successful Bidder with the requirements of this Provision during the course of the work to be performed under the Contract. The Successful Bidder shall permit the Authority to have access to the job site and to necessary records and to examine such information as the Authority deems appropriate for the purpose of investigating and determining compliance with this Provision, including, but not limited to, manning tables, records of expenditures, change orders, observations at the job site and contracts between the Successful Bidder and other parties entered into during the life of the Contract. **THE SUCCESSFUL BIDDER MUST CERTIFY, ON FORMS PROVIDED BY THE AUTHORITY, THE DOLLAR VALUE OF WORK ACCOMPLISHED BY EACH SUBCONTRACTOR. THIS CERTIFICATION MUST ACCOMPANY EACH PAY ESTIMATE.**

FAILURE TO SUBMIT INFORMATION REQUESTED BY THE AUTHORITY WITHIN SEVEN (7) DAYS MAY RESULT IN SANCTIONS LISTED UNDER SECTION IV (D) OF THIS PROVISION.

2. The Contractor shall permit the authorized representatives of the Massachusetts Bay Transportation Authority, U.S. Department of Transportation and the Comptroller General of the United States to inspect and audit all data and records of the Contractor relating to its performance under the Disadvantaged Business Enterprise Participation Provision of this Contract through the expiration of three years after completion of the Contract with which Federal funds are used.

D. Sanctions for Violations

If at any time the Authority has reason to believe that the Successful Bidder is in violation of its obligations under this Provision, or has otherwise failed to comply with this Provision, the Authority may, in addition to pursuing any other available legal remedy, commence proceedings to impose such sanctions. Such sanctions may include, but are not limited to, one or more of the following:

1. the suspension of any payment or part thereof due the Successful Bidder until such time as the issues concerning the Successful Bidder's compliance are resolved;
2. the termination or cancellation of the Contract in whole or in part unless the Successful Bidder is able to demonstrate within a reasonable time its compliance with the terms of this Provision; and

3. the denial to the Successful Bidder of the right to participate in any further Contracts awarded by the Authority for a period of not longer than three (3) years.

No such sanction shall be imposed by the Authority upon the Successful Bidder without an adjudicatory proceeding conducted by the Authority.

E. PROMPT PAYMENT

In accordance with the Department of Transportation's Disadvantage Business Enterprise Regulations 40CFR, Part 26; all prime contractors are required to pay subcontractors for satisfactory performance of their contracts no later than 10 business days from receipt of each payment the MBTA makes to the prime contractor.

The prime contractor shall also promptly return any retainage payments to the subcontractor within 10 business days after the subcontractors work is satisfactorily completed.

All prime contractors are required to include in their subcontracts language assuring that the prime contractor and subcontractors will use appropriate dispute resolution mechanisms to resolve payment disputes.

If the prime contractor determines the work of the subcontractor to be unsatisfactory, it must notify the MBTA's Construction Project Manager, Contract Administration Department, and DBE Coordinator/ Contract Compliance Office, where applicable. Any delay or postponement of payment among the parties may take place only for good cause and with prior written approval from the MBTA.

The Authority reserves the right to not make payment to the prime contractor for work performed by subcontractors, DBEs and non-DBEs, unless and until the prime contractor ensures that the subcontractors are promptly paid for the work they have performed.

The prime contractor may be required to provide certified proof of payment to all subcontractors before any subsequent payments to prime contractors are made by the Authority.

Failure by the prime Contractor to comply with this requirement will be construed to be a breach of contract and subject to termination or sanctions specified in the contract.

Form A

SCHEDULE OF PARTICIPATION OF DISADVANTAGED BUSINESS ENTERPRISE
(TO BE ATTACHED TO THE BID FORM)

MBTA PROJECT No. G67CN01
LOCATION: Acton, MA

(NAME OF PRIME BIDDER)

NAME OF DISADVANTAGED BUSINESS	ADDRESS	TYPE OF WORK AND CONTRACT ITEMS OR PARTS THEREOF TO BE PERFORMED	PROJECTED START AND FINISH DATE FOR WORK	AGREED PRICE

A COPY OF THE DBE'S MOST RECENT CERTIFICATION AND AN ORIGINAL AFFIDAVIT MUST BE ATTACHED TO THIS SCHEDULE.

**DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION
LETTER OF INTENT**

To: _____
(Name of Prime Bidder)

The undersigned intends to perform work in connection with the above project as (check one):

_____ an individual _____ DBE
_____ a partnership _____ a joint venture
_____ a corporation

The Disadvantaged Business status of the undersigned is confirmed

- a. on the reference list of Disadvantaged Business Enterprises dated _____, or
- b. on the attached Disadvantaged Business Enterprise identification Statement.

The undersigned is prepared to perform the following work in connection with the above project,
(Specify in detail particular work items or parts thereof to be performed):

at the following price: _____

You have projected the following commencement date for such work, and the undersigned is projecting completion of such work as follows:

<u>Items</u>	<u>Projected Commencement Date</u>	<u>Projected Completion Date</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

The above work will not be sublet to a non-Disadvantaged Business Enterprise at any tier. The undersigned will enter into a formal agreement for the above work with you, conditioned upon your execution of a contract with the MBTA.

Date _____

Name of Disadvantaged Business Enterprise

By _____

DBE AFFIDAVIT

STATE OF _____ (Date _____)

COUNTY OF _____ S.S.

The undersigned being duly sworn, deposes and says that he/she is the
(sole owner; partner; president; treasurer; or other duly authorized official of a corporation)

of _____
(Name of DBE)

and certifies that since the date of its certification by

(SOMWBA or out-of-state certification agency)

the certification has not been revoked nor has it expired nor has there been any change in the minority status of

(Name of DBE)

(Signature and Title of Person Making Affidavit)

Sworn to before me this _____ day of _____ 20

(Notary Public)

NOTE: The Bidder must attach the DBEs most recent certification letter or document to this affidavit.

Form D

DISADVANTAGED BUSINESS ENTERPRISE UNAVAILABLE CERTIFICATION

I, _____
(Name) (Title)

of _____, certify that on _____
(Prime Bidder) (Date)

I contacted the following Disadvantaged Business Enterprise to obtain a bid for work items to be performed on MBTA Contract No. _____

<u>Disadvantaged Contractor</u>	<u>Work Items Sought</u>	<u>Form of Bid Sought (i.e., unit price, materials & labor, labor only, etc.)</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

To the best of my knowledge and belief, said Disadvantaged Business Enterprise was unavailable for work on this project, or unable to prepare a bid for the following reason(s):

Signature: _____

Date: _____

_____, was offered an opportunity to bid on the
(Name of Business Enterprise)

above-identified work on _____ by _____
(Date) (Source)

The above statement is a true and accurate account of why I did not submit a bid on this project.

(Signature of Disadvantaged Business Enterprise)

(Title)

(Date)

A SEPARATE UNAVAILABILITY CERTIFICATION FORM SHOULD BE COMPLETED FOR EACH DBE

Date _____

I, _____ (Name of Signatory Party) _____ (Title)
do hereby state:

(1) That I pay or supervise the payment of the persons employed by _____ (Contractor or Subcontractor) _____ on the _____ (Building or Work) _____; that during the payroll period commencing on the _____ day of _____, _____, and ending the _____ day of _____, _____, all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said _____ (Contractor or Subcontractor) _____ from the full weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below.

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:
(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS
 - in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

- Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

CONSTRUCTION SPECIFICATIONS

FOREWORD

The MBTA's Standard Plans referred to herein as the book of plans entitled "MBTA Railroad Operations – Book of Standard Plans – Track and Roadway"; and the MBTA's Standard Plan entitled "MBTA Railroad Operations – Commuter Rail Design Standards Manual" are included in Appendix E.

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SECTION 01010

SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 GENERAL

- A. The Work shall be performed in accordance with the following documents as issued by the Massachusetts Bay Transportation Authority:
1. The Standard Specification which includes the Instructions to Bidders; General Conditions; and Divisions 1 through 16.
 2. The Contract Specifications which includes the Notice to Bidders; Instructions to Bidders; Form for Bid; Various forms and exhibits; Supplementary Conditions; Federal and State requirements; and applicable Sections of Divisions 1 through 16.
 3. The Contract Drawings.

1.2 CONTRACT DESCRIPTION, COMMENCEMENT AND COMPLETION TIMES

- A. Description of the South Acton Station Work
1. Overview: Work at the new South Acton Commuter Rail Station will consist of improvements to the existing station. The improvements will include construction of two 800 foot long, high level, side platforms; two head houses each with lobby space, a stairway, and an elevator; a pedestrian bridge over the tracks; access ramps and stairs up to the platform level; canopies over sections of the platforms and ramps; a lighting system; a communications system; drop off areas and sidewalks; landscaping; signs; and all other elements necessary to create an accessible and fully functional commuter rail station. These improvements will be made while the existing South Acton Station continues to function for commuter rail service.
 2. Existing Conditions: South Acton Station is a major station along the Fitchburg Line. The Fitchburg Line is a one track system in the area of South Acton Station. The station is located within the railroad right of way in the South Acton commercial center; it has been in continuous railroad use for many years. The station lies between the Main Street Bridge (Route 27) over the railroad right of way at Mile Post 25.13 to the east of the station site and the Martin Street grade crossing at Mile Post 25.60 to the west of the station site. Central Street runs parallel to the railroad right of way to the north of the station site; Maple Street runs parallel to the railroad right of way to the south of the station site. There are two parking lots associated with South Acton Station. The town-owned, 269-space Main Parking Lot is on the north side of the station site; it is accessed from Central Street. The Authority-owned, 27-space Railroad Street Parking Lot is on the north side of the station site to the east of the Main Parking Lot; it is accessed from Railroad Street. The Railroad Street Parking Area is leased to the Town for station parking use. Other satellite parking lots located nearby the station are also used by commuter rail system riders who currently walk to the station from the east and south. There is private property located along the south side of the right of way through the station area. There is a 400 foot long, low level platform along the north side of the railroad right of way. The platform is directly adjacent to the Main Parking Lot and a drop off-pick up lane. There is a sewer pipeline and a drainage pipeline that pass under the railroad right of way in the area of the station. There

are wooded wetland areas on town property both to the west and to the east of the Main Parking Lot. There is a wooded wetland area to the south of the right of way on private property. Soils in the area consist of very dense sands and silts over shallow bedrock. Groundwater is high.

3. Track Work and Signal Work by Others: The track system in the area of the station will be expanded from a one track system to a two track system throughout the new station limits. This finish track work and the related signal system work will be carried out by others as part of the overall Fitchburg Line Improvements Project. The station improvements work will be carried out in cooperation with the ongoing track work and signal system work in the station area.
4. Major Elements of the Station: The new station improvements will involve four major elements that make up the bulk of the work. These will be (1) the platforms, (2) the head houses and the pedestrian bridge, (3) site features, and (4) the lighting and communications systems.
5. The Platforms: The two side platforms will be the main features of the proposed station improvements. The length of the platforms will be 800 feet. The platforms will each be 12 feet wide. The height of the platform will be 4 feet above the top of rail to put the platform surface flush with the floor of a railroad passenger car. The structural system for the platform will be drilled mini-pile foundations, cast in place concrete pile caps, and pre-cast concrete double tee slabs spanning between the pile caps. The typical span of the pre-cast concrete slabs between the pile caps will be 32 feet. Each platform will have a strip of tactile surfacing and a timber rubbing strip along the trackside edge. There will be a continuous railing along the back side of each platform. There will be access ramps and stairs leading up to the platform level. Steel framed canopies will be located over portions of the platforms and ramps. The platforms will have signs, windscreens, benches, and other features along their length.
6. The Head Houses and Pedestrian Bridge: The head houses and pedestrian bridge system will consist of two head houses and a pedestrian bridge connection over the tracks. One of the head houses will be located at the outbound platform on the north side of the station site; the other head house will be located at the inbound platform at the south side of the station site. Each head house will contain a lobby area, a stairway from the entrance level up to the pedestrian bridge level, and an elevator from the entrance level up to the pedestrian bridge level. The head houses will be steel framed structures with metal cladding, metal framed glazing systems, and metal framed mesh screening systems around their exterior. The roofs will be corrugated metal; the foundations will be spread footings. The stairways will be steel structures and the elevators will be appropriate for heavy use. The structure for the pedestrian bridge will be a steel truss spanning over the tracks between the two head houses. The floor of the pedestrian bridge will be a composite steel and concrete deck system; the roof will be corrugated metal.
7. Site Features: The proposed site work will blend the new station configuration into the existing area. All existing site functions will be preserved or enhanced. There will be entrance ways onto the platforms from the Main Parking Lot on the north side of the station site, from Railroad Street on the north side of the station site to the east of the Main Parking Lot, and from Maple Street on the south side of the station site. The entrance way from the Main Parking Lot will be the main entrance to the station. There will be a drop off area and a large sidewalk at the level of the lobby of the outbound head house. The Railroad Street Parking Lot will be improved and there will be direct access from Railroad Street up to the outbound platform. The entrance way from Maple Street will be a new access point into the station; it will include a drop off area, a sidewalk, and a direct entrance onto the inbound platform. A two inch water service connection will be provided from the existing water main in Railroad Street to a yard hydrant adjacent to the inbound platform. Trackside fencing will be provided. Provisions will be made for bicycle racks and lockers and a future fare system enclosure. A maintenance of way storage structure will be provided on each side of the tracks. Landscaping will involve loam, seed, and low level plantings in areas of new construction.

8. The Lighting System: The lighting system will extend into all areas of the platforms, ramps, canopies, head houses and pedestrian bridge. All lighting fixtures throughout the station will be of the metal halide type. The open platform space outside of the canopies will be lighted with Kim style fixtures mounted on round galvanized steel poles. The platform space under the canopies and the head house will be lighted by Arida style wall mounted fixtures attached to the underside of the structures. Site lighting will be provided for walkways and the Railroad Street Parking Lot.
 9. Communications, CCTV System and Variable Message Signs: The Closed Circuit Television (CCTV) System to be installed at South Acton Station includes Pan-Tilt-and Zoom (PTZ) cameras to be installed in the Inbound and Outbound Head Houses to monitor the lobby and elevator door areas. It also includes CCTV cameras in each of the elevator cabs to provide security surveillance for passengers. The Variable Message Sign (VMS) System includes a double-sided electronic display sign on both inbound and outbound platforms to inform passengers of train arrival times and other information. This system also includes a low power AM radio transmitter to simultaneously transmit this same information to people approaching the station or waiting in their automobiles.
 10. Environmental: The Order of Conditions for the station work was issued on 9/19/11 and will expire on 9/19/2014.
- B. Other Descriptions: The Contractor's attention is directed to provisions of Article 6.02 of Section 00700, General Conditions, as modified by the Supplementary Conditions, for additional stipulations relative to Contract Description, Commencement, and Completion Times.

1.3 CONSTRUCTION PHASING

- A. The Contractor's attention is directed to provisions of Article 6.2 of the General Conditions, and Supplementary Conditions, for stipulations relative to Commencement and Completion Times and phasing of work.
- B. Construction Phasing of the work shall be planned in such a manner that will maintain uninterrupted existing operations of the MBTA Commuter Rail Service currently operated by Massachusetts Bay Commuter Rail (MBCR), as well as Pan Am Railways (PAR) freight operations.
- C. The Contractor shall coordinate all construction activities with the appropriate agencies of the Town of Acton and shall avoid construction related impacts on the adjacent and adjoining areas.
- D. All necessary and required permits and approvals from the Town of Acton shall be obtained by the Contractor. All other necessary and required approvals from the MBTA, MBCR, Pan Am Railways, utility companies, abutters, etc. shall also be obtained by Contractor.

1.4 LIMITS OF WORK AND ACCESS TO SITES OF WORK

- A. The Contractor is to restrict work to MBTA or State owned areas or to areas within a public right-of-way. However, any additional areas which the Contractor might require shall be secured by the Contractor at the sole expense and responsibility of the Contractor, but written evidence thereof shall be furnished to the Authority. Prior approval from the MBTA and the owner will be required.
- B. Prior to the commencement of construction, the Contractor shall present the Authority with a detailed plan of how he will perform the work on this project without impacting Commuter Rail Service and Railroad Operations. The plan should also identify how materials and equipment will be delivered to the construction site. This plan cannot be implemented until it is approved by the Authority. The detailed construction plan shall be prepared and submitted in accordance with the requirements of all applicable specification sections.

- C. Contractor shall not be allowed to work within the “foul” area of the railroad (25 feet from centerline of track) without flagmen and/or track foremen present from the operating railroad.
- D. Contractor shall be responsible for coordinating with the local or regional utility company for relocation of their facilities as required for the construction of all work.
- E. Construction laydown and/or storage areas shall be located out of wetlands and the 100-foot wetland buffer zone unless approved in writing by the Authority.
- F. Contractor shall be responsible for conforming to the requirements of all environmental permits for this project.

1.5 EXISTING CONSTRUCTION AND CONDITIONS

- A. The Authority believes that information on the drawings describing existing construction or conditions is correct insofar as it is shown; however, it does not guarantee or represent that existing construction, utilities or conditions conform to the drawings. The Contractor shall visit the site and satisfy himself as to the existing conditions. No claim for extra cost will be allowed by the Authority because of the Contractor's unfamiliarity with observable site conditions.
- B. In case of discrepancies being found in the Contract Documents, the Contractor shall immediately report them to the Authority and shall commence no new work or place orders concerned with the matter in doubt until resolution is made by the Authority.

1.6 REPAIRING AND REPLACING EXISTING WORK

- A. The Contractor shall work through the Engineer to obtain the necessary coordination with the Operation and Maintenance Departments of the Authority in order to permit construction progress with the most possible cooperation. MBTA commuter service shall be maintained uninterrupted. Furthermore, the Contractor shall coordinate his efforts with other Contractors working on separate contracts in the immediate vicinity of the construction sites.

1.7 NOTIFICATION

- A. Prior to commencing work, the Contractor shall notify DIG-SAFE at 811. Contractor shall give dates and locations where he intends to work.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

Not Used.

END OF SECTION

SECTION 01020

ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies allowances for all services, personnel, labor, materials, and equipment necessary to perform the work as specified herein. The Contractor shall include in his bid proposal the allowance for each item listed. Except for when the Contractor performs the work with their own forces, they shall not add any Contractor markups, including overhead and profit, except as noted, to these allowance items. The work is further specified in Section 01010 - SUMMARY OF WORK and in the applicable Construction Specifications sections referenced herein.

1.2 ALLOWANCE ITEMS

- A. Section 01020 ALLOWANCES – Include an allowance amount of \$10,400 for PROJECT OFFICE - Item No. 0130.133. This item will be used for various office supplies and Project Management support equipment to be identified and defined by the MBTA Project Manager.
- B. Section 01570 - TRAFFIC REGULATION - Include an allowance amount of \$49,000 for TRAFFIC OFFICERS SERVICES - Item No. 0130.429.
- C. Section 16500 – LIGHTING - Include an allowance amount of \$52,200 for ELECTRIC COMPANY - Item No. 0130.436.
- D. Section 02858 SUBSTITUTE TRANSPORTATION – Include an allowance amount of \$52,200 for BUSING - Item No. 0130.439. This will cover the cost of Busing during a weekend shutdown period for culvert replacement work. Specific time and date to be identified by the MBTA Project Manager.
- E. Section 02650 – EXISTING SITE UTILITIES - Include an allowance of \$20,900 for SITE UTILITIES - Item No. 0211.495.
- F. Section 01565 – RODENT CONTROL - Include an allowance of \$33,400 for RODENT CONTROL - Item No. 0213.202.
- G. Section 02282 – HANDLING, TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIALS – Include an allowance of \$188,900 for DISPOSE OF CONTAMINATED SOIL - Item No. 0221.330.
- H. Section 02713 – EXTERIOR WATER DISTRIBUTION SYSTEM – Include an allowance of \$15,700 to INSTALL WATER SERVICE - Item No. 1520.006. This is to cover fees and demand charges imposed by the Water Supply District of Acton in relation to the Contractors work responsibility for installation and connection of the 2” water supply line from the Town water main in Railroad Street.
- I. Section 16742 – VARIABLE MESSAGE SIGN SYSTEM – Include an allowance of \$10,400 for RAILROAD WORK - Item No. 0290.005. This is to cover the work to be done by MBCR relating to the installation of the VMS system.

1.3 MEASUREMENT

- A. Allowances will be made to reimburse the Contractor for work and materials performed and supplied by the Contractor and others as specified herein and as further specified in the applicable Construction Specifications Sections.

1.4 PAYMENT

- A. Before permitting work to begin under any allowance, the Contractor shall request an itemized written estimate of cost from the Railroad, utility companies, private firms, subcontractors, and City and State agencies for the work to be performed. The Contractor shall submit these written estimates to the Engineer for review and approval. For work performed by the Contractor, they shall be reimbursed in accordance with Section 01151 - MEASUREMENT AND PAYMENT, Part 1 "Payment for Extra Work" Article. No payments exceeding the approved amounts will be made by the Authority.
- B. Payment for allowances will be based upon receipted invoices and signed receipts, without charges for Contractor overhead and profit (except when the Contractor performs the work), submitted for the actual work performed.
- C. The Contractor shall submit receipted copies of itemized invoices for such work to the Authority for partial payments. Payment will be based upon receipted invoices and signed receipts from the utility companies, private firms, Railroad, subcontractors or the City and/or State agencies to the Contractor, four copies of which shall be submitted to the Authority.
- D. The final payment for allowances under this Contract will be withheld until the Contractor has paid each affected utility company, private firm, Railroad, subcontractor, or City and/or State agency for all costs in connection with work specified herein.
- E. Each allowance will be adjusted to the actual amount paid by the Contractor for such work done.
- F. The Contractor shall be responsible to notify the MBTA a minimum of one week in advance of their need for Railroad employees required for flagging, operational and infrastructure protective services, and follow-up inspection of the facilities as a result of the work and other operations of the Contractor. The MBTA will assume the costs charged by the Railroad for flagging, operational and infrastructure protective services, and follow-up inspection of the facilities as a result of the work and other operations of the Contractor, however, the Contractor shall be responsible for all costs incurred by the MBTA for Railroad support services as a result of the Contractor delays in the work or by other Contractor caused issues.

1.5 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.133	PROJECT OFFICE	AN
0130.429	TRAFFIC OFFICERS SERVICES	AN
0130.436	ELECTRIC COMPANY	AN
0130.439	BUSING	AN
0211.495	SITE UTILITIES	AN
0213.202	RODENT CONTROL	AN
0221.330	DISPOSE OF CONTAMINATED SOIL	AN
1520.006	INSTALL WATER SYSTEM	AN
0290.005	RAILROAD WORK	AN

END OF SECTION

SECTION 01070

ABBREVIATIONS AND DEFINITIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies abbreviations for standards and trade associations and definition of technical terms.

1.2 ABBREVIATIONS AND NAMES

- A. The following abbreviations as referenced in the Contract Documents are defined to mean:

1.	AA	Aluminum Association
2.	AAN	American Association of Nurserymen
3.	AAR	Association of American Railroads
4.	AASHTO	American Association of State Highway and Transportation Officials
5.	ACI	American Concrete Institute
6.	AGC	Associated General Contractors of America
7.	AI	Asphalt Institute
8.	AIA	American Institute of Architects
9.	AISC	American Institute of Steel Construction
10.	AISI	American Iron and Steel Institute
11.	AMCA	Air Moving and Conditioning Association
12.	ANSI	American National Standards Institute
13.	APA	American Plywood Association
14.	ARA	American Railway Association
15.	AREA	American Railway Engineering Association
16.	ARI	American Refrigeration Institute
17.	ASCE	American Society of Civil Engineers
18.	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
19.	ASLA	American Society of Landscape Architects
20.	ASME	American Society of Mechanical Engineers
21.	ASTM	American Society for Testing and Materials
22.	AWG	American Wire Gauge
23.	AWPA	American Wood-preservers' Association
24.	AWPI	American Wood-Preservers' Institute
25.	AWWA	American Water Works Association
26.	AWS	American Welding Society
27.	CISPI	Cast Iron Soil Pipe Institute
28.	CRSI	Concrete Reinforcing Steel Institute
29.	DOT	U.S. Department of Transportation
30.	EEI	Edison Electric Institute
31.	EIA	Electronic Industries Association
32.	EPA	U.S. Environmental Protection Agency
33.	FHWA	Federal Highway Administration, Department of Transportation
34.	FSS	Federal Specifications and Standards

35.	FTA	Federal Transit Administration
36.	GSA	General Services Administration
37.	HUD	U.S. Department of Housing and Urban Development
38.	IACS	International Annealed Copper Standard
39.	IEEE	Institute of Electrical and Electronic Engineers
40.	IES	Illuminating Engineering Society
41.	IMSA	International Municipal Signal Association
42.	IPCEA	Insulated Power Cable Engineers Association
43.	ITE	Institute of Transportation Engineers
44.	JIC	Joint Industrial Council
45.	MBTA	Massachusetts Bay Transportation Authority
46.	NAAM	National Association of Architectural Manufacturers
47.	NBC	National Building Code
48.	NBS	National Bureau of Standards
49.	NEC	National Electric Code
50.	NEMA	National Electrical Manufacturers' Association
51.	NESC	National Electrical Safety Code
52.	NET&T	New England Telephone & Telegraph Company
53.	NFPA	National Fire Protection Association
54.	NLMA	National Lumber Manufacturers' Association
55.	OSHA	United States Department of Labor, Occupation Safety and Health Administration; and Occupation Safety and Health Act
56.	PCA	Portland Cement Association
57.	PCI	Prestressed Concrete Institute
58.	PEI	Porcelain Enamel Institute
59.	SAE	Society of Automotive Engineers
60.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
61.	SJI	Steel Joist Institute
62.	SSPC	Steel Structures Painting Council
63.	UBC	Uniform Building Code of the International Conference of Building Officials
64.	UL	Underwriters' Laboratories, Inc.
65.	USSG	United State Standard Gauge

1.3 PUBLICATION DATES

- A. Except as otherwise indicated, where compliance with an industry or trade association standard is required, comply with the standard in effect as of the date of the Contract Documents.

1.4 DEFINITION OF TERMS

- A. Wherever in he Contract Documents the following technical terms or pronouns in place of them are used, the intent and meaning shall be:
1. Aerial Structure - Any MBTA System structure other than a culvert, which carries transit tracks and spans above an earth or water surface.
 2. Alignment - Horizontal and vertical location of a track, street or highway as described by curves and tangents.
 3. Ballast - Specified material placed on the track bed to hold the track in line and elevation.
 4. Base - A layer of material of planned thickness placed immediately below the pavement or surface.

5. Basement Material - Material in excavations or embankments, underlying the lowest layer of subballast, ballast, base, pavement, or other specified layer which is to be placed.
6. Bridge - A structure, other than a culvert, which carries railroad, highway, pedestrian, or other traffic, or a utility facility, and spans above an earth or water surface.
7. Culvert - A structure, other than a bridge or aerial structure, which provides an opening under a track or roadway for drainage or other purpose.
8. Frontage Road - A street or road generally paralleling a portion of the MBTA System for service to abutting or adjacent property.
9. Gauge (Track) - Distance between the inside faces of rails and measured 5 inch below the top of the center line of heads of running rails and at right angles thereto.
10. Guard Rail (Track) - A rail or other structure laid parallel with the running rails of a track to contain wheels after derailment, or to hold wheels in correct alignment to prevent their flanges from striking the points of turnout or crossing frogs or the points of switches.
11. Highway, Road, Street - Each is a term denoting a public vehicular way and includes the entire area within their right-of-way.
12. Layout Plans - Plans showing layout (location) lines, property lines, corner markers, names of property owners, and the location of bounds.
13. Location Lines - Lines indicating the limits of the Right-of-Way.
14. Material - Any substances specified for use in the construction of the Contract and its appurtenances.
15. Median - That portion of a divided highway separating traffic moving in opposite directions.
16. Pavement - Uppermost material placed on the traveled way or shoulders of a road or on a parking area. This term is used interchangeably with surfacing.
17. Right-of-Way - A Term denoting land and property, and interest therein, acquired by the Authority for construction of the MBTA System.
18. Running Rail - Rail or surface on which the tread of the wheels of rail vehicles bear.
19. Shoulder (Track) - That portion of the track subgrade or subballast which, when the track is in cut, lies between the ballast-covered portion and the ditch and, when the track is on embankment, lies between the ballast-covered portion and top of slope.
20. Sieves - All sieves referred to in the Specifications shall be standard woven wire cloth sieves and conform to the requirements of AASTHO Designation M92.
21. Subballast - Specified material placed on the finished subgrade and below the ballast.
22. Subbase - A layer or layers of specified material of planned thickness between the base and the basement material.
23. Subgrade (Pavement) - That area on which pavement, surfacing, base, or subbase is placed.
24. Subgrade (Track) - Finished surface of the track bed below the ballast or subballast.
25. Substructure - All that part of an aerial structure or bridge below the bridge seats, tops of piers, haunches of rigid frames, or below the spring lines of arches. Backwalls and parapets of abutments and wing walls of bridges shall be considered as parts of the substructure.
26. Subway - That portion of a MBTA Transit System line which is constructed beneath and approximately parallel to the ground surface regardless of its method of construction.
27. Superelevation - Vertical distance measured at the centerline of the rails that the outer rail is above the inner rail.
28. Superstructure - All that part of an aerial structure or bridge above the bridge seats, tops of piers, haunches of rigid frames, or above the spring lines of arches, including the floor, and not including the substructure.
29. Top of Rail Profile - Profile line representing the elevation of the top of running surface of rails. Where superelevation occurs, top of rail profile represents the inside lower running rail, unless otherwise indicated.
30. Track Bed - That portion of a MBTA Transit System line between the curb lines or outside boundaries of ballast or track support slab.

31. Trackway - That portion of a MBTA System line between outside of curbs where track is on aerial structure, tunnel, or subway; and between outside of cut slopes or parallel drainage ditches where track is at grade, including apportioning drainage structures.
32. Trackwork - Rails, switches, frogs, crossings, fastenings, pads, ties and ballast over which transit or railroad cars or trains are operated.

1.5 ADDITIONAL DEFINITIONS

- A. See the General Conditions and other Sections of the Specifications

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

Not Used.

END OF SECTION

SECTION 01151

MEASUREMENT AND PAYMENT

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the general requirements for Measurement and Payment.
- B. Provisions of this Section are augmented by the measurement and payment provisions for specific classifications of construction, materials, and services as specified in the applicable sections of these Standard Specifications, the Contract Specifications and as listed in the Bid Form for a specific contract.
- C. See Specification Section 01322 – CONSTRUCTION SCHEDULE for additional requirements of processing the payment request.

1.2 MEASUREMENT OF QUANTITIES

- A. This Contract is a Lump Sum Contract with Allowance payment items and Add-Alternates. The Lump Sum base bid price shall reflect the total cost to complete the work indicated in the Bid Documents, whether shown or incidental to completing the work in accordance with applicable codes, laws, rules and regulations.
- B. Quantities of various items of work provided shall be determined from the As-Planned Schedule and subsequent Progress Schedules, for purposes of payment, by the Engineer; and by the Contractor for purposes of the certification(s) of work provided that are required by the provisions of Article 1.7.
- C. Upon the completion of Work and before final payment is made the Engineer will determine that all Work is completed according to the approved As-Planned Schedule and subsequent Progress Schedules, as the basis for final settlement.
- D. Method of measurement and computations to be used in determination of quantities of material furnished and of work provided under the Contract will be those methods generally recognized as conforming to good engineering practice.
- E. Unless otherwise specified, the following shall apply:
 - 1. Allowance will not be made for surfaces laid over a greater area than those indicated, or for any material moved from outside the area of cross section and lines shown on the Drawings except when specifically authorized by the Engineer.
 - 2. The term "gauge" when used in connection with the measurement of plates, will mean the U.S. Standard Gauge, except that when reference is made to the measurements of galvanized or aluminum sheets used in the manufacture of corrugated metal pipe, metal plate culverts and arches, metal cribbing and corrugated aluminum pipe, the term "gauge" will mean that specified in AASHTO Designations M36, M167, M196 or M197.

3. When the term "gauge" refers to the measurement of wire, it will mean the wire gauge specified in AASHTO Designation M32.
4. The term "pound" when used in the measurement or payment of any material or work, will mean 16 ounces avoirdupois, based on computed or scale weight.
5. The term "ton" when used in the measurement or payment of any material or work, will mean the short tone consisting of 2,000 pounds avoirdupois. When applicable, materials measured in pounds will be converted to tons.
6. The term "each," when used as an item of payment, such as project markers, right-of-way monuments, and the like, will mean complete payment for the work prescribed for that item.
7. The term "lump sum," when used as an item of payment will mean complete payment for the work prescribed for that portion of the Contract work under the item, or all work prescribed in the Contract, as the case may be.
8. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.
9. The Quantities may be shown on the Contract Drawings for items for which lump sum is the method of measurement. If shown, the quantities are approximate and are shown for estimating purposes only. The Contractor shall ensure that the lump sum price (whether the base bid or lump sum breakdown per Activity (see Section 01322)) includes all labor, equipment and material to provide the Work complete in place.
10. The term "complete in place," when used in the measurement and payment provisions, means the completion of the contract item, including the furnishing of all materials, equipment, tools, labor and work incidental thereto, unless otherwise specified.
11. Rental of equipment will be measured by hours of actual working time and necessary traveling time of the equipment within limits of the Contract or between the source of supply and contract site (but not exceeding 100 miles) except when special conditions or other agreements make some other method of measurement desirable and is specified.
12. When standard manufactured items are specified such as fence, wire, plates, rolled shapes, culvert pipe, and the like, and these items are identified by gauge, unit weight, section dimensions, or other measurements, such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

1.3 SCOPE OF PAYMENTS

- A. The Authority will pay and the Contractor shall receive and accept the compensation as provided in the Bid Form, in full payment for furnishing all materials, labor, tools and equipment and for performing all work contemplated and embraced under the Contract; also for all loss or damage arising out of the nature of the Work, or from the action of the elements (except as specified in General Conditions Article 5.21), or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the Work (except as set forth in General

Conditions Article 2.9 or as otherwise noted in the Contract Specifications) until its final approval by the Authority, and for all risks of every description connected with the prosecution of the Work; also for all expenses incurred by or in consequence of the suspension or discontinuance of the said prosecution of the Work (except as provided in General Conditions Article 6.7), and for any infringement of patent, trademark or copyright, and for completing the Work in an acceptable manner according to the Contract Documents.

- B. Payment of any current estimate, or any retained percentage shall in no way constitute an acknowledgment of the acceptance of the Work or in no way or degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to repair, correct, renew or replace any defects and imperfections in the construction of, or in the strength of, or quality of materials used in or about the construction of the Work under Contract and its appurtenances, as well as damages due or attributable to such defects; which defects, imperfections or damages shall have been discovered on or before the expiration of the one year guaranty period specified in General Conditions Article 2.8. The Engineer shall be the sole judge of such defects, imperfections, or damages and the Contractor shall be liable to the Authority for failure to correct the same as provided herein. (Also see General Conditions Article 5.24.)
- C. If the "measurement and payment" clause in the Construction Specifications relating to any price in the Bid Form requires that said price cover and be considered compensating 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 Specifications.
- D. Except as specifically provided otherwise, no separate payment will be made for any work in fulfillment of the requirements of these Division 1, General requirements nor of the respective Specifications relating thereto, and all cost thereof shall be included in the lump sum bid price.
- E. Except as specifically provided otherwise, no separate payment will be made for any work in fulfillment of the requirements of the Contract Documents. All costs shall be included in the lump sum bid price.

1.4 COMPENSATION FOR ALTERED QUANTITIES

- A. The Contractor is obligated to bid work in a responsive and responsible manner. Prices proposed for the work must be realistic.

1.5 PAYMENT FOR EXTRA WORK

- A. Payment for extra work or materials.
 - 1. If the Engineer directs additional work, 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. Unless otherwise directed, the stated price shall be divided so as to show that it is the sum of: (a) estimated cost of direct labor, materials, and the use of equipment, plus 10 percent of this total for overhead; (b) actual cost of Workmen's Compensation and Employer's Liability Insurance, Health, Welfare and Pension Benefits, Social Security deductions, and Employment Security 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; (c) a reasonable percent of the total (a) and (b) shall be negotiated for profit utilizing the procedure outlined under this Article, paragraph B.3; (d) the estimated proportionate cost of surety bonds.

2. Unless an agreed lump sum and /or unit price is obtained from above and is so stated in a Supplemental Agreement or an 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: (a) the actual cost for direct labor, material (less value of salvage, if any) and use of equipment (see below), plus 10 percent of this total for overhead; (b) actual cost of Workmen’s Compensation and Employer’s Liability Insurance, Health, Welfare and Pension Benefits, Social Security deductions, and Employment Security 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; (c) a reasonable percent of the total (a) and (b) shall be negotiated for profit utilizing the procedure outlined under this Article, paragraph B.3; (d) the estimated proportionate cost of surety bonds. The actual cost of use of equipment (except small tools and manual equipment) will be the actual and necessary operating expenses of such equipment power and fuel for the same, and a reasonable rental for the same as determined by the Engineer.

3. A reasonable percent of the total (a) and (b) for Items 1 and 2 above shall be negotiated for profit on each Extra Work Order utilizing the following weighted guidelines:

(a) Breakdown:

Profit Calculation Summary Chart

FACTOR	WEIGHT	RATE	PROFIT
	(W)	FACTOR	VALUE
		(R=.03 to .08)	
1. Degree of Risk			
General Issues of Concern	10 x		=
Labor Productivity	15 x		=
Pricing	15 x		=
Availability of Materials	5 x		=
2. Relative Difficulty of Work	15 x		=
3. Size of Job	15 x		=
4. Period of Performance	15 x		=
5. Subcontracting	10 x		=
TOTAL	100		

(b) Based on the Factors for each Work Order, the Weight (W) for each Factor shall have a Rate Factor (R) from .03 to .08 as indicated below. The Profit Value (V) shall be obtained by multiplying the Rate Factor (R) by the Weight (W). The sum of the Profit Value column represents the fair and reasonable profit percentage as determined by the Factors of the particular Extra Work Order.

DEFINITION OF PROFIT RATE FACTORS

1. Degree of Risk:

Where the Work associated with an Extra Work Order involves no risk to the Contractor, or the degree of risk is very small, the Rate Factor should be .03; as the degree of risk increases, the Rate Factor should be increased up to a maximum of .08. The Degree of Risk has been determined to include but not limited to the following major factors:

- a) General Issues of Concern
- b) Labor Productivity
- c) Pricing
- d) Availability of Materials². Relative Difficulty of the Work involved:

If the modified Work is most difficult and complex the Rate Factor should be .08 and should be proportionately reduced to .03 on the simplest of jobs.

3. Size of job:

If the sum of the modified Work (direct costs) is not in excess of 5% of the base Contract work or \$25, 000, the Rate Factor shall be .08. Work greater than 10% of the base Contract Work or \$50,000 shall have a Rate Factor of .03. Work estimated between 5% (\$25,000) and 10% (\$50,000) shall be proportionately rated from .08 to .03.

4. Period of performance:

A change during the early phases of a contract shall have a Rate Factor of .03 and should be proportionately increased to .08 as the period of impact approaches the substantial completion. Additionally, the Rate Factor shall be >.03 for a time extension less than 10 days to a defined Milestone and as the potential time extension to a defined Milestones increases the Rate Factor shall also proportionately increase to .08.

5. Subcontracting:

The Rate Factor shall be inversely proportional to the amount of subcontracting. Where 66 percent or more of the Work is to be subcontracted, the Rate Factor shall be .08 and where 90% to 100% of the Work is performed by the Contractor's own forces the Rate Factor shall be .03. If the amount of subcontracting is estimated between 11% and 65% of the Work, the Rate Factor shall be proportionately rated from .08 to .03.

4. The term "direct labor" shall mean the labor actually expended in performing the required work exclusive of all supervisory labor.

5. No allowance will be made for general superintendence and the use of small tools, manual equipment, or buildings.

6. For extra work performed by a subcontractor under this Article, paragraph B.2. above the Contractor shall accept as full payment therefore an amount equal to the following: (a) the subcontractor's cost computed as described above plus (b) an additional 10 percent of such costs. Said subcontractor's cost must be reasonable and approved by the Engineer.

7. The Contractor shall, when requested by the Engineer, furnish itemized statements of the cost of the work ordered and give the Engineer access to accounts, bills, and vouchers relating thereto, and unless the Contractor shall furnish such itemized statements, access to accounts, bills and vouchers, the Contractor shall not be entitled to payment for which such information is sought by the Engineer.

B. Equipment Rates

In the event there arises the need for determination of costs for use of equipment as part of "actual costs" or "cost of performance" or "damages" under General Conditions, Section 00700, Articles 2.9, 5.19, 6.7; Section 01151, Measurement and Payment, Articles 1.03 and/or 1.05; or under Chapter 30 of the Massachusetts General Laws, such costs for use of equipment shall be established in accordance with the following:

1. "Construction equipment" as used herein means equipment in sound workable condition, either owned or controlled by the Contractor or the subcontractor at any tier, or obtained from a commercial rental source, and furnished for use under the Contract.
2. Allowable hourly ownership and operating costs for Contractor-owned or subcontractor-owned equipment shall be determined as follows:
 - a. Actual cost data from the Contractor's accounting and operating records shall be used whenever such data can be determined for hourly ownership and operating costs for each piece of equipment, or groups of similar serial or series equipment. Actual costs shall be limited to booked costs of the annual accounting period or periods during which the equipment was utilized on the Contract, and will not include estimated costs not recorded and identifiable in the Contractor's formal accounting records. The Contractor shall afford Authority auditors full access to all accounting, equipment usage, and other records necessary for development or confirmation of actual hourly cost rates for each piece of equipment, or groups of similar serial or series equipment. The Contractor's refusal to give such full access shall invalidate any request or claim for payment of the equipment costs. When costs cannot be determined from the Contractor's records, hourly equipment cost rates may be determined under "b." below.
 - b. When the Engineer ascertains that it is not practicable to determine actual equipment cost rates or elements thereof from the Contractor's records, hourly equipment cost rates or elements shall be determined by the use of rate schedules or the formula developed from the "Rental Rate Blue Book" (Volume 1) published by Equipment Watch:
 - (1) Hourly rates shall be developed by dividing monthly rates by 176 hours per month (the "weekly," "hourly" and "daily" rates listed in the "Blue Book" will not be used);
 - (2) Rates shall in all cases be adjusted by application of Rate Adjustment Tables (machine age adjustment) plus adjustment to eliminate Equipment Overhead plus Regional Adjustment; and

- (3) Rates shall be further reduced by 20 percent to eliminate duplicate and excessive costs, except that the rates shall instead be reduced by 75 percent to determine standby rates.

The number of hours to be paid for shall be the number of hours that the equipment is actually used on a specific force account activity. The "current revisions" to the Blue Book will be used in establishing rates. The "current revision" applicable to specific force account work will be the "current revision" as of the first day of work performed on that force account work and that rate will apply throughout the period the force account work is being performed. In all cases, the Engineer reserves the right to utilize, in preference to Blue Book rates, equipment cost rates based upon actual costs per accounting records or hybrid rates as described above.

- c. In those cases where a 10 percent additive for overhead is to be superimposed on the equipment costs provided in Section 00700, Article 2.9, and Section 01151, Article 1.5, equipment cost rates determined under (a) and (b) shall exclude any overhead costs such as equipment insurance, licenses or taxes. The 10 percent additive shall compensate the Contractor for all overhead costs, including equipment overhead, general superintendence, small tools, manual equipment, field overhead and central office overhead. Where the 10 percent overhead additive is not applicable, overhead items clearly related to equipment, (equipment insurance, licenses, taxes), shall be included in the equipment rates; provided, however, that such costs shall be identified and eliminated from any other direct or indirect costs or damages payable by the Authority under the Contract. No element of profit shall be allowable in equipment cost rates for Contractor-owned equipment; it being understood that a reasonable percent of profit in accordance with Article 1.5, Paragraph B, Item 3 will be superimposed upon equipment costs when called for by the Contract.
3. Reasonable hourly costs of renting equipment are allowable subject to Contractor production of auditable records supporting actual costs incurred, provided further that:
 - a. Costs such as fuel, lubricants, and minor or running repairs incident to operating such rented equipment that are not included in the rental rate are allowable.
 - b. Costs incident to major repair and overhaul of rental equipment are not allowed.
 - c. Charges for equipment leased or rented from any division, subsidiary organization under common control, or business under common ownership, ordinarily will be reimbursable to the extent that they do not exceed the actual costs of ownership and operating costs determined as in "2.", above. Rental cost of equipment leased or rented from any division, subsidiary, affiliate of the Contractor under common control, or business under common ownership, that has an established practice of renting out the same or similar equipment to unaffiliated parties, shall be allowed at rates higher than actual ownership and operating costs, provided that the Contractor furnishes the Authority adequate documentation, including the rental and usage records for the same or similar equipment items, demonstrating a reasonable likelihood that the equipment would have been rented out if not used on this Contract, and that the rental rates

charged are consistent with rates charged to unaffiliated parties and going market rates. Rental costs under a sale and leaseback arrangement will be allowable only up to the amount the Contractor would be allowed if the Contractor retained title.

4. Equipment cost rates determined in "2." and "3." above shall be exclusive of labor cost of equipment operators. Such costs shall be reimbursable subject to Contractor production of auditable payroll and other records sufficient for determination of hours, pay rates, and reimbursable fringe costs as defined in Section 00700, Article 2.9 and above.
 5. Except in cases of unit price or lump sum extra work orders approved by the Engineer before the work is done, actual reimbursable hours of equipment usage and operator time must be adequately documented by the Contractor's field and office records maintained during performance of the work in a manner acceptable to the Engineer. Failure of the Contractor to so maintain time records which adequately segregate added equipment hours caused by extra work required by the Engineer, or caused by other Authority actions cited in the Contractor's claim for damages, from other equipment time worked on the Contract, when maintenance of such records would have been feasible, shall constitute a cardinal omission of the Contractor, invalidating any claim for equipment cost reimbursement.
- C. Payment for specialized engineering services which may be required in the performance of extra work and which is not otherwise provided for in the Contract shall be for actual costs to be incurred that comply with the standards of the Federal Acquisition Regulations, Part 31, including (a) direct labor based on hours worked on the Contract at the hourly rates paid; (b) overhead costs based on audited financial statements and other data as may be required by the Authority; (c) ten percent of the total of (a) and (b); and (d) other direct expenses related to the Contract.

1.6 OMITTED ITEMS

- A. Should any item or items of Contract work be determined unnecessary for the proper completion of the Work, the Authority may, upon written notice to the Contractor, eliminate such item or items from the Contract and allowance will not be made for such items so eliminated in making final payment to the Contractor, except for such actual work as shall be done and materials purchased, including the cost of moving in and out the special equipment necessary for work on the eliminated item or items, prior to notification of the elimination of such item or items. The amount of the credit to the Authority shall be determined in a similar manner as described above for payments for extra work. This Article shall also apply to work eliminated from the Contract Documents in the form of a lump sum credit to the Authority.

1.7 PARTIAL PAYMENTS

- A. Monthly, the Engineer will make an estimate in writing of the total amount of the work done to the date of such estimate and the value thereof, including advance payments on materials stores or on hand but not yet incorporated in the Work which may be made as provided in Article 1.8 of this Section. This estimate shall be based on the Contractor's As-Planned Cost/Resource Loaded Schedule and Progress Schedule Updates returned as "Resubmittal not Required". The Authority will retain the following from these payments:
1. Five percent of the approved amount of the payment to secure satisfactory performance of the Contract Work.

2. An amount sufficient to cover claims it has against the Contractor.
3. An amount sufficient to cover all demands for direct payment filed by subcontractors under Chapter 30 Section 39F of the General Laws of the Commonwealth.
4. Five percent of the value of all items to be planted in the ground.

The Authority will pay monthly to the Contractor while carrying on the work the balance not retained as hereinbefore provided. No such estimates or payment shall be required to be made when, in the Engineer's judgment, the work is not proceeding in accordance with the provisions of the Contract, or when in his judgment the total value of the work done since the last estimate amounts to less than \$500.00.

- B. The Authority may, at its option, after 50 percent of the Work has been completed and (1) if the work is proceeding in accordance with the approved CPM Construction Plan submitted under Section 01322 Article 1.2 and (2) is being performed in accordance with the Specifications and the Contract, not retain the 5 percent to secure satisfactory performance of the Contract Work as provided in Article 1.7A of this Section 01151 on any subsequent payments. However, if the Authority does not retain these monies, it will reimpose this 5 percent retainage on all subsequent payments should the Contractor fail to maintain progress in accordance with the Contract and approved schedule or fail to execute the Work as required by the Specifications and Contract. Retainages withheld under Articles 1.7A (2) and (3) will remain in effect throughout the Contract Work period as detailed therein. Retainage withheld under Article 1.7A (4) for plantings will be retained until Final Acceptance (Article 1.10).
- C. Partial payments will be made on lump sum contracts, and on lump sum items of a contract if the Contractor requests partial payment of such an item, in accordance with a schedule of the quantities and unit prices for the major components of a lump sum contract or of the lump sum items of a contract, to be submitted by the Contractor and approved by the Engineer prior to making partial payments for such contract or for such items. For lump sum contracts, this schedule of major components shall approximate the activities shown on the CPM Construction Plan required by Section 01322 Article 1.2. Each component part shall be considered as including all its concomitance so that the total cost listed for the components is the contract cost for the item. Approval of the schedule by the Engineer shall not be considered as a guarantee to the Contractor that the quantities shown on the schedule are the approximate quantities actually included in the lump sum items. The schedule is only for the purpose of estimating partial payments, and it shall not affect the contract terms in any way.
- D. The Contractor shall certify in writing on forms approved by the Authority that the work for which payment is included in the estimate in question, has in fact been done.
- E. Whenever the Work is substantially complete, the Authority may, if it considers the amount retained to be in excess of the amount adequate for its protection, at its discretion, release to the Contractor all or a portion of such excess amount and may cause the Contractor to be paid, temporarily or permanently, from time to time, such portion of the reserve as it deems prudent.
- F. When the first partial payment estimate is prepared, the Contractor shall submit to the Engineer a cash drawdown forecast indicating the estimated amount of each partial payment by month, projected through completion of the project. The Contractor shall, with each succeeding partial payment estimate, submit updated cash drawdown forecasts to the Engineer. The forecast is for the purpose of estimating cash requirements.

- G. Massachusetts Bay Transportation Authority-Statement of Payment to Subcontractors Form is included at the end of this Section 01151. It must be completed and signed by authorized contractor representative and submitted to the Authority with each payment request.
- H. With each partial payment estimate, the Contractor shall submit, at a minimum, the following information which is extracted from the As-Planned Schedule:
 - a. Progress Schedule Submittal # that is the basis for the partial payment request
 - b. Activity ID
 - c. Activity Description
 - d. Budgeted cost for each Activity in the Lump Sum contract
 - e. Value completed this period
 - f. Percentage completed this period
 - g. Value completed to date
 - h. Percentage completed to date
 - i. Balance of budgeted cost per activity
 - j. Separate information must be provided per DBE Subcontractor, including:
 - 1. DBE budgeted cost
 - 2. DBE value completed this period
 - 3. DBE percentage completed this period
 - 4. DBE value completed to date
 - 5. DBE percentage completed to date
 - 6. Balance of DBE value
 - 7. Other information required by MBTA Contract Administration
- I. Failure to provide this information with each partial payment request will result in non-payment by the Authority.

1.8 PAYMENT FOR MATERIALS STORED OR ON HAND

- A. When requested in writing by the Contractor, allowances may be made on partial payments for certain materials stored or on hand, but not incorporated in the Work, subject to the following terms and conditions.
- B. Upon presentation to the Engineer by the Contractor of copies of paid invoices, advance payments may be made for acceptable reinforcing steel, structural steel, piles, culvert pipe, guard rail, track

rails, precast prestressed concrete members, costly machinery items, and other similar nonperishable materials purchased expressly for the Work and delivered on or in the approved storage places at the site, but which materials are not considered as erected or complete in place under the items of the Contract, and for which partial payment would not otherwise be made until such materials and items were erected or complete in place.

- C. The amount to be included in the estimate will be the value of the materials as shown by the certified copies of paid invoices including transportation and handling costs. However, the Engineer reserves the right to limit payment for such materials when such payment is based upon a standard unit of measure. When contract payments are made on the basis of estimated quantities, payment for material stores or on-hand may be limited to an amount not to exceed the value of ninety percent of the estimated contract quantity.
- D. Before any advance on materials is made as hereinbefore provided, the Authority will require, as security for the incorporation of the materials in the Work, documents from the Contractor transferring to the Authority the absolute legal title to such materials.
- E. However, the transfer of title and the partial payment for such materials shall not in itself constitute acceptance of same nor void the right to reject material subsequently found unsatisfactory as provided in General Conditions Article 4.4, nor in any way relieve the Contractor of his responsibility for satisfactorily furnishing and placing the material in the Work in accordance with the terms of the Contract.
- F. In the event any of such material subsequently becomes lost, stolen, impaired, or damaged, the monetary value of the lost, stolen, impaired, or damaged material as may have been paid for in a current estimate will be deducted from the next estimate, and no further payment will be made therefor until such material has been satisfactorily replaced in accordance with Specification requirements.
- G. If it is impossible due to lack of area on the site or other valid reason, the Contractor may request in writing permission from the Engineer to store materials off the site and still have the materials paid for as materials on hand and the Engineer may approve payment; however, no advance payment for material stores off the site will be made until written approval of the Engineer has been given. This request will state the reason for the request, location of proposed storage site, and methods that will be employed to insure that material is properly protected and will be used on the particular Contract. The amount to be included in the estimate for materials stores off the site will be limited to 80 percent of the value of the materials as shown by the certified copies of paid invoices including transportation and handling costs.
- H. In the case of property not owned or controlled by the Authority, the Contractor shall also lease, or procure a lease, free from encumbrances to the Authority, such lease to be in a form approved by the Authority and to contain provisions for the protection and indemnification by the Contractor of the Authority, its employees and agents, against all claims by reason of such lease or by reason of anything done or permitted in or upon the leased sites. The Contractor shall also take such steps as the Authority may require for the purpose of security and assuring to the Authority the control of such materials, particularly the right to enter upon the property, take possession of such materials and use the same.
 - 1. No advance payment for materials stores or on-hand, but not incorporated in the work, will be made in an estimate when the value therefor amounts to less than \$10,000 per contract bid item and represents the value of at least fifty percent of the estimated quantity involved as shown in the contract or as determined by the Engineer.

2. Deductions at rates and in amounts which are equal to the advance payments will be made under the appropriate Contract pay items in estimates as the materials are incorporated in the Work.

1.9 SEMI-FINAL ESTIMATE

- A. A semi-final estimate may be made, at the discretion of the Authority, under the following conditions:
 1. If, after final inspection has been made, there are any payments or Extra Work items that are in dispute between the Contractor and the Authority, either as to the quantity or value of work provided thereunder, such items or claims may be excluded from the final estimate, and payment for such disputed items may be deferred until such time as agreement has been reached between the Contractor and the Authority or until such claim has been adjudicated. In such case, a semi-final estimate shall be prepared within a period of 65 days after substantial completion of the Contract Work covering the value of Work provided and retained percentage on items of the Contract that are not in dispute and with disputed items or claims excluded but subject to deduction and retention of a sum sufficient to satisfy any and all outstanding claims or liens that have been duly filed by subcontractors and material men against the Contractor, or to cover amount of such claims or liens that may have been paid by the Authority directly to others for the Contractor's account (see General Conditions Article 5.17), and subject to deduction and retention from such payment any other amounts to be deducted and retained in accordance with the terms of the Contract. The existence of a dispute between the Contractor and the Authority as to any payment item or items shall not be considered a valid reason for delaying preparation of a semi-final estimate as provided herein.
 2. In the event the Contract has been substantially completed and the Contract has been opened to public use by order of the Authority, but final acceptance of the Work is subject to delay because of minor uncompleted items which do not impair the usefulness of the Contract, a semi-final estimate shall also be prepared within a like period of 65 days after the Contract has been substantially completed and placed in public use. Such semi-final estimate shall include an intimate of the value of all Work provided in accordance with the terms of the Contract, including the amount of retained percentage withheld by the Authority from previous periodic payments, but excluding (a) the same deductions and retainage sufficient to cover subcontractors and material men's claims and other amounts to be deducted and retained in accordance with the terms of the Contract, as provided by the first paragraph of this Article; (b) an amount equal to the estimated value of the work remaining to be performed and (c) any items or claims for extra Work, or parts thereof, that may be in dispute; and payment for such excluded items or portions thereof, may be deferred until such remaining work has been satisfactorily completed, or in the case of disputed items or claims until such time as agreement has been reached thereon or such claims have been adjudicated.

1.10 FINAL ACCEPTANCE AND FINAL PAYMENT

- A. When all of the physical work covered by the Contract has been substantially completed (see General Conditions Article 3.11), the Authority will inform the Contractor in writing the date of such final acceptance upon which date the Contractor's responsibility shall cease except as provided in his bond and as provided in General Conditions Articles 2.8 and 5.24.

- B. The Engineer shall, as soon as practicable after the satisfactory completion of the Contract, make a final estimate of the amount of work done thereunder and value of such work. Within 65 days from and after the date the Work has been accepted by the Engineer, the Authority will forward to the Contractor a copy of the final estimate or semi-final estimate, as stipulated in Chapter 30 section 39G of the General Laws of the Commonwealth, which will include an agreement form for the Contractor's acceptance. After such acceptance has been filed with the Engineer, payments of the entire sum will be made, so found to be due thereunder after deducting therefrom all previous payments and all amounts to be kept and all amounts to be retained under the provisions of the Contract. All prior partial estimates and payments will be subject to correction in the final estimate and payment. If within six months from the date the final estimate is forwarded to the Contractor, the Contractor has not filed a valid (as determined by the Engineer) written reason(s) for not accepting final estimate, final estimate will be considered acceptable to the Contractor and payment of final estimate made.
- C. Acceptance by the Contractor of the final payment shall operate as and will be a release to the Authority and every member, agent, and employee thereof, from all claim and liability to the Contractor for anything done or furnished for, or relating to, the Work, or for any act or neglect of the Authority or of any person relating to or affecting the Work, except the claim against the Authority for the remainder if any there be, of the amounts kept or retained to satisfy liens or claims pending against the Contractor.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY -- STATEMENT OF PAYMENT TO SUBCONTRACTORS

[Note : Use this page for Non-FTA Contract. Use the following page for FTA funded.]

GENERAL CONTRACTOR _____
 CONTRACT TITLE _____

CONTRACT AWARD _____
 Subcontractor \$ Value _____
 Subcontractor Percentage _____
(Subcontractor \$ Value divided by Contract Award)

CONTRACT NO. _____
 PAYMENT NO. _____
 PERIOD ENDING _____
 NET PAYMENT _____
(General contractor's gross amount, less retainage)

1
2
3
4
5
6
7
8
9
10
11
12

Subcontractors	Trade	(S) Mat.	Subcontractor Awards			Subcontractor Payments			(X) Final
			Award Amount	Adjustment	Revised Amt.	Previously Paid	This Payme	Total	

TOTALS									

I hereby certify, under pains and penalties of perjury, that all information provided herein is complete and accurate:

Signed: _____
 Authorized Contractor Representative

_____ Date

SECTION 01300

SUBMITTALS

1.1 DESCRIPTION

- A. This Section specifies the general requirements and procedures for preparing and transmitting data to the Engineer for his information, acceptance or approval. Detailed requirements for submittals are specified in applicable Sections of these Standard Specifications and in the Construction Specifications.

1.2 RELATED SECTIONS

- A. 01322 Construction Schedule

1.3 SUBMITTALS (SHOP DRAWINGS, WORKING DRAWINGS AND MISCELLANEOUS)

- A. Definitions

1. Shop Drawings: Original drawings, submitted to the Engineer by the Contractor pursuant to the Work, including, but not limited to: stress sheets, working drawings, diagrams, illustrations, schedules, performance charts, brochures, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or other supplementary plans or similar data which are prepared by the Contractor or a Subcontractor, manufacturer, supplier or distributor, and which the Contractor is required to submit for review and approval by the Engineer.
2. Working Drawings: Contractor prepared plans for temporary structures and facilities. Working Drawings for elements of work which may affect safety of persons or property included but are not limited to Contractor's plans for temporary structures such as decking, temporary bulkheads, support of utilities, and for such other work as may be required for construction but which do not become an integral part of completed project.
3. Miscellaneous Submittals: Those submittals directly related to the work (non-administrative) including quality assurance program, resume of QA Managers, warranties, guarantees, maintenance agreements, maintenance of traffic plan, project photographs, survey data and reports, physical work records, quality testing and certifying reports, record and as-built drawings and data, operating and maintenance manuals, security and protection lists (including keying) and other similar information and materials not defined as shop drawings, working drawings, product data, samples mockups or sample panels.

- B. Within 15 calendar days of receipt of Notice to Proceed, submit to Engineer a schedule of all submittals required by the contract. Submit schedules for submission of shop drawings, working drawings, mock-ups, sample panels, product literature and miscellaneous submittals in that order of priority which reflects sequence of construction requirements, project schedule logistics, and include anticipated review time that may be required by Contractor and Engineer for these submissions. If complexity of submittal requires more time for review, show approximate extended number of days required. Show all submittals on progress schedules required by Sections 01321 or 01322 as appropriate. Submittal schedules shall contain the following information as a minimum:

1. Submittal number, including revisions.

2. Specification section and paragraph reference.
3. Submittal title and description
4. Date needed to support construction schedule.
5. Date sent to Engineer.
6. Date returned from Engineer
7. Comments. Included within this section will be references to any new RFIs issued as a result, reasons for delay and any other relevant information.

C. General Procedures

Transmit submittals sufficiently in advance of construction requirements to permit a maximum of 30 calendar days for checking and appropriate action by Engineer.

Submit all work related submittals as defined in this Section and as required by Contract Documents on a Transmittal Form: Prepare draft of required transmittal form and submit it to Engineer for acceptance. At a minimum, furnish: transmittal forms sequentially numbered and show contract number, project name, date; names of subcontractors, suppliers, manufacturers, and required specification references; category and type of submittal, purpose, description, distribution record (for both transmittals and submittals) and signature of transmitter.

1. Examine and check submission for accuracy, completeness, and compliance with Contract before delivery to Engineer.

Stamp and sign each submission with following statement: "Having checked this submission, we certify that it conforms to the requirements of the Contract in all respects, except as otherwise indicated."

By reviewing and approving each submittal, Contractor represents that he has determined and verified materials, field measurements and field construction criteria related thereto, and has checked and coordinated information contained within such submittals with requirements of Work and Contract.

Submit one construction material or one drawing per submittal review.

2. Maintain at site of Work a complete up-to-date, organized file of all past and current submittals including an index and locating system, which identifies the status of each submission.
 - a. Assign sequential numbers to each submittal.
 - b. Assign new submittal numbers to all re-submissions and cross-reference to previous submittals.

Certify shop drawings, working drawings and calculations as submitted by a professional engineer registered in the Commonwealth of Massachusetts when required by individual Specification Sections. Convey, or be accompanied by, information sufficient to completely explain the structures, machines, or systems described and their intended manner of use. When professional certification is required by Contract requirements, Engineer is entitled to rely upon accuracy and completeness of such calculations and certifications.

3. Engineer's Review and Action
 - a. The Engineer will review and approve or take other appropriate action upon Contractor's submittals only for the limited purpose of reviewing for conformance with information given and design concept expressed in Contract requirements. The Engineer's action will

be taken as to cause no delay in Work or in activities of Contractor. Review of such submittals is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor as required by Contract. Engineer's review will not constitute approval of safety precautions or, unless specifically stated by Engineer, of any construction means, methods, techniques, sequences or procedures. Engineer's review of a specific item does not indicate approval of entire assembly of which the item is a component.

- b. Time required for review of submittals and resubmittals by Engineer will be a maximum of 30 calendar days, except as otherwise specified.
- c. All Contractors' submittals will be stamped with one of following dispositions:
 - 1) **NO EXCEPTIONS TAKEN:** Work may proceed, provided it complies with Contract. Approval of shop drawings and samples will be general, but approval is not construed:
As relieving Contractor of responsibility for any errors or omissions, including details, dimensions, and quantity of materials; or

As approving departures from details furnished by Engineer.
 - 2) **EXCEPTION AS NOTED:** Work may proceed, provided it complies with Contract and changes shall be made by Contractor. Resubmission not required. Exception, as noted, will be general.
The above dispositions will be general, but approval or exceptions noted shall not be construed as:
 - Permitting any departure from Contract requirements;
 - Relieving Contractor of responsibility for any errors or omissions, including details, dimensions, and quantity of materials; or
 - As approving departures from details furnished by Engineer.
 - 3) **REVISE AND RESUBMIT:** Work recognized as not being able to proceed. Revise submittal in accordance with notations thereon and resubmit without delay.
- d. Handle re-submissions in the same manner as first submittals. On re-submissions, direct specific attention in writing to revisions other than the corrections on previous submissions. Make any correction required by Engineer.
- e. Failure of any material to pass specified tests is sufficient cause for refusal to consider, under this Contract, further samples of same brand or make of that material. Engineer reserves right to disapprove any material or equipment previously proven unsatisfactory in service.
- f. Samples of various materials on site, stored or in place may be taken by Engineer for testing. Samples failing to meet Contract requirements will automatically void approval of items tested. Replace such materials or equipment to meet Contract requirements. When tests are required, make only one test of each sample. Samples that do not meet specified requirements will be rejected. Additional testing of samples will be made by Engineer at Contractor's expense.

D. Requirements for shop drawings.

1. Shop drawings shall include stress sheets, fabrication details, bending schedules for reinforcing steel, location and details of construction joints in concrete, catalog cuts of equipment or

fixtures, wiring or piping diagrams, data sheets and performance curves for electrical, mechanical, or other equipment and any other supplementary data required by the Engineer.

2. Detail drawings for cribs, cofferdams, falsework, shoring, decking, form work, and for other temporary work and methods of construction the Contractor proposes to use, will be required to be furnished. Such drawings shall be subject to review, but details of design will be left to the Contractor who shall be responsible for the safety and successful construction of the Work. Drawings, the original design for which is the responsibility of the Contractor, shall bear the seal of a Professional Engineer registered in the Commonwealth.
 3. Shop drawings shall show design, dimensions, connections, and other details necessary to insure that the Contract Documents are accurately interpreted. Shop drawings shall show proper connections with adjoining work in detail. Where adjoining work requires shop drawings, such drawing must be submitted for approval at the same time so that connections can be accurately checked.
 4. Shop drawings shall establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work and amplify design details of mechanical and electrical equipment in the physical spaces in any structure and incorporate minor changes of design or construction details to suit actual conditions. Where separate sections or trades are involved, shop drawings shall be coordinated and where required by the Engineer shall be submitted in composite form (coordination drawings) clearly designating which trade will perform which work; the words "work by others" will not be accepted.
 5. All requests for approval of materials and equipment and submissions of drawings shall indicate the corresponding number of the section and paragraph of the Specifications and reference to the Contract Drawing sheet numbers under which each of the above are required, and the Construction Performance Monitoring (CPM) activity number.
 6. All shop drawings shall be thoroughly checked by the Contractor for compliance with the Contract Documents before submitting them to the Engineer for approval and shall bear the Contractor's stamp of approval certifying that they have been so checked. Shop drawings submitted without the stamp of approval and certification, or which are incomplete, contain numerous errors, have not been checked, or have been checked only superficially will be returned unchecked by the Authority for resubmission by the Contractor. The Contractor shall certify: "This shop drawing has been thoroughly checked and complies with the Contract Documents and field measurements and the item fits with adjoining work except as noted."
 7. In checking shop drawings, the Contractor shall verify all dimensions and field conditions and shall check and coordinate the shop drawings with the requirements of all other Sections, adjoining materials or trades whose work is related thereto, as required for the proper and complete installation of the work.
 8. Nothing in the above shall be construed to hold the Contractor liable for the design of any of the permanent structures.
- E. When submitting shop drawings or working drawings for approval or review by the Engineer, the following procedures shall apply:
1. Submit to the Engineer with such promptness as to cause no delay in his work, two copies of reproducible transparencies (equal to Ozalid Sepia), and two blackline prints checked and

approved by him, of all shop drawings and detail drawings required for the work.

2. The Engineer will make a prompt decision on approval of such Drawings no later than 30 days after submittal; but if such decision requires extended investigation and study, the Engineer will, within 30 days after the receipt of the submission, give the party making the submission written notice of the reason why the decisions cannot be made within the 30 day period and the date by which the decisions will be made.
 3. Markings of approval, or of corrections required, will be made on the transparencies by the Engineer and record copies made by the Engineer for his own use will be at the Authority's expense.
 4. If corrections are required by the Engineer, make such corrections and resubmit the drawings, again as two reproducible transparencies and two blackline prints, to the Engineer for approval. If corrections are still required, the same procedure shall be carried out until the drawings are acceptable.
 5. Upon the Engineer's approval, furnish the Engineer two corrected blackline prints.
 6. All items shown on shop drawings shall be clearly identified with their location in the Contract, or by the sheet or detail number in which they appear, in order to facilitate checking by the Authority.
- F. Upon completion of the Work, submit to the Engineer a 35 mm microfilm of each shop drawing only, which shall become the property of the Authority. Microfilm copies shall be made on 35 millimeter black and white microfilm of archival permanent quality and mounted on aperture cards with the title of the drawing typed on the upper portion of the card.
- G. Resolution and density of the developed microfilms shall meet or exceed the Requirements of the U.S. Department of Defense Specification MIL-M-9868D, and shall contain no scratches, abrasions or fog.
- H. Portions of the developed microfilm, which do not meet those requirements, shall be replaced, at no expense to the Authority.
- I. Contract prices shall include the cost of furnishing all shop and detail drawings as specified and microfilms.
- J. Progress Photographs - Progress photographs are required to be taken by the Contractor. Ten 8x10-inch color photographs (including slides of these photographs) of progress and construction operations shall be required each month.

1.4 QUALITY CONTROL

A. SAMPLES AND TESTS

1. Inspection and sampling of materials will be carried out, ordinarily at the source or at the site of the Contract Work in accordance with established policies and procedures of the Authority, but the Authority will not assume any obligation for the inspection and sampling of materials at the source. Responsibility for incorporating satisfactory material in the Work rests entirely with the Contractor.

2. Furnish to the Engineer samples specified in the various specification sections. Prepay shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved in writing by the Engineer.
3. Unless otherwise indicated, submit not less than two identical samples of each type required. Label each sample indicating:
 - a. Name of project and contract number;
 - b. Name of contractor and subcontractor;
 - c. Material or equipment represented;
 - d. Source;
 - e. Name of producer and brand (if any);
 - f. Specification Section, article, and paragraph; and
 - g. Location in project.
4. Mail, under separate cover, a letter in triplicate submitting each shipment of samples and containing the information required in Article 1.04C of this Section. Enclose a copy of the submittal letter with the shipment and a copy to the Engineer. Approval of a sample shall be only for the characteristics and use named in the submittal and approval, and will not be construed to change or modify any Contract requirement. Before submitting samples, the Contractor shall assure himself that the materials or equipment will be available in the quantities required in the Contract, as no change nor substitution will be permitted after a sample has been approved unless approved by the Engineer in writing.
5. Approved samples not damaged in testing may be incorporated in the finished work if marked for identification and approved by the Engineer. Materials incorporated in the Work shall match the approved samples.
6. Failure of any material to pass the specified tests will be sufficient cause for refusal to consider, under the Contract, any further samples of the same brand, make, or source of that material. The Engineer reserves the right to disapprove any material, which has previously proven unsatisfactory in service.
7. Samples of various materials or equipment delivered on the site or in place may be taken by the Engineer for testing. Failure of samples to meet Contract requirements will automatically void previous approvals of the item tested.
8. As soon as possible and a minimum of 35 days in advance of the time when placing of bituminous or Portland cement concrete is expected to begin, deliver to the Authority Laboratory samples and available analysis of concrete ingredients. Quantities of materials, aggregate sizes, cement, admixtures, and bitumens as may be required for the performance of necessary tests and trial mixes will be determined by the Authority's Materials Testing Engineer.

1.5 REQUESTS FOR INFORMATION

- A. Upon discovery of the need for interpretation of the Contract Documents, the Contractor shall prepare and submit a Request for Information (RFI) on the form specified at the end of this Section. RFIs shall not be used to request approval of submittals, request approval of design changes or substitutions, nonconforming conditions, or requests for changes to Contract schedule and/or Quantities.

1. RFIs shall be issued by the Contractor to the Engineer. RFIs submitted by entities other than the Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in the work.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project Name
 2. Contract Number
 3. Date
 4. Name of Contractor
 5. RFI Number, numbered sequentially
 6. Specification Section number and title and related paragraphs, as appropriate
 7. Drawing number and detail references, as appropriate
 8. Field dimensions and conditions, as appropriate
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Completion Date or Quantities, Contractor shall state the impact in the RFI.
 10. Contractor's signature
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe item needing interpretation.
- C. RFI Log: Prepare, maintain and submit a log of RFIs organized by the RFI number containing the following information:
1. Project Name
 2. Project Contract Number
 3. Name of Contractor
 4. RFI number and Revision Indicator
 5. RFI Description
 6. Date RFI was submitted
 7. Date Response Required
 8. Date Response Received
 9. Date Closed
- D. Engineer's Action: Engineer will review each RFI, determine action required and return to the Contractor within 30 days. Any change to the Contract Completion Date or Quantities may result in a change being submitted under Article 2 – Scope of Work of Section 0700 of the General Conditions.

1.6 MEASUREMENT AND PAYMENT

No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item of Work to which they pertain.



MBTA Request For Information

RFI No. _____

CONTRACTOR: _____

CONTRACT NO. _____

AFFECTED DOCUMENT (S): SPEC: _____

DWG (S): _____ **OTHER** _____

DESCRIPTION:

JUSTIFICATION:

SIGNATURE: _____

DATE: / /

RESPONSE:

DESIGNER: _____

DATE: / /

MBTA PROJECT MGR: _____

DATE: / /

END OF SECTION

SECTION 01322

CONSTRUCTION SCHEDULE

1.1 DESCRIPTION

- A. This Section specifies the general requirements and procedures for preparing and submitting Contract Schedules to the Authority for review and acceptance.
- B. Refer to section 01151 regarding payment requirements associated with the schedule.

1.2 SCHEDULE GLOSSARY

- A. The following terms used in this Section or elsewhere in the Contract Documents shall have these meanings:
 - 1. Activity - An element in the Progress Schedule highlighting or depicting a part of the Work and establishing the time and resources required, for completing that part of the Work.
 - 2. As-Planned Schedule/Baseline Schedule - Construction Schedule Revision 0 (Rev. 0) Submittal returned by the Authority to the Contractor as "Resubmittal Not Required," with or without comments or objections noted, showing the contractor's plan to complete the work within the Contract Time. As-Planned and Baseline may be used interchangeably, but shall have the same meaning.
 - 3. Business Day - Any day except Saturdays, Sundays and legal holidays observed by the Authority. Also termed Work Days.
 - 4. Days - Refer to Section 00700, Article 1 of the General Conditions.
 - 5. Contract Float - Number of Business Days between the Contractor's anticipated date for early completion of all or part of the work and the corresponding Contract Time or Contract Milestone(s). Contract Float is further defined as the amount of time any given activity or path of activities may be delayed before it will affect the Contract Time.
 - 6. Cost Loaded Schedule - A CPM schedule which includes the accurate allocation of the cost of the Work to all schedule activities to represent the complete scope of work included in the Contract. Costs allocated to each Activity are to be proportional to the scope of the Work of the Activity and consistent with the Contractor's detailed bid. The Authority reserves the right to use the cost-loading as a secondary means to resolve changes and/or claims. 'Front-loading' or other unbalancing of the cost distribution will not be permitted. The sum of the cost of all schedule Activities is equal to the total Contract Price.
 - 7. Critical Path - Any continuous sequence of Activities in the Progress Schedule that control achievement of a corresponding Contract Time or Milestone(s).
 - 8. CPM - The Critical Path Method of planning and scheduling. References to the Critical Path Method (CPM) shall be to CPM construction industry standards that are consistent with this Section 01322.

9. Construction Schedule - Schedule which shows the Contractor's approach to planning, scheduling, and execution of the work. Includes the Revision 0 and monthly Progress Schedule Submittal(s).
10. Date for Commencement of Contract Time - The date when the Contract Time starts as defined by Article 6.02 A.
11. Delays - Slippage of the Early Dates in any Progress Schedule Submittal which forecast any slippage or overrun of Milestone(s) or Contract Times.
12. Early Completion Schedule - A CPM schedule showing completion of the Work ahead of the Contract Time specified in article 6.02, Prosecution of Work.
13. Early and Late Dates - Early times and late times of performance for the Activities as defined by CPM techniques and as further limited by the requirements of the General Conditions.
14. Job Progress Meeting - A bi-weekly Schedule meeting to review the progress on the Schedule including but not limited to the actual percentage of completion, the actual quantity of resources and number of personnel used, comparing actual dates with the early dates; and the resources/personnel intended to be used for the Look-Ahead Schedule and Recovery Plans as necessary.
15. Milestone - A key point of progress (zero duration) established in the Construction Schedule and as specified in the Contract Documents under Article 6.02.
16. Progress Schedule Submittal - A monthly status report of the As-Planned Schedule (Rev. 0) intended to aid in and facilitate the evaluation of a Partial Payment. Submittal to reflect Delays, schedule recovery plans and all other Contractor-initiated schedule revisions, subject to the acceptance by the Authority.
17. Resource Loaded Schedule - A CPM schedule which includes the accurate allocation of the resources to perform the Work, for all schedule activities. Resources allocated to each Activity are to be proportional to the scope of the Work of the Activity and consistent with the Contractor's detailed bid. The Authority reserves the right to use the Resource Loading as a means to resolve changes and/or claims. Indicating the manhours per day, by craft, and equipment hours/day will be acceptable. In addition, all change orders will be required to be resource loaded to validate and monitor the duration of the Work to be performed.

- B. Other terms used in this Section shall have the meanings assigned to them elsewhere in the Contract Documents, and if not assigned and where the context will permit, as used or defined in Massachusetts General Laws (M.G.L.).

1.3 SCHEDULER REQUIREMENTS

- A. The name of the Project Scheduler, together with his/her qualifications, shall be submitted to the MBTA for approval. 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 of this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

1.4 CONSTRUCTION SCHEDULE REQUIREMENTS

- A. The Contractor's approach to prosecution of the Work shall be disclosed to the Authority by submission of the computerized; **cost/resource loaded** Construction Schedule required in this Section. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.
- B. The project requires an integrated cost/schedule controls program that the Contractor shall comply with, from Contract award, until final completion of all Work. The Contractor is advised that its schedules and reports, as specified herein, will be an integral part of the Authority's management program. The Contractor's schedules will be used by the Authority to monitor project progress, plan the level-of-effort by its own work forces 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 timely and accurate throughout the life of the project. The Contractor's Schedules shall be used by the Authority and Contractor for the following purposes as well as any other purpose where the issue of Time is relevant, the Contractor must prepare and plan the CPM with the following considerations:
1. To communicate to the Authority the Contractor's current plan for performing and completing the Work;
 2. To identify Work items and paths that are critical to the timely completion of the Work;
 3. To identify upcoming activities on the critical path(s);
 4. To evaluate the best course of action for recovering schedule delays;
 5. As the basis of progress payments to the Contractor;
 6. As the basis for analyzing the Time; impact of changes in the Work;
 7. To identify when submittals will be submitted by the Contractor for the Authority's review.
 8. To aid in prioritizing the Authority's review of submittals;
 9. To document the actual progress of the Work;
 10. To evaluate resource requirements of the Contractor and the Authority;
 11. To aid in integrating the Work with the operational requirements of the Authority
 12. To facilitate efforts to complete the Work in a timely manner.
 13. Assignment of responsibility for performing specific activities;
 14. Access to and availability of work areas;
 15. Identification of interfaces and dependencies with proceeding, concurrent, and follow-on contractors;
 16. Actual tests, submission of test reports, and approval of test results;
 17. Planning for phased or total takeover by Authority.
- C. Within 5 days after Contract award, and prior to submission of the initial Construction Schedule Revision 0, the Contractor shall host and conduct a schedule planning session. This session will be attended by the Authority and its consultants. During this session, the Contractor shall present its planned approach to the project (including the Work to be performed by the

Contractor and its subcontractors) including, but not limited to: the planned construction sequence and phasing; planned crew sizes; summary of equipment types, sizes, and numbers to be used for each work activity; estimated durations of major work activities; the anticipated critical path of the project and a summary of the activities on that critical path; a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges; and 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 Authority and its Consultants may have. The Contractor shall provide 5 copies of a written summary of the information presented and discussed during the session to the Authority. The Contractor's initial Construction Schedule Revision 0 and accompanying schedule narrative shall incorporate the information discussed at this schedule planning session.

- D. The Construction Schedule shall consist of (a) the Construction Schedule Revision 0 (Rev. 0) Submittal (As-Planned Schedule), and (b) monthly Progress Schedule Submittals. The Construction Schedule shall clearly define the prosecution of the Work from the Date of Commencement of Contract Time to substantial completion by using separate CPM activities for, but not limited to : construction; testing; permitting; submittal preparation, reviews, resubmissions and approval; material and equipment deliveries; Authority furnished items; interfaces with other contractors, Public Utilities, etc.; Final Inspection; Punchlist; Milestones and Substantial Completion; Authority training; and move-in. CPM Activities and logic ties shall be detailed as necessary to show the Contractor's Work sequencing and separately define all requisite Authority tasks.
- E. In preparing the Construction Schedule Submittals, the Contractor has the responsibility to request clarification from the Authority on any areas of the schedule which reflect the Contractor's interpretations of, or variations from, the requirements of the Contract Documents. The Contractor also has the responsibility to incorporate the Subcontractors and Suppliers input into the schedule for Activities, logic ties, restraint dates, etc. involving their Work.
- F. Acceptance of the Construction Schedule by the Authority shall not relieve the Contractor from compliance with the requirements of the Contract Documents, or result in the approval of any variation from the Contract Documents.
- G. The current version of Primavera Project Management® or equivalent schedule software shall be used for the Construction Schedule and one license is to be provided to the MBTA Project Office. The contractor may submit for MBTA approval a request to use Primavera Project Planner. The schedule software shall run on IBM PC compatible equipment, capable of processing and plotting the Progress Schedule information required in this Section, and create data base files accessible by Windows based software.

The software must also have a demonstrated ability to compare multiple updates (equivalent to Primavera 'target' and claim digger). The Contractor shall inform the Authority of the Construction Schedule software the Contractor will use to comply with the requirements of this Section. Provide the Authority with certified software training, pay all costs associated with maintenance fees and furnish to the Authority all upgrades and updates acquired from the software vendor during the period allowed for completion of the Work.
- H. The Contractor will submit as part of the Rev. 0 and monthly Progress Schedule Submittal(s) a compact diskette containing the complete Construction Schedule data, files in compliance with the requirements of this Section. Submit electronic files in XER or PRX format. Provide the appropriate amount of schedule submittals to the project and one copy to:

Sr. Project Manager Construction Project Controls,
MBTA
500 Arborway,
Jamaica Plain MA 02130
617-222-5910

- I. Contractor agrees to and guarantees that the Contractor will not:
 - 1. Misrepresent to the Authority it's scheduling or execution of the Work.
 - 2. Utilize schedules substantially different from those submitted to the Authority or any Subcontractor for performance or coordination of the Work, or are not practical.
 - 3. Submit schedules that do not accurately reflect the intent or reasonable expectations of the Contractor and its Subcontractors.

- J. Contractor's failure to substantially comply with this agreement shall be a substantial and material breach of contract. In the event the Contractor fails, refuses or neglects to comply with the requirements of this Section 01322, the Authority may elect any of the following: (a) nullify any mobilization payments previously made, (b) stop payments under the monthly Partial Payment Request, (c) prepare alternate progress schedules, as may be suitable under the circumstances, and deduct from the Contract Price all related costs by Change Order, (d) entitle the Authority to the damages afforded for misrepresentation or fraud by these Contract Documents or applicable law. Continued failure of the Contractor to perform in accordance with the requirements of this Section 01322 will be reason to place the Contractor in default of his obligation there under and terminate the Contract.

- K. The Contractor is required to provide a Cost/Resource Loaded Schedule. These project controls tools are to include the accurate allocation of the costs and resources to complete the Work for all schedule activities. Costs allocated to each Activity are to be proportional to the scope of the Work of the Activity and consistent with the Contractor's detailed bid. The Authority reserves the right to use the Cost-Loading as a means to resolve changes and/or claims. Front-loading or other unbalancing of the cost distribution will not be permitted. The sum of the cost of all schedule Activities is equal to the total Contract Price. If the cost distribution appears to be unbalanced the Authority will require justification.

- L. Default progress data is not allowed. Actual start and finish dates shall not be automatically updated by default mechanisms that may be included in the CPM scheduling software systems. Actual start and finish dates and remaining duration on the CPM schedule shall match those dates provided from the Contractor back up paperwork (i.e. daily reports, delivery slips, etc...).

- M. 'Out-of-sequence progress' - Activities that have posted progress without predecessors being completed, based on the As-Planned Schedule, is not allowed without the written approval of the Authority. The contractor shall not utilize "Progress Override" (schedule calculation) unless written approval is provided by Authority.

- N. The Contractor shall not artificially improve its progress by revising schedule logic restraints or shortening planned activity durations. The contractor may improve its progress by performing

sequential activities concurrently or by performing activities more quickly than plan, but such improvement shall not be recorded on the schedule until they have actually been achieved by the contractor, nor shall such improvement constitute additional compensation to the Contractor.

1.5 USE OF FLOAT

- A. Contract Float is not for the exclusive use or benefit of either the Authority or the Contractor, but must be used in the best interest of completing the project within the Contract Time. If the Early Dates in any Progress Schedule Submittal forecast any slippage or overrun of the Contract Times, the Contractor shall indicate such slippage or overrun by reporting negative Contract Float.
- B. The Contractor shall not utilize (1) float suppression techniques in the Construction Schedule, including but not limited to interim dates imposed by the Contractor other than Contract Time(s) and Contract Milestone(s), or (2) the inclusion of activities or constraints in a path or chain leading to a Contract Milestone which are unrelated to the Work as stated and specified in the Contract Documents, or (3) activity durations or sequences deemed by the Authority to be unreasonable in whole or in part.
- C. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. Sequestering of float shall be cause for rejection of the contractor's schedule submittal. In the event that float sequestering is identified the schedule shall be revised appropriately.
- D. All Contract Time(s) and Milestones shall be imposed, coded and separately identified in all Progress Schedule Submittals in conformance with the Milestone(s) and Contract Time(s) set forth in the Contract Documents. The Contractor shall impose no other date restraints in the Construction Schedule, unless an explanation of their bases is provided and is acceptable to the Authority. Contract Completion and Milestones incorporated in the Contractor's Construction Schedule shall be assigned duration of zero (0) days.
- E. Contract Float in an early completion Revision 0 Submittal or Progress Schedule Submittal shall be calculated based on the definitions given in the Contract, regardless of the float values shown in any Construction Schedule Revision Submittal or Progress Schedule Submittal.
- F. Extensions of time for performance of the Work required under the General Conditions pertaining to equitable time adjustment will be granted only to the extent that the equitable time adjustment for activities affected by any condition or event which entitles the Contractor to a time extension, exceed the Contract Float along the path of the activities affected at the time of Notice to Proceed of a Contract Modification or commencement of any delay or condition for which an adjustment is warranted under the Contract Documents.
- G. If the Contractor is delayed in performing the Work, the Contractor shall absorb any related delay, disruption, interference, hindrance, extension or acceleration costs, however caused, until all Contract Float, if any, is consumed and performance or completion of the Work, or specified part, necessarily extends beyond the corresponding Contract Times. The Contractor shall work cooperatively with the Authority, adjacent contractors, and third parties, to identify and implement to the maximum extent possible, no-cost measures to recover all schedule delays,

regardless of the cause of the delays. One example of such measures is no-cost re-sequencing of Work activities.

1.6 ACTIVITY REQUIREMENTS

- A. Activity durations shall equate to the Business Days required to complete the Work included in each Activity. Activities shall be in sufficient detail to separate items of Unit Price Work from lump sum Work, breakout distinct classes of Work (e.g., CSI Divisions/Sections or equivalent) and Work in separate areas or locations, as specified by the Authority. Work being performed by DBE firms shall be identified as separate CPM activities.
- B. In general, Activities shall be detailed in a manner that utilizes planned durations from ten (10) to thirty (30) Calendar Days, unless shorter durations result from the rules in paragraph 1.5.A, and have a value not exceeding \$50,000. Activity durations, greater than 30 calendar days shall be kept to a minimum, and must be approved by the Authority, except in the case of nonconstruction activities such as mobilization, procurement of materials, delivery of equipment, and concrete curing. Submittal Review Activities shall be thirty (30) Calendar Days, unless different review times are specified in other sections of the Contract Documents. No costs shall be applied to “Prepare and Submit” and “Review and Approve” submittal activities.
- C. Activities shall be assigned consistent descriptions, identification codes and sort codes. Sort code schemes shall: (a) be subject to the Authority's prior consent; (b) group Activities using meaningful schemes defined by Contractor and the Authority; and (c) designate lead responsibility for each Activity. The Contractor shall include specific schedule activity identification codes in its daily field reports when describing the items of Work performed each day.
- D. The total Contract Price shall be allocated to the CPM activities. The cost coded schedule shall be directly related to the Bid Form and Activities defined in the As-Planned schedule. Other data such as the proposed number of business (working) days per week, manpower allocation by craft and type, the planned number of shifts per day and the number of hours per shift, shall all be included in the computerized Construction Schedule.
- E. Work Breakdown Structure – The first code field shall designate the bid item. The second field shall identify the type of activity. (Types of activities shall be defined as “submittal”, “review/approval”, “procurement/fabrication”, “delivery”, “construction/installation” or “change order”.) The third code field shall identify which specification section the activity shall be paid under. The fourth code field shall identify who is responsible to perform the activity (i.e., contractor, subcontractor(s) by trade, supplier, etc.). The fifth code field shall identify the different areas being worked in if appropriate. The sixth code field shall identify the construction phase and associated milestone. All change orders and notices of non-conformance shall be included as separate code fields.
- F. Provide Justification for all lag. No lag shall be greater than 15 calendar days. Negative lag is not allowed.

1.7 SCHEDULES; REPORTS; PLOTS; NARRATIVES

- A. Activity Reports shall include Activity identification code, description, duration, calendar, Early Dates and Late Dates, Total Float and sort codes as specified by the Authority. The Late Finish Date of any Activity representing a Milestone shall equal the corresponding Contract Time. In

addition, Activity reports shall show, for each Activity, all preceding and succeeding logic ties (lead/lag and lead times) or attach a separate report combining such Activity and logic tie data.

- B. Time Scaled Logic Diagrams shall be arrow or precedence and shall be plotted on MBTA Standard Size 22"x 34" sheets with a calendar heading acceptable to the Authority. Logic diagrams shall identify the Contract Time(s) and Critical and sub-Critical Path(s). Activities shall show the Early Dates, Remaining durations and Total Floats. Logic connectors will be shown for all predecessors and successors.
- C. Resources - The Contractor shall manpower load all Schedules. The Contractor shall manpower load each individual Activity. The activities included in the Schedule shall be analyzed, in detail, to determine activity durations in units of project working days. Durations shall be based on the planned production rates, based on the labor (crafts), equipment, and materials required to perform each activity on a normal work-day basis, in accordance with the Contractor's bid. All durations shall be the result of definite manpower and resource planning by the contractor to perform the work in consideration of contractually defined on-site work conditions. The manpower to be assigned, by craft definition, shall be shown on each construction activity of the Schedule. All of these Activities shall remain manpower loaded, and updated, until final Contract completion. The Contractor shall provide weekly, monthly, and cumulative manpower curves for its own forces and Sub-contractors, as designated by the Authority, with all Schedule submissions. Curves shall be based on current Early Dates and Late Dates and, when requested by the Authority, shall compare As-Planned Early Dates and current Early Dates. The Contractor shall also resource load its planned equipment for all activities. At all times throughout the duration of the Project, the manpower loaded Schedules, manpower curves, and list of equipment shall be kept current and shall accurately represent the Contractor's current actual plan for performing the Work.

The Contractor shall prepare a manpower analysis in the form of a series of graphic displays depicting manpower by principal trades in the aggregate, and in accordance with the Schedule. The graphs shall display the number of man-days of effort, for each month, over the life of the project. This submission shall be computerized and shall correlate with the manpower data, exported from the Scheduling software. The Manpower requirements forecast shall be updated monthly and shall include the manpower actually expended, by trade, as of the current report period and the manpower required to complete all remaining contract work.

D. ADVERSE WEATHER PLANNING

- 1.) The schedule submittal to the MBTA must include planning for adverse weather if applicable. Planning for adverse weather is the strategy used to develop a schedule that produces reasonable and historically consistent early start dates that take into account the adverse weather conditions that would be expected for a specific project in a specific location during a specific time frame.
- 2.) Planning for adverse weather helps produce schedule dates that have a higher likelihood of accuracy so that the schedule is resilient enough to be useful in a specific location and time frame. Adverse weather may easily reduce the productivity of work on a project to a greater extent than planned.
- 3.) Historical adverse weather data sources would be used when a project has activities that will be performed under the influence of weather. This includes all forms of precipitation including rain, snow, hail, sleet, as well as any other weather influences such as high or low humidity, high winds, high or low temperatures.

- 4.) The historical weather data can supply the average non-work days lost to adverse weather in the previous five years, with the average precipitation each day, the average wind speeds, humidity, temperatures, cloud cover, and other adverse conditions. The scheduler should provide parameters for weather conditions that would result in adverse weather in the region where work is to occur, meaning weather that forces shut down of 50% or more of the project, the work day, or personnel, for critical activities.
- 5.) Use the chart below to show total anticipated non work days on a monthly basis due to adverse weather. **These planned adverse weather impact allowances must be added to schedule calendars and discussed in each Narrative. The project will keep track of weather impacted days against these pre-determined allowances.**

Month	J	F	M	D	M	J	J	A	S	O	N	D
Days Lost												

- E. Cash Flow Using the cost assigned to each activity of the Schedule, the Contractor shall develop a monthly cash flow projection, illustrated by exporting the scheduling data in graphic display or tabular form. Both shall demonstrate the estimated cash drawdown in the aggregate, by month, over the life of the project. Additionally, the data shall be organized/sortable by Activity. The cash flow projection shall be updated each month to show actual cash drawdown and a forecast of remaining payment to be made over the remaining life of the project.
- F. Each Look-back and Look-Ahead Schedule shall display the activities planned at the closing (i.e., data, cut-off) date that cover the previous two (2) weeks and the next four (4) weeks.
- G. Monthly Schedule Narrative - Each narrative shall list the Activities on each Critical Path and compare Early Dates and Late Dates for Activities designating Contract Times.
1. Rev. 0 narrative shall be included which details (a) the use of construction equipment and resources, (b) basis and assumptions for critical activity durations and logic, (c) compliance with winter weather requirements, and (d) any shifts, non-Business Days and multiple calendars applied to the Activities.
 2. For each Progress Schedule Submittal, the narrative shall respond to previous update review comments from MBTA, recap progress and days gained or lost versus the previous Progress Schedule, describe changes in resources to be used on remaining Work and identify Delays, their extent and causes. For Progress Schedule Submittals, each narrative also shall itemize and explain changes in Activities, calendar, and logic ties schedule recovery plans and Contractor-initiated revisions.
 3. The Schedule Narrative shall include the following components, to communicate to the Authority the Contractor's current plan for performing and completing the Work. A statement:
 - to identify Work items and paths that are critical to the timely completion of the Work;
 - of upcoming activities that the Authority needs to be aware of;
 - of the proposed course of action for recovering any schedule delays;
 - of critical submittals by the Contractor, for the Authority's review;

- of any significant changes to resource for future or past work;
 - of any upcoming information that is important to the operational requirements of the Authority;
 - that alerts the Authority of any potential/future/pending changes in access to or availability of work areas;
 - that highlights future tests, submission of test reports, and approval of test results;
 - that addresses and upcoming phased or total takeover by Authority. Overview of Progress and Changes Since the Last Submittal and Discussion of Potential and Actual Delays
 - that describes the plan and approach to sequencing of the Work
 - that highlights and describes any Change Orders that have been included or are pending for approval.
 - that provides a Glossary of Terms, Schedule Coding, and Abbreviations used in the Contract Schedule
- H. Each narrative shall certify that the Contractor has not been delayed, as of the closing date, by any act, error or omission of the Authority, except as otherwise specifically stated in the narrative or identified in a claim submitted in accordance with the General Conditions of the Contract. Any determination by the Authority will be binding on the Contractor if the Contractor fails to do.
- I. Additional Scheduling Requirements — The Schedule and computer tabulations shall be reviewed jointly at a meeting, with the Authority, for the purpose of verifying:
1. Actual start dates;
 2. Actual completion dates;
 3. Cost value of work reported in place;
 4. Activity percent completion;
 5. Revised logic (as-built and projected) and changes in activity durations, costs, and manpower assigned;
 6. Influence of change orders;
 7. Revisions due to unauthorized modifications;

If any of the required schedule submissions, in this Section, are returned to the Contractor for corrections or revisions, they shall be resubmitted, along with a new computer disk, for approval within ten (10) calendar days after the return.

1.8 CONSTRUCTION SCHEDULE REVISION 0 SUBMITTAL

- A. The initial 90 Day Rev.0 Submittal shall be due within ten (10) Days after receipt of the Notice to Proceed, and shall include the Contractor's detailed plan, with all schedule requirements contained in this Section with at least the first three (3) months of the forthcoming complete Rev. 0 Submittal. This schedule shall be cost/resource loaded and shall identify activities to be

completed and associated cash flows for the first three (3) months. Once reviewed and agreed to by the Authority, the initial schedule will be the basis of the first partial payment. The Contractor may contain a Mobilization Activity in this schedule which shall not exceed 1% of the Bid. Costs associated with Insurance and Bonds may be added to the 1% mobilization dollar value if applicable.

- B. The complete Rev. 0 Submittal (i.e. the full cost and resource loaded Baseline Schedule that also includes the exact activities, logic and durations of the initial 90 Day Rev.0 Submission) shall be due within 30 days of the Authority issuing "Resubmittal not Required" of the initial 90 day Rev.0 submittal or with the second partial payment request, whichever is sooner. The Construction Schedule Rev. 0 Submittal shall reflect the Work as awarded and shall purposely exclude any Delays, Change Orders, "or equal" materials and equipment and substitutions of any kind. Additionally, the Contractor is to ensure that the schedule submission is complete conformance with the intent of the Contract Documents; no proposed alternates will be accepted until presented to the Authority after the full Baseline Schedule has been accepted.
- C. Each Revision 0 Submittal shall include an electronic computer disk with the Contractor's schedule data files (including activity data, logic, coding, resource and cost data), a narrative and four (4) copies of the specified Activity Reports, Time Scaled Logic Diagrams, Cash Flow Plots, Resource Plots, Look Ahead Schedule and Cost Distribution as defined in paragraph 1.05, all in formats, sorts and sequences acceptable to the Authority.
- D. Once the Rev. 0 Submittal (initial and complete baseline) (or Rev. 0A, or Rev. 0B, etc. for a resubmission) is returned to the Contractor as "Resubmittal Not Required," with or without comments or objections noted, it shall become the *As-Planned* Schedule of record. Once established, the *As-Planned* Schedule shall be used as the basis for Progress Schedule Submittals (i.e. Monthly Schedule Updates).
- E. The first partial payment shall be not be made until the Authority returns to the Contractor the Initial 90 Day Rev. 0 Submittal as "Resubmittal Not Required." The second partial payment shall not be made until the Authority returns to the Contractor the complete Rev. 0 Submittal as "Resubmittal Not Required".
- F. In the event the Authority is unable to accept the complete Rev. 0 Submittal and the *As-Planned* Schedule is not established, the Contractor shall submit *unapproved* Progress Schedule Submittals as specified by the Authority, each reflecting the Contractor's approach to completion of Work remaining, progress of the Work and schedule issues in dispute.
- G. The Construction Schedule shall incorporate the Contractor's best estimate of the Activities and logic ties required to perform items covered by allowances within the limits of the Contract Times.

1.9 PROGRESS SCHEDULE

A. PROGRESS SCHEDULE SUBMITTAL

- 1. Schedule Meeting in the first week of each month, the Contractor shall submit a DRAFT Progress Schedule and invoice (4 prints and e-disk) to the Authority and the Consultant. This DRAFT schedule shall include information described in the Section 01322.1.9.A.4 for the previous month. After the Authority's review of this DRAFT schedule and invoice, a schedule meeting with the Contractor will be held in the second week of the month to validate the as-built data and discuss at a minimum: the delays,

recovery plan, change order schedules (subnets), plan vs. performance, manpower, etc. The Contractor shall incorporate the information discussed at this schedule meeting and finally submit Progress Schedule Submittal in the third week of the month.

2. Progress Schedule Submittals statusing the *As-Planned* Schedule Submittal shall be due with each partial payment request, starting with the third request and with each subsequent monthly partial payment request. Progress Schedule Submittal is a prerequisite to processing each Partial Payment Request. The Progress Schedule Submittal shall be returned (“Resubmittal Not Required”) by the Authority prior to processing subsequent Partial Payment Requests. At the Authorities discretion a maximum of three months may be allowed to process Partial Payments without resolving schedule review comments.
3. Each required Progress Schedule Submittal shall include an electronic computer disk with the Contractor's schedule data files (including activity data, logic, coding, resource and cost data), a narrative and four (4) copies of the reports, schedules and plots, defined in paragraph 1.06, all in formats, sorts and sequences acceptable to the Authority.
4. The Contractor shall uniquely identify each Progress Schedule Submittal by using a numbering convention similar to that used on technical Submittals. Resubmissions shall be assigned the corresponding Submittal number and the letter A, or B, or C, etc., and shall fully address all the Authority's review comments and objections on the previous Submittal. If the Contractor fails to fully address all the Authority's review comments and objections in the next Schedule Submission, the Authority may withhold all progress payments until the Contractor addresses all such comments and objections to the satisfaction of the Authority.
5. Progress Schedules Submittals shall reflect progress up to the closing (i.e., data, cut-off) date, forecasted finish for in-progress Activities and re-forecasted Early Dates for Activities planned in the next update period. The current Progress Schedule Submittal should incorporate all proposed Activity, logic and restraint date revisions required to (a) implement changes in the Work, (b) detail all impacts on pre-existing Activities, sequences and restraint dates, (c) recover schedule, (d) reflect the Contractor's current approach for Work remaining, (e) incorporate any accepted Delays that are being negotiated between the Authority and Contractor, and (f) reflect “or equal” or substitution proposals. Progress up to the closing date shall be limited to changes in as-built dates for completed and in-progress Activities. As-built data shall include actual start dates (excluding premature starts), remaining durations, actual finish dates (when dependent Work could/did proceed), Delays and other events significant to the Progress Schedule that occurred since the previous Progress Schedule Submittal.
6. The Authority and Contractor shall employ the accepted Progress Schedule, subject to the Contractor's position on the Authority objections to outstanding schedule issues, to monitor progress against the Contract Time(s), evaluate the effect of Delays on Contract Time and Contract Price and support the justification for any assessment of liquidated damages.
7. In the event the evolution of the Progress Schedule is interrupted, paragraph 1.9 B.3 provides Delay evaluation and Progress Schedule update procedures which shall be binding on both the Authority and Contractor.

8. When change orders or delays are experienced by the Contractor and the Contractor requests an Extension of Time, the Contractor shall submit to the Authority a written Time Impact Analysis illustrating the influence of each change or delay on the current Completion Milestones. Each Time Impact Analysis shall include a 'fragnet' demonstrating how the Contractor proposes to incorporate the change order or delay into the next Progress Schedule Update. This fragnet must be incorporated in a copy of latest accepted schedule update and it should not be included in the monthly updates until it is accepted by the Authority. A fragnet is defined as a sequence of new activities and/or activity revisions that are proposed to be added to the existing schedule to demonstrate the influence of delay and the method for incorporating delays and impacts into the schedule as they are encountered. This fragnet shall be presented with resource and cost loading as well.

B. DELAY PROVISIONS

1. The Contractor shall review the schedule information presented in this Section, and the progress of Work, bi-weekly at the Job Progress Meeting. Unless otherwise directed in writing, by the Authority, whenever this review, as determined by the Authority indicates a late completion of the Work, or should activities shown on the Progress Schedule Submittal slip by ten (10) or more Days beyond any Contract Time or Milestones. The Contractor shall work cooperatively with the Authority, adjacent contractors, and third parties, to identify and implement to the maximum extent possible, no-cost measures to recover all schedule delays, regardless of the cause of the delays. One example of such measures is no-cost re-sequencing of Work activities.

The Contractor shall be required to, at no extra cost to the Authority, prepare and submit a recovery schedule which displays how the Contractor intends to reschedule those activities, in order to regain compliance with the Contract Time or Milestones. The Contractor will also submit a narrative, which shall describe the cause of schedule slippage and actions taken to recover schedule within the shortest reasonable time (e.g., re-sequencing of Work activities, hiring of additional labor, use of additional construction equipment, expediting of deliveries, etc.).

2. Schedule recovery will be excused if the Contractor requests and demonstrates entitlement to an extension in Contract Time, in writing, due to delay(s) not within the control of the Contractor, and the Authority concurs schedule recovery is not required at that time.

Any Contractor request for adjustment in Contract Time and Contract Price will not be evaluated unless (a) the Contractor, using the procedures in this Section and the Contract, shows that conditions justifying adjustments in Contract Time and/or Contract Price have arisen, and (b) the Contractor's analysis is verifiable through an independent review by the Authority of the electronic disk files for the Progress Schedule Submittal provided by the Contractor.

3. In the event the Authority is unable to return any Progress Schedule Submittal as "Resubmittal Not Required," and the effect of Delays on Contract Time and Contract Price need evaluation, both the Authority and Contractor shall employ the *As-Planned* Schedule and not any *unapproved* Progress Schedule Submittal for such evaluations. The procedure for updating the *As-Planned* Schedule and including Activity, logic tie and restraint date revisions is specified in paragraphs 1.9 B.3.A and 1.9 B.3.B, respectively.

- a. The Contractor shall include a subnet demonstrating how the Contractor proposes to incorporate each Change Order into the most recently accepted Schedule. A subnet is defined as a sequence of new or revised activities that are proposed to be added to the Schedule.
 - b. The extension of Contract Time shall be considered only if the Contractor demonstrates via the timely submittal of a detailed schedule analysis by using the contemporaneous window Analysis methodology or other similar methodology acceptable to the Authority. The analysis shall include: a) a detailed narrative which clearly describes the events causing the delay and the resulting impacts to the project schedule; b) documentation substantiating and supporting the delay; c) detailed CPM schedules (both electronic and hard copies) clearly delineating the delay; d) a matrix showing delays caused by any third party and any force majeure delays; e) any additional information reasonably requested by the Authority, in order to enable the Authority to perform a timely and informed analysis of the request for extension of Contract Time.
4. Determination and extension of Contract Time will be in accordance with Article 6.8 and this Section 01322 CONSTRUCTION SCHEDULE. Contractor acknowledges and agrees that the actual delays in activities which, according to the most recent Progress Schedule Submittal accepted by the Authority, do not have any affect on the Contract Time or Milestone shown by the critical path in the network, do not have any affect on the Contract Time or Milestone and therefore will not be the basis for a change therein.
 5. The Contractor's failure, refusal or neglect to comply with the requirements specified in Section 01322 Article 1.9 B.I shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence. If faced with such situation, the Authority may (a) demand adequate, written assurance of due performance, as required in Section 00700 Article 6.10 Termination of the Contract (b) direct alternate schedule recovery actions. If in the judgment of the Authority it appears that the Contractor cannot complete his Work within the scheduled time, then the Contractor shall work overtime, additional shifts or adopt such other procedures as may be necessary to restore adherence to the schedule. The full cost of any such recovery work efforts shall be borne by the Contractor, and/or (c) withhold liquidated damages, as provided in Article 6.9.
- C. The Contractor will provide a separate electronic disk file of the *As-Planned* Schedule statused for all activities in progress or completed through the time periods for each delay issue or significant project events. Each updated schedule will be compared and analyzed, identifying any slippage between the actual dates for any impacted or delayed activities and the *As-Planned* Schedule. This schedule slippage can then be correlated to the Delay Issues that occurred between two (2) schedule update periods.
 - D. For each update window schedule submitted, revisions in Activities, logic ties and restraint dates affecting Work after that update window shall be included only if they are identified and jointly agreed to be incorporated by the Contractor and the Authority.

1.10 MEASUREMENT AND PAYMENT

A. MEASUREMENT

1. Separate Measurement will not be made for the work of this Section complete in place, but all costs, therefore, shall be included in the Contract Lump Sum Price for the work as indicated herein. All preparation and incidental work necessary to accomplish the installation will be considered incidental to the Lump Sum price.

B. PAYMENT

1. Fifteen percent (15%) of the cost associated with the CPM Scheduling Activity will be made upon return to the Contractor of the complete cost and resource loaded CPM Construction schedule Rev.0 Submittal as "Resubmittal Not Required" (As-Planned Schedule). This shall be included in the Contractors Lump Sum breakdown as an Activity within the CPM schedule.
2. The remaining (85%) will be pro-rated in equal amounts on each subsequent application for payment upon the Authority's receipt and approval of the monthly CPM updates. The number of months to be used for the pro-rating will be the number of months estimated to complete the work as defined under Article 6.02 - Prosecution of Work. The final month pro-rated amount will not be made until the final application for payment.
3. All payments are subject to retainage.

C. PAYMENT ITEM

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 01331

CHAMP MANAGEMENT SYSTEM REQUIREMENTS

1.1 DESCRIPTION

- A. This section specifies CHAMP, a software application that is specifically designed to monitor conformity with State and Federal affirmative action and Disadvantaged Business Enterprise (DBE) laws and regulations (see Appendices No.1, 2, and 3). The Authority expects this software to support the administration of Executive Order 11246, 390 and Bill 2142, EEO Requirements and Disadvantaged Business Enterprise Utilization Requirements more efficiently and effectively than typical manual methods. The use of CHAMP will eliminate the need for manual production of weekly work hour reports, DBE Payment forms and annual contractor workforce reports.

1.2 EQUIPMENT

- A. The specified management system is comprised of software products marketed under the trademark CHAMP by Washington and Rice, LLC, 27629 Chagrin Blvd., Suite 201, Woodmere, Ohio, 44122, 216-591-9130. The contractor shall obtain this software from Washington and Rice, LLC.

1.3 DETAILS

- A. The contractor shall import text files of CHAMP compatible payroll data into the CHAMP software. The contractor and all approved subcontractors shall create these payroll files via an export from their computerized company payroll systems and/or manual data entry. After award of the contract and prior to notice to proceed, the contractor shall, if necessary, purchase CHAMP software and arrange for technical support and training from the indicated sources as follows.
 - 1. Washington and Rice LLC.
 - 2. The Contractor shall purchase one copy of the CHAMP Contractor Module (CM) to support the contractor's import of contractor and subcontractor payroll data, compliance monitoring and creation of required CHAMP reports.
 - 3. The Contractor shall purchase a copy (ies) of the CHAMP Subcontractor Module(SM) to support manual entry of payroll data by its subcontractor (s) in instances where a subcontractor (s) does not own CHAMP and cannot create compatible import files from their company payroll system.
 - 4. The Contractor shall obtain file specifications for the payroll import file.
 - 5. The Contractor shall obtain technical advice and assistance regarding software, installation and operation.
 - 6. The Contractor shall obtain CHAMP training from an Authority approved vendor.

1.4 BASIS OF ACCEPTABILITY:

- A. For the duration of the contract, the Contractor shall keep the CHAMP software updated with contractor and subcontractor data;
- B. The Contractor shall provide a diskette containing the exported contract file and hard copies of required reports in accordance with established submittal procedures, and;
- C. The Contractor shall install vendors issued upgrades and maintain the software to ensure data submissions are made using the most recent version of the software.
- D. The contractor shall bear all costs associated with the purchase of all hardware, software and training associated with the CHAMP Management Program.
- E. The contractor or its subcontractors shall not re-sell any module of the CHAMP Management Program

1.5 SYSTEM FEATURES

- A. Champ-CM provides the following features:
 - 1. **Work Force Utilization**
 - a. Establish goals for project by race, gender, and craft
 - b. Automatic assignment of work force hours to projects
 - c. Import work hours capability
 - d. Graphic display of work hours actual versus goals
 - 2. **On-Job-Training (OJT)**
 - a. Establishes OJT Plan for projects
 - b. Track Hours for Apprentices and trainees
 - c. Presents OJT graphic information
 - 3. **DBE Monitoring**
 - a. Establishes DBE goals for project
 - b. Tracks payments to Prime & DBE's.
 - 4. **Reporting**
 - a. Generates monthly utilization reports
 - b. Generates form 1391
 - c. Work Force information
 - d. DBE summary
 - e. Work Force listings.

1.6 MINIMUM SYSTEM REQUIREMENTS

- A. Computer and related components
 - 1. A 486DX computer or higher
 - 2. 8 Megabytes or more of memory
 - 3. 128 Cache memory
 - 4. 1 megabyte VRAM
 - 5. PC-DOS or MS-DOS version 3.3 or higher

6. Microsoft Windows 3.1 or higher
7. A 3.5" high density disk drive
8. 25 MB hard disk space for the deployment DLLs, Database, BD files, ODBC and EXE
9. VGA display
10. Windows supported mouse

1.7 GENERAL

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item of work to which they pertain.

END OF SECTION

SECTION 01400

QUALITY ASSURANCE

GENERAL

1.1 DESCRIPTION

- A. This Section specifies the general requirements for quality assurance and quality control including source of supply and quality of materials, acceptance testing by the Engineer, control testing by the Contractor, off-site inspection, inspection and use of local materials, inspection of proportioning plants and coordination of finishes.
- B. Quality Assurance Program: The Contractor is responsible for controlling the quality of Work including work of its Subcontractors and suppliers and for assuring that the specified quality is achieved. The Contractor, Subcontractors and suppliers shall establish, maintain and implement a written Quality Assurance Program meeting the requirements of U. S. Department of Transportation Quality Assurance and Quality Control Guidelines (FTA-MA-06-0189-92-1). The Program shall be tailored to the scope and complexity of the Work and shall include implementing procedures and inspection forms equal to those included at the end of this Section. Subcontractors or suppliers may use the Contractor Quality Assurance Program in lieu of developing their own.
- C. The overall administration of the Quality Program shall be vested in a responsible section of the Contractor's organization. This section shall contain a QC Organization headed by an on-site QC Manager who has clear access to top-level management and to Subcontractors' officers responsible for the execution of the Subcontractor's QC Program. The QC Manager's sole duty is to manage and administer the QC Program unless otherwise authorized in writing by the Engineer. Such authorization can be withdrawn at any time. The QC Manager shall have at least five (5) years experience in quality control inspection on construction projects.
- D. The QC Organization shall be staffed by technically competent personnel with freedom to make decisions without pressure or bias and shall have sufficient authority to ensure that quality requirements are consistently maintained.

1.2 SUBMITTALS

- A. The Contractor shall submit within three weeks of the Notice to Proceed the Quality Assurance Program to be used on the project by the Contractor and Subcontractors. The resume of the Contractor's Quality Control Manager shall be included with the submittal. Changes to the Quality Assurance Program shall be submitted for approval prior to implementing the changes.
- B. The Contractor shall submit the name, address, and qualifications, together with the scope of proposed services, of proposed inspection or testing firms to the Engineer for approval at least 30 days prior to the scheduled commencement of any work involving such inspection or testing.
- C. Test Reports - Within five days after completion of testing performed by or for the Contractor, submit test results to the Engineer. The Contractor shall identify the test reports to be submitted as required in Section 01300. Test reports shall be identified with the information specified for samples in Section 01300 and additionally, the name and address of the organization performing the test, the date of the tests and a signature of an authorized representative attesting to the validity of the test results.

1.3 DELIVERY, STORAGE, AND HANDLING (Not Applicable)

1.4 QUALITY ASSURANCE

A. Source of Supply and Quality

1. If the Engineer so desires, materials will be approved at the source of supply before delivery.
2. Unless otherwise stipulated the Contractor shall furnish all materials required for the Work specified in the Contract, and said materials shall meet the requirements of the Specifications for the kind of Work involving their use.
3. Unless otherwise provided, only new and first quality materials conforming to the requirements of the Specifications and approved by the Engineer shall be used in the work, except for material used by the Contractor for his convenience and which is not to be permanently incorporated in the work.
4. After testing if the sources of supply that have been approved do not furnish a uniform product or if the product from such sources proves unacceptable at any time, the Contractor shall, at no additional expense to the Authority, take any and all steps necessary to furnish acceptable materials.
5. Materials such as crushed stone, gravel borrow, or ordinary borrow, shall be sampled at the source and, if satisfactory, given preliminary approval for use. Samples shall be taken by or in the presence of the Engineer. The Contractor shall furnish such facilities as the Engineer may require for collecting and forwarding samples to the Authority Laboratory. Samples shall be furnished without charge and with any shipping charges prepaid. However, preliminary approval by the Engineer does not relieve the Contractor of the responsibility for placing satisfactory material in the Work as determined by subsequent samples taken at the source or on the Contractor site, prior to the material being incorporated into the Work and if the Contract site samples test satisfactorily the material will be considered to meet the Contract requirements as to quality. If such sampling and testing reveal that the material is unsatisfactory it shall be removed from the Work or blended in with such other materials so that an acceptable material will be produced. Removal and blending of such material shall be done by the Contractor without additional compensation.

B. Rights of Access

The Engineer may make visits at the proportioning plant or source of supply to audit or inspect the production of material, or the manufacture of products. These visits, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer or manufacturer. The Contractor shall assure that "Rights of Access" clauses are contained in the purchase document with the producers of materials or manufacturers of products allowing the Engineer, or an authorized representative, to have free entry at all times to such parts of the off-site plant concerned with the manufacture or production of the materials. Adequate work facilities at the off-site plant, shall be furnished free of charge to the Authority for its use during audits or inspections. The Engineer assumes no obligation to inspect materials at the source of supply. The responsibility of incorporating satisfactory materials in the Work rests entirely with the Contractor, notwithstanding any prior inspections or tests.

C. Acceptance Testing

1. Acceptance testing is the testing of materials and workmanship by the Engineer for acceptance of the completed Work. The Engineer will perform acceptance testing of materials and workmanship in

accordance with the Contract Documents and reserves the right to perform additional testing at any time to determine conformance with the Contract requirements.

2. Acceptance testing by the Engineer is not to be considered a replacement for control testing conducted by the Contractor or a manufacturer producing materials for the Contract. Acceptance testing will be at the expense of the Authority.

D. Hold and Notification Points

The Contractor will be required to notify the Engineer when certain activities will be performed. These notifications and time requirements will be detailed in the various sections of the Specification. There will be two types of notifications as follows:

Hold Point - A point in a function or process in which the Engineer performs a planned inspection and beyond which work may not proceed without prior approval from the Engineer.

Notification Point - A point in a function or process in which the Engineer may perform an inspection. The Engineer must be notified at this point and work may proceed.

Failure to provide sufficient notice to the Engineer or violating a "Hold Point" may result in the subsequent rejection of the work. Any correction of the work will be at the expense of the Contractor.

E. Control Inspection and Testing

1. Control inspection and testing are the testing or inspection of materials prior to their delivery from a manufacturer, or during construction. Examples of such testing are soils tests before and after compaction, concrete tests during placement, except for concrete strength tests that the Engineer will perform, and other tests and inspections specified in the various sections of the Specifications to ensure compliance with Contract requirements. The Contractor shall assume full responsibility for control inspection and testing and give sufficient notice to the Engineer to permit the witnessing of the inspections or tests. Control inspection and testing shall be at the expense of the Contractor and may be performed by independent firms.

Notification Point - The QC Manager shall make periodic site inspections of the work areas with the construction supervisors to assure that there are no conditions that would affect the quality of the installation or product. Deficient areas shall be identified, causes identified and deficient conditions corrected. Inspections shall be documented on the "General Inspection Form" contained at the end of this Section. The Contractor shall notify the Engineer in advance of the periodic inspections to allow participation by the Authority.

F. Coordination of Finishes

1. Within a reasonable time after Award of Contract, and unless otherwise included in the Contract Drawings the Engineer will provide a color coordination schedule designating colors and textures of finish materials in areas where required.
2. It is the intent of the Contract Documents to produce harmony of matching finish, texture, and color throughout various components of the Project.
3. Work coordination of like materials to achieve the above-mentioned intent is required by submitting to the Engineer for approval pilot samples of acceptable ranges of color variation and of finish textures. Coordination is especially required for concrete surfaces: metals including anodized aluminum; glass;

- sealants; hardware; floor, wall and ceiling coverings; painted surfaces; equipment items; and paving of dry nature.
4. Upon obtaining the Engineer's acceptance of any range of colors and textures, furnish the Engineer with one record set of samples, or more if required, and keep sufficient sets for use in coordinating conformity with this record set.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item of work to which they pertain.



HIGH STRENGTH BOLTING CHECKLIST ROTATIONAL CAPACITY TEST

DATE: _____

DATE OF TEST _____

CONTRACTOR _____

CONTRACT NO. _____

PAY ACTIVITY _____

SUBMITTAL _____

TEST NO. _____

ITEM TESTED

SIZE AND DESCRIPTION	MFG.	MARKING	LOT NO.	FINISH
BOLT				
NUT				
WASHER				

ROTATIONAL CAPACITY LOT NUMBER: _____

TEST RESULTS

	RESULT TEST 1	RESULT TEST 2	PASS		FAIL	
MINIMUM TENSION REQUIRED						
TORQUE AT MINIMUM TENSION						
TENSION AFTER FULL ROTATION						

COMPUTED TORQUE VALUE: _____

TEST WAS CONDUCTED USING: SKIDMORE SERIAL NO.: _____ CAL. DATE: _____
 SOLID PLATE

TORQUE WRENCH USED: SERIAL NO.: _____ CALIBRATION DATE: _____

DEGREE OF ROTATION: _____
REMARKS: _____

RCL TEST SHEETS FOR ALTERNATE DESIGNED FASTENER WILL BE FURNISHED UPON REQUEST

CONTRACTOR REPRESENTATIVE _____ DATE _____

MBTA _____ DATE _____



CONCRETE PLACEMENT CARD

DATE:	CONTRACTOR:	CONTRACT NO.
CONCRETE PLACEMENT NO:	SCHEDULED PLACEMENT DATE:	
STRUCTURE	ELEVATION: FROM	TO
ACTUAL PLACEMENT DATE:	TIME:	START: FINISH:
TYPE MIX:	ESTIMATED QUANTITY-CY	ACTUAL
PLACEMENT FOREMAN:	MBTA INSPECTOR	

CONTRACT DOCUMENTS:

REMARKS:

PREPLACEMENT CHECKS

ITEM	CONTRACTOR INSPECTOR	MBTA INSPECTOR	REMARKS
EXCAVATE AND SUBGRADE			
FORMS – LINE AND GRADE			
FORMS – BRACED, READY TO POUR			
RE-STEEL - QUANTITY/LOCATION/TYPE			
RE-STEEL - SECURE AND CLEAN			
WATER STOPS/SEALS, JOINT PREP.			
PIPE – QUANTITY-SECURE-ELEV.			
ELEC. CONDUIT-QTY-SECURE-ELEV.			
GROUND WIRE			
ANCHOR BOLTS & RODS/EMBED ITEMS			
FORMS HEATED IN COLD WEATHER			
COLD WEATHER CURING PRECAUTIONS			
CLEAN-UP INSIDE FORMS			
METHODS OF CURING			
SLURRY			
GUIDE WALLS IN TOLERANCE			
BENTONITE SLURRY TESTING			
OTHER (IDENTIFY)			
O.K. TO PLACE CONCRETE		MBTA INSP.	DATE:



EXPANSION/EPOXY EMBEDDED ANCHORS INSTALLATION AND INSPECTION REPORT

DATE: _____

CONTRACT NO.:

CONTRACTOR:

ATTACHMENT LOCATION:

DRAWING/REV.:

SUBMITTAL:

PAY ACTIVITY:

TYPE, SIZE, NUMBER OF ANCHORS:

PREPLACEMENT CHECKS

INSPECTOR CHECKPOINTS	CONTRACTOR	DATE	MBTA	DATE
CONCRETE SURFACE				
ANCHOR HOLE LOCATION SURVEY AND MARKED				
EPOXY INJECTION SATISFACTORY				
TEMPERATURE RANGE SATISFACTORY				
TORQUE TEST				
ANCHORS INSTALLED CORRECTLY				

TEST WRENCH ID: _____ CALIBRATION DUE DATE: _____

REMARKS:



FIELD COATING INSPECTION REPORT

DATE: _____

CONTRACT NO.: _____ CONTRACTOR: _____

LOCATION: _____

ITEM DESCRIPTION: _____

COATING DATE: _____ 1ST 2ND 3RD

AREA INSPECTED: _____

SUBMITTALS: _____ DRAWING/REV.: _____

PAY ACTIVITY: _____

<u>INSPECTIONS</u>	CONTRACTOR	DATE	MBTA	DATE
SHELF LIFE/STORAGE TEMPS NOT EXCEEDED; UNOPENED ORIGINAL CONTAINERS WITH LABELS. BATCH NUMBER _____				
SURFACES TO BE COATED ARE CLEANED OF OIL, GREASE AND OTHER DETRIMENTAL MATERIAL				
TOUCH UP BARE OR ABRADED SURFACES WITH APPROVED COATING				
FIELD CONNECTIONS (WELD, BOLTING) SURFACES CLEANED AND PROFILED PRIOR TO PRIMER				
MATERIALS MIXED AND PREPARED TO MANUFACTURER'S RECOMMENDATIONS				
APPLICATION TO MANUFACTURER'S SPECIFICATIONS				
CURE TIME ACHIEVED PRIOR TO COATING				
COLOR AS SPECIFIED				
COATING THICKNESS (DFT) REQUIRED ACTUAL _____ _____				
ENVIRONMENTAL RECORD SURFACE TEMP _____ HUMIDITY _____ AMBIENT TEMP _____ DEW POINT _____ SURFACE CONDITIONS _____ WEATHER CONDITIONS _____				
REMARKS: 				



GROUTING INSPECTION REPORT

DATE: _____

CONTRACT NO.: _____ CONTRACTOR: _____

LOCATION: _____

DRAWING/REV.: _____ SUBMITTAL: _____

SUBMITTAL: _____

DESCRIPTION OF _____

GROUT TYPE/ID: _____ PAY ACTIVITY: _____

<u>INSPECTIONS</u>	CONTRACTOR	DATE	MBTA	DATE
RELEASE OF ITEM FOR GROUT				
SURFACE PREPARATION COMPLETE				
SURFACE DAMP FOR REQUIRED TIME				
ALL VOIDS FILLED				
COLD WEATHER PROTECTION				
GROUT CURE COMPLETE <input type="checkbox"/> MOIST MEMBRANE <input type="checkbox"/>				

PRESSURE GROUT

RELEASE OF ITEM FOR GROUT	
EXCESS WATER REMOVED	
TENDONS GROUTED WITHIN (15) DAYS OF STRESSING	
GROUT PUMPED CONTINUOUSLY UNTIL CONSISTENT AT UPPER VENT (A STEADY STREAM OF GOOD GROUT BEFORE CLOSING)	
PRESSURE # _____ HOLD TIME _____ BEFORE CLOSING	
REMARKS:	



MATERIAL RECEIVING INSPECTION REPORT

CONTRACT NO.: CONTRACTOR:

DATE: REPORT NO.:

MATERIAL RECEIVED:

DESCRIPTION:

QUANTITY:

SUBMITTAL NO.:

ACTIVITY NO.:

MANUFACTURER/SUPPLIER

RECEIVING INSPECTION REQUIREMENTS

REQUIREMENTS	REQ'D	REQ'D	SAT	UNSAT	REQUIREMENTS	SAT	UNSAT	N/A
MATERIAL CERTIFICATION					PHYSICAL CONDITION			
CERTIFICATE OF COMPLIANCE					PACKAGING			
SPECIAL TEST REPORTS					CLEANLINESS			
MANUALS					IDENTIFICATION/MARKINGS			
OWNER RELEASE FORM								

STORAGE AND MAINTENANCE REQUIREMENTS:

MATERIAL COMPLIES WITH CONTRACTURAL REQUIREMENTS: YES NO

COMMENTS:

CONTRACTOR REPRESENTATIVE

DATE:

MBTA REPRESENTATIVE

DATE:



POST TENSIONING INSPECTION REPORT

DATE _____

CONTRACT NO.:	CONTRACTOR:
DRAWING/REV.:	SUBMITTALS:
IDENTIFICATION/DUCT NUMBER:	
PAY ACTIVITY:	

				SURVEY			
				CONT	MBTA		
PLACEMENT	INSPECTION	CONTRACTOR	DATE			MBTA	DATE
	ELEVATION OF DUCT						
	DUCT PROFILES SMOOTH & CORRECTLY SHAPED						
	DUCT JOINTS MATED & SEALED WITH DUCT TAPE						
	ALL HOLES IN DUCT REPAIRED						
	SECURED TO PREVENT DISPLACEMENT DURING CONCRETING						
	DRAINS INSTALLED AT LOW POINTS						
	VENTS INSTALLED AT HIGH POINTS						
	BEARING PLATES SECURELY ATTACHED, ELEVATIONS & CONFIGURATION						
TENSIONING	ANCHOR HEADS FREE FROM CORROSION						
	WEDGES FREE OF RUST & STEEL SHAVINGS						
	PRESTRESSING STEEL FREE FROM CORROSION AND PROTECTED						
	EACH DUCT HAS THE SAME HEAT/REEL NUMBER INSTALLED						
	TENDONS STRESSED SLOWLY- 9 ONE END 9 BOTH						
	WEDGES SEATED EVENLY						
	TAILS CUT BY SAW						
	EQUIPMENT ID _____						

	HEAT/REEL # _____						
	ELONGATED MARK INITIAL _____ FINAL _____						
	FINAL ELONGATION REQUIRED _____ ACTUAL REQUIREMENT _____ 5% MAX D						
	Final Tension						
REMARKS							



STRUCTURAL STEEL INSPECTION REPORT

DATE: _____

CONTRACT NO.: _____ CONTRACTOR: _____

STRUCTURE: _____ WELDING CODE: _____

DRAWING/REV.: _____ PAY ACTIVITY: _____

SUBMITTAL: _____

AREA/LOCATION/ELEVATION/GRID/BAY/COL.LN. _____

CONFIGURATION	ITEM	INSPECTION	CONTRACTOR	DATE	SURVEY		MBTA	DATE
					CONT	MBTA		
	1.	ANCHOR BOLTS						
	2.	BASEPLATE ELEVATION & BEARING						
	3.	BRIDGE BEARING TYPE & LOCATION						
	4.	COLUMNS/BENTS						
	5.	BEAMS/GIRDERS						
	6.	EXPANSION JOINTS						
	7.	STIFFENERS						
	8.	DECK INSTALLATION						
	9.	HIGH STRENGTH BOLTING						
	10.	EXPANSION ANCHORS						
	11.	WELD INSPECTION COMPLETE						
	12.	FINAL ELEVATION TOP OF STEEL						

REMARKS



NO.

MBTA RESOLUTION REPORT

DESIGN CHANGE

NONCONFORMANCE

CONTRACTOR:

CONTRACT NO.

DOCUMENT AFFECTED: SPEC:

DWG:

OTHER:

DESCRIPTION:

ORIGINATOR:

DATE:

RES. ENG:

DATE:

DISPOSITION: DESIGN CHANGE NONCONFORMANCE ACCEPT AS IS REWORK REPAIR

PREVENTIVE ACTION:

DESIGNER:

DATE:

RES. ENG:

DATE:

PROJ. MGR:

DATE:

QA MGR:

DATE:

CORRECTIVE/PREVENTIVE ACTION COMPLETE:

CONTRACTOR:

DATE:

MBTA INSP:

DATE:

RES. ENG:

DATE:

OTHER:

DATE:

GENERAL CONSTRUCTION INSPECTION REPORT

Contract No: _____

Contract Title: _____

Inspection Date: _____

Plan No(s): _____

Specification Section(s): _____

Inspection Description (State The Work Inspected)

Results Of Inspection Including List of Deficiencies Noted, or State "No Deficiencies"

Contractor's Representative: _____ **Date:** _____

Signature

QC Manager: _____ **Date:** _____

Signature

END OF SECTION

SECTION 01500

CONSTRUCTION TEMPORARY FACILITIES AND TEMPORARY CONTROLS

1.1 DESCRIPTION

- A. This Section specifies the general requirements for furnishing, installing, operating and removing construction temporary facilities and temporary controls during construction.

1.2 TEMPORARY FACILITIES AND SERVICES DURING CONSTRUCTION

- A. During the progress of the Work, provide all temporary facilities and services not limited to, the following:
 - 1. Water Supply
 - a. Make all arrangements for obtaining temporary water connections, and pay all costs thereby incurred. Furnish, install and pay for all piping and equipment required to provide water for the execution of the Work.
 - b. Have location, material, and installation for all temporary piping lines and connections approved by the Engineer. Water for construction purposes may be distributed by means of connections to the permanent system, if available when required, at the expense of the Contractor. Make connections for temporary water to comply with all applicable codes for buildings under construction and fire safety regulations. Remove temporary connections and restore the permanent system as approved by the Engineer.
 - c. Pay all costs of water until final acceptance of the Work.
 - d. Provide drinking water with suitable cups for all personnel and workmen on the job.
 - e. Remove the temporary water service at the completion of the Work.
 - 2. Light and Power
 - a. Provide and maintain, including power or fuel, sufficient lights for the safety of construction forces and to insure the proper construction, inspection and prosecution of the Work, in addition to any lights necessary to protect the Work or the traveling public (see Section 01560, Article 1.06 and Section 01570, Article 1.04).
 - b. Make application to the local private utility company for the necessary temporary electric service (see Article 5, of the General Conditions, Subsection 5.02, Permits and Licenses).
 - c. Furnish and install all temporary wiring, extension cords, sockets, and all lamps, both initial and replacement, used for temporary power and lighting systems.
 - d. Remove temporary power and lighting systems at completion of the Work.
 - e. When permanent electrical power and lighting systems are in operating condition, said systems or portions thereof may be used, in lieu of the temporary service, for construction purposes, provided that the Contractor, (1) assumes full responsibility for the entire power and lighting systems, and

(2) pays all costs for operation and restoration of the systems including relamping just prior to occupancy by the Authority.

3. Fire Protection

- a. Take all necessary precautions to prevent fires at the Work. Provide and maintain adequate facilities for extinguishing fires, taking special precautions in the storage and use of solvents, paints, adhesives, and other flammable materials. No on-site burning or storage of rubbish will be allowed.

4. Weather Protection and Heating During Construction

- a. Provide temporary, weather-tight enclosures and heat to permit construction work to be carried on during the months of November through March. These requirements are not to be construed as requiring enclosures or heat for operations that are economically infeasible to protect in the judgment of the Engineer. Included in this category, without limitations, are such items as Site Work, Excavation, Pile Driving, Steel Erection, Erection of Certain Exterior Wall Panels, Roofing, and similar operations.
- b. "Weather protection" means the temporary protection of that Work adversely affected by moisture, wind and cold, by covering, enclosing, heating or a combination thereof. Provide adequate protected working areas during the months of November through March as determined by the Engineer and consistent with the approved construction schedule to permit the continuous progress of Work necessary to maintain an orderly and efficient sequence of construction operations. Furnish and install weather protection material and be responsible for costs, including heating required to maintain a minimum temperature of 40 deg F at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Documents with added regard to performance obligations of the Contractor.
- c. As necessary and within 30 days prior to its expected need, submit to the Engineer in writing, for approval, three copies of proposed methods for weather protection and heating during the construction of those items requiring such protection.
- d. Installation and operation of weather protection and heating devices shall comply with safety regulations, including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.
- e. Furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Engineer. Provide one additional accurate Fahrenheit thermometer for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.
- f. Assume all risks of damage by the elements to the work under the Contract.
- g. Protect work carried on, or materials used in the work or stored during extreme weather, against freezing, drying, wetting, snow or other harmful conditions, and heat, cover, or protect as required by good practice or as directed by the Engineer.
- h. Heating during construction shall mean providing protection from cold and moisture by covering, enclosing and heating materials and work under construction and providing suitable working conditions in all areas for all trades employed on the work. Provide all heating during construction

and pay costs, including fuel, incurred. Supply and maintain means of properly heating the facility until it is accepted.

- i. For facilities and areas not presently being heated from existing sources, and as a result of construction, provide heating and ventilation in enclosed areas within the contract limit lines from the time of enclosure until the acceptance of the Project. The temperature shall:
 - 1) not be less than specified in any Section of the Specification.
 - 2) not be less than that recommended by the manufacturers of the materials incorporated in the Project, whether specified in the pertinent Section or not.
 - 3) be made available sufficiently in advance of any predetermined operation requiring advance heating before operations commence.
 - 4) not be less than required for the protection of all installed work as determined by the Specifications or determined by the Engineer within the range of not less than 55 deg F nor more than 75 deg F.
 - 5) The ventilation shall be adequate for:
 - a) the areas (volumes involved).
 - b) the personnel employed therein.
 - c) the operations planned, under execution or executed.
 - d) the insuring of no adverse toxic conditions.
 - 6) Heat and ventilation within buildings shall be, at all times, uniform and constant and shall have such controls as to insure this requirement, regardless of variances in external temperatures.
- j. Where the Contract includes more than one building, temporary heating shall be provided for each building, in accordance with the above provisions
- k. The permanent heating system may be utilized for temporary heat if specifically authorized by the Engineer.
- l. Salamanders shall be allowed for unenclosed form of work and structural concreting operations only with the approval of the Engineer.
- m. Unit heaters or other methods of heating shall meet with the approval of the Engineer. Install unit heaters and other heating equipment and operate in such a way that finished work will not be damaged. Any surface damaged by the use of unit heaters or other heating methods selected by the Contractor shall be repaired or refinished to the satisfaction of the Engineer at no cost to the Authority.
- n. Provide operating labor for continuous direct attendance, including frequent inspection of the system, emergency repairs, and keeping of temperature records. Continuous direct attendance shall include Saturdays, Sundays, and holidays, throughout the progress of the Work, unless

otherwise permitted by the Engineer and so certified in writing.

1.3 SANITARY PROVISIONS

- A. Provide and maintain in a neat and sanitary condition, properly secluded, such accommodations for employees as may be necessary to conform to the Commonwealth of Massachusetts Department of Public Health Sanitary Code and all local by-laws and ordinances. Necessary conveniences, properly secluded, shall be provided and maintained for the use of the Engineer, satisfactory to the Engineer and sanitary authorities. No public nuisance will be tolerated.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item or items of work to which they pertain.

END OF SECTION

SECTION 01545

PROTECTION OF WORK AND PROPERTY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the general requirements for the temporary protection of work and property during the Contract period.

1.2 TEMPORARY PROTECTION

- A. Protect the following:
 - 1. Sills, jambs and heads of openings through which materials are handled;
 - 2. All finished surfaces, such as walls, doors, floors, ceilings, treads, and platforms, against damage, mortar droppings, oil, grease, paint, or other material which will stain or mat the finished surface;
 - 3. Roof surfaces where any activity must take place on finished roofing in order to carry out the Contract.
- B. After work is properly completed, be responsible for protecting work and for repairing, replacing, and cleaning of damaged work, so that all work is in the specified condition at the time of acceptance of the facility.
- C. Remove all temporary protection and coverings at the completion of the Work.

PART 2 - PRODUCTS (Not Used).

PART 3 - EXECUTION (Not Used).

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item or items of work to which they pertain.

END OF SECTION

SECTION 01550

HOT WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies "Hot Work" fire control procedures for contractors and their personnel, including cutters, welders and operators of heating equipment. Hot work is any work that utilizes or produces an ignition source.

1.2 SUBMITTALS

- A. Perform "Hot Work" operations as follows:
1. Ensure the safe handling of "Hot Work" equipment and the safe use of the particular "Hot Work" process.
 2. Determine the combustible materials and hazardous areas present or likely to be present in the work locations.
 3. Protect combustibles from ignition by the following:
 - a. Have work moved to a location free from dangerous combustibles.
 - b. If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustible properly shielded against ignition.
 - c. See that "Hot Work" is so scheduled that any operation which might expose combustibles to ignition is not started during the "Hot Work".
 4. Give notice to the project office of the need to perform "Hot Work" operations and secure authorization from the Engineer.
 5. Ensure that the cutter or welder secures his or her supervisor's approval that conditions are safe before going ahead with the work.
 6. Ensure that fire protection and extinguishing equipment are properly located at the site.
 7. Where fire watchers are required, see that they are available at the site.
 8. Shall not use the signal rail system of a single rail track circuit as a negative return.
 9. Procure all required permits as per Document 00700 - GENERAL CONDITIONS, Articles 5.1 and 5.2.
- B. Ensure the worker handles the "Hot Work" equipment safely and uses it so as not to endanger lives or property and:
1. has the approval of his or her supervisor and the MBTA project office before starting any "Hot Work";
 2. does not perform any "Hot Work" where conditions are not safe;

3. continues to perform "Hot Work" only so long as conditions are unchanged from those under which approval was granted.

1.3 FIRE PREVENTION PRECAUTIONS

- A. Permit "Hot Work" only in areas that are or have been made fire-safe. Within the confines of a building or other enclosed structure, perform cutting and welding operations preferably in a specific area designed or approved for such work, such as a maintenance shop or a detached outside location. Ensure that such areas are of noncombustible or fire resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. When work cannot be moved practicably, as in most construction work, make the area fire-safe by removing combustibles or protecting combustibles from ignition sources.
- B. Do not permit "Hot Work" in the following situations:
 1. In areas not authorized by the project office;
 2. In sprinklered buildings while such protection is impaired;
 3. In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts;
 4. In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulphur, baled paper or cotton.
- C. Before "Hot Work" is permitted, the Engineer will give notification authorizing the "Hot Work", and designate precautions to be followed. He will have designated MBTA personnel inspect the work area for fire safety, as indicated herein, and which personnel will complete a "Hot Work" checklist. The Engineer will also assure himself of the following:
 1. The "Hot Work" equipment to be used is in satisfactory operating condition and in good repair.
 2. Where there are combustible materials such as paper clippings, wood shavings or textile fibers on the floor, sweep the floor clean for a radius of 35 feet. Keep combustible floors wet, covered with damp sand, or protected by fire resistant shields. Where floors have been wet down, protect personnel operating arc welding or cutting equipment from possible shock.
 3. Where practicable, relocate combustibles at least 35 feet from the work site. Where relocation is impracticable, protect combustibles with flame proofed covers or otherwise shield with metal or fire resistant guards or curtains. Secure edges of covers at the floor so they are tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile.
 4. Tightly cover wall or floor openings or cracks within 35 feet of the site to prevent the passage of sparks to adjacent areas.
 5. Suitably protect or shut down ducts and conveyor systems that might carry sparks to distant combustibles.
 6. Where "Hot Work" is done near walls, partitions, ceilings or roofs, or combustible construction, provide fire resistant shields or guards to prevent ignition. If welding is to be done on a metal wall, partition, ceiling or roof, take precautions to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, provide a fire watch on the opposite side of the work. Do not

- attempt welding on a metal partition, wall, ceiling or roof having a combustible covering, nor on walls or partitions of combustible sandwich type panel construction.
7. Do not undertake to perform "Hot Work" on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs if the work is close enough to cause ignition by conduction.
 8. Provide sufficient quantities of portable fire extinguishers, appropriate for the type of possible fire, at the work area. Where hose lines are available, connect them so they are ready for service.
 9. Suitably protect nearby personnel against heat, sparks, slag, etc.
- D. Require the services of Fire Watchers whenever "Hot Work" is performed in locations where other than a minor fire might develop, or where the following conditions exists:
1. Appreciable combustible material in the building construction or contents is closer than 35 feet to the point of operation.
 2. Appreciable combustibles are more than 35 feet away, but are easily ignited by sparks.
 3. Wall or floor openings within a 35 foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
 4. Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings or roofs, and are likely to be ignited by conduction or radiation.
- E. Fire Watcher's responsibilities include:
1. Have fire extinguishing equipment readily available and be trained in its use.
 2. Be familiar with facilities for sounding an alarm in the event of fire.
 3. Watch for fires in exposed areas, and try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm.
 4. Maintain a fire watch for at least one half hour after completion of "Hot Work" operations to detect and extinguish possible smoldering fires.
- F. Where a Fire Watch is not required, make a Final Check Up one half hour after the completion of "Hot Work" operations to detect and extinguish possible smoldering fires.
- G. Have "hot tapping" operations or other cutting or welding on a flammable gas or liquid transmission or distribution utility pipeline performed only by a crew qualified to make hot taps.

PART 2 - PRODUCTS (Not Used).

PART 3 - EXECUTION (Not Used).

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section. Costs in connection therewith will be considered incidental to the item or items of work to which they pertain.

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies the general requirements for furnishing, installing, and operating temporary controls during construction.

1.2 DEBRIS AND CLEAN UP

- A. Debris shall:
 - 1. not be permitted to accumulate: the Work shall at all times be kept satisfactorily clean. Remove debris and rubbish as required by the Engineer.
 - 2. not be disposed of on-site. Under no circumstances shall open fires or incinerators be used for disposal of rubbish or debris.
- B. Disposal of debris:
 - 1. Do not throw rubbish, debris, and waste material from windows, platforms, or other parts of the facility. Wet down rubbish, dirt, and other dust-producing materials from time to time if it cannot be removed from the site in a timely manner.
 - 2. Immediately after unpacking, remove and dispose of all packing materials, case lumber, excelsior, wrapping, or other rubbish from the site.
- C. Cleanup:
 - 1. Be responsible for all breakage of glass from the time the glazier has completed his work until the Contract is accepted by the Authority. Replace all broken glass and deliver the entire facility with all glazing in the specified condition, without any blemishes, intact and clean. Broken glass shall be replaced in kind: the replacement of special glass shall conform to the original specification and the integrity of special sash shall be retained as specified.
 - 2. Prior to final inspection, the entire exterior and interior of the facility within the Contract limit lines shall be cleared of all rubbish and thoroughly cleaned by the Contractor, including, but not restricted to, the following:
 - a. all construction facilities, debris, and rubbish shall be removed from the site.
 - b. all finished surfaces within the facility shall be swept, dusted, washed, and polished. This includes cleaning of the work of all finished trades where needed, whether or not cleaning for such trades is included in their respective specifications:
 - c. pipe and duct spaces, chases, and crawl spaces shall be thoroughly clean:
 - d. all equipment shall be in an undamaged, bright, clean, polished condition:
 - e. all glass shall be washed and polished, both sides.

- D. The Contractor shall have full responsibility for cleaning up during and immediately upon completion of his work, shall remove all rubbish, waste, tools, equipment, and appurtenances caused by and used in the execution of his work, leaving the site clean, free of debris and in proper condition.
- E. Equipment or material shall not be left within any of the aforementioned areas after acceptance of the Contract without the written permission of the Engineer. Do not abandon any material at or near the site regardless of whether or not it has any value.

1.3 LAWS TO BE OBSERVED

A. Air Pollution Control

1. Comply with the provisions of Section 142B of Chapter 111 of the General Laws pertaining to air pollution within the Metropolitan Air Pollution Control District. The burning of trees, brush, and other combustible materials will not be permitted. Provide satisfactory methods of disposal without additional compensation.
2. On all Federal Aid Projects, submit evidence, to the Engineer, that the governing criteria issued by agencies of the U.S. government pertaining to prevention and control of air pollution can be met.

B. Prevention of Water Pollution

1. Attention is directed to Section 42 of the Massachusetts Clean Waters Act (Chapter 21 of the General Laws as amended).
2. On all Federal Aid Projects, submit evidence to the Engineer that the governing criteria issued by agencies of the U.S. government pertaining to prevention and control of water pollution can be met.
3. Further, during the performance of all work under the Contract, take sufficient precautions in the conduct of operations necessary to avoid contaminating water in adjacent streams or pond areas. All earthwork, grading, moving of equipment, water control in foundation areas, and other operations likely to create silting, shall be planned and conducted so as to avoid or minimize pollution in adjacent streams or pond areas. Water used for any purpose which has become contaminated with oil, bitumen, salt, or other pollutants shall be discharged so as to avoid affecting nearby waters. Under no circumstances shall pollutants be discharged directly into any adjacent stream or pond areas.
4. When water is used from natural sources for any operations, intake methods shall be such as to avoid contaminating the source of supply and maintaining adequate downstream flow when the source is a stream.
5. Attention is directed to Chapter 220, Acts of 1955, relative to inland waters.

C. Plant Pest Control

1. Attention is directed to the provisions of the Federal Plant Quarantine Act of 1912, as amended (7 U.S.C. 151-165 and 167), the Terminal Inspection Act of March 4, 1915, as amended (7 U.S.C. 166), Organic Act of 1944, as amended (7 U.S.C. 150aa-150jj), Cooperation with States in Administration and Enforcement of Certain Federal Laws, approved September 28, 1962 (7 U.S.C. 450).

2. All soil moving equipment operating in regulated areas in Massachusetts shall be subject to plant quarantine regulations. In general, these regulations require the thorough cleaning of soil from equipment before such equipment is moved from regulated areas within Massachusetts to uninfested areas either within or outside the Commonwealth. The cost of such cleaning shall be included in the Contract prices and shall not be in addition thereto.
3. Complete information may be obtained from the Massachusetts Department of Agriculture, Plant Pest Control Division, 100 Cambridge Street, Boston. For interstate movement of soil moving equipment, contact:
U.S. Department of
Agriculture Plant Pest
Control Division
424 Trapelo Road
Waltham, Massachusetts 02154

D. Protection of Fish Life

1. In carrying out work within the limits of pools or streams or adjacent to the same, comply with the regulations of the State Department of Game and Fisheries, and give that Department such advance notice of intentions to proceed with the work at such locations as will enable that Department, if it so desires, an opportunity to transfer fish from pools or streams which will be affected by the work.
2. Any isolated potholes remaining from operations shall be provided with open water channels in such a manner that there will be a direct outlet at the lowest water level of the stream.

E. Energy policy and Conservation Act

1. Comply with mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC Section 6321 et. seq.).

F. Environmental Violations

1. Comply with the Massachusetts Department of Environmental Protection Regulations for Releases of Oil and Hazardous Materials and all other requirements of the Environmental Protection Agency regulations of the Clean Air Act and Clean Water Act and any other provisions of law, or amendments thereto including the laws or regulations of local municipalities.
2. All diesel construction equipment used in this contract shall have emission control device installed, such as oxidation catalysts or particulate filters on the exhaust system side of the diesel combustion engine equipment.

1.4 DEPOSITS IN NAVIGABLE WATERS

- A. Attention is directed to the Federal River and Harbor Act approved March 3, 1899, and amendments thereof or supplements thereto, which prohibits (except under certain conditions with prior approval of the secretary of the Army) the placing or suffering to be placed of any obstructive material or refuse in any navigable water, on the bank of any tributary of any navigable water where the same will be liable to be washed into such navigable water by ordinary or high tides by storms or flood, or otherwise

whereby navigation will or may be impeded or obstructed. and which also provides penalties for violation.

1.5 WORK IN OR OVER NAVIGABLE WATERS

- A. Conduct all work in or over navigable waters such that free navigation of the waterways will not be unreasonably interfered with and that the existing navigable depths will not be impaired. Comply with all governmental regulations pertaining to the work and secure all permits necessary for the performance of this work, except that the Authority will obtain the permit, from whatever agency issues such permits, for the construction of the permanent structure over navigable waters, and such permit will be available for the Contractor's inspection at the office of the Authority.
- B. Promptly clear the channel of all pilings or other temporary or movable obstructions placed therein or caused by the operations of the Contractor when in the opinion of the District Engineer of the Department of the Army, there is no further need for such obstructions or their presence creates a hazard to marine traffic. In any case, such clearing shall be completed prior to acceptance of the Contract.
- C. Any work of a temporary nature required by the Department of the Army, the United States Coast Guard or any other agency having jurisdiction, including but not limited to, lights, signals, buoys, and the likes. to protect navigation during construction operations, shall be provided by the Contractor at his own expense.

1.6 PUBLIC SAFETY AND CONVENIENCE

- A. At all times until final acceptance of the Work by the Engineer, the Contractor shall protect the Work and shall take all precautions for preventing injuries to persons or damage to property on or about the site.
- B. The Contractor shall comply with all applicable laws, ordinances, rules, and regulations regarding the safety of persons or property or with regard to protecting them from damage, injury, or loss and shall not load or permit any part of the Work to be placed so as to endanger the safety of the Work.
- C. If the Contractor constructs temporary bridges or provides temporary crossings of streams. his responsibility for accidents shall include the roadway and sidewalk approaches as well as the structure of such crossings (also see Articles 1.04 and 1.05).
- D. The decision for routing traffic through or around the Work and provisions for the control of same will be made by the Engineer. Whenever it is deemed advisable, special detours will be provided for truck or bus traffic. Where deemed advisable by the Authority, traffic patterns and schedules will be studied in the design stage and included in the Contract Specifications. Highways and streets shall be closed to travel only as directed by the Engineer.
- E. Schedule the temporary or permanent closing of highways and city and town ways to travel only after consultation with the Police Chief and Fire Chief of the municipalities concerned. The temporary closing of highways and city and town ways shall be kept to a minimum.
- F. When detours around the Work are provided on existing city or town ways, maintain such city or town ways as required in Section 01570, Article 1.02 and be compensated as specified in that Article.
- G. Where new construction coincides with the present MBTA Transit System. carry on the work in a manner acceptable to the Engineer so that a reasonably safe uninterrupted transit flow is maintained through the Contract during the entire construction period. Provide and maintain in a reasonably safe condition the temporary approaches and the crossings of intersecting work.

- H. Maintain temporary roadways in a manner which will provide reasonably safe and convenient travel. When temporary roadways outside the contract limits are abandoned, remove the surfaces and grade to a smooth, neat, natural appearance, free from water pockets as directed by the Engineer.
- I. Abandon temporary or existing roads beyond the limits of the MBTA Transit System trackway slopes, but within the Contract limits, shall be excavated, graded, loamed, and seeded as directed to present a neat, natural appearance and provide for proper drainage. Compensation for this work will be included under the respective items of work involved.
- J. As directed, conduct the work such that abutters shall have reasonable access to their property. When public or private property- is isolated by the closure of a highway or city or town way, the Contractor shall be responsible for providing such reasonably safe means of access to a public way as the Engineer deems essential and he shall be compensated for all work directed by the Engineer at the Contract unit prices for the type of work and materials involved. When it is necessary to leave materials and equipment upon the highway or city or town way, place them so as to cause the least possible obstruction to drainage, pedestrian, and other travel.
- K. When the work in any way affects the operation, management, maintenance, business or traffic on any railroad, carry on such work in a manner satisfactory- to the said railroad: but all orders, directions, or instructions to the Contractor relative to Work under the Contract will be issued only by the Engineer. All possible vigilance in order to effectively guard against all accidents or damages on the railroad due to the work, and at all times during the progress of the Work manage and execute the same so as to cause the least possible interference with the operation, management, business or traffic of the railroad (also see General Conditions Article 5.08).

1.7 NOISE CONTROL

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

1.8 DUST CONTROL

- A. Dust control shall be the responsibility of the Contractor, and furnishing and applying calcium chloride or other dust control material shall be at the Contractor's expense unless specified otherwise in the Contract Specifications.
- B. Notify the Engineer, in writing, what measures will be implemented to provide adequate dust control measures. If the actual dust control measures used on the work are inadequate, when directed by the Engineer, immediately provide additional dust control to rectify the situation at no additional expense to the Authority.

1.9 SITE SECURITY AND ACCESS

- A. The Contractor shall prepare and submit to the Engineer for approval, a site specific security plan for the all phases of the Work. This plan shall be detailed to address all site security issues of the Work including all subcontractor efforts. The plan shall be maintained and updated as required throughout the Contract duration. The Contractor, Subcontractor, Vendors and Suppliers are required to comply with the approved site security plan at all times. The Contractor is required to provide identification badges for all employees including subcontractors. The badges must include personal photograph, name and employer and must be visible when worn at all times.

END OF SECTION

SECTION 01565

RODENT CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies rodent control within the limits of this Contract prior to and during site preparation and the specified work.
- B. Do not proceed with the work of this Section until written release is issued by the Engineer.

1.2 QUALITY CONTROL

- A. Exterminator Qualifications: Hold a current license issued by the Massachusetts Pesticide Board.
 - 1. Employ servicemen for work on this Contract, each having experience in rodent control procedures.

1.3 SUBMITTALS

- A. Submit rodent control procedures, indicating material, quantity, methods, and time schedule for extermination.
- B. Ten days prior to commencement of rodent control procedures, furnish name of rodent control licensed exterminator, date of initial rodenticide application, and methods and materials to be employed.
- C. Manufacturer's printed application instructions for the approved toxicants.
- D. Bi-weekly individual reports on activities, including location of sites treated, amount and types of rodenticides used during the month, and determinable results of the program.

1.4 LIABILITY

- A. The Contractor shall be liable for death or injury to persons or domestic animals in the use of the toxicants and shall determine the appropriate material from the materials list for each treatment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Limit toxicants in rodent baits to the following:
 - 1. Antu.
 - 2. Cyanogas.
 - 3. Anticoagulant.
 - 4. Zinc Phosphide.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Apply materials in strict accordance with EPA approved label directions and the Rules and Regulations of the Massachusetts Pesticide Board.
- B. First Application: Blitz; apply immediately after execution of the Contract and written release by the Authority; use zinc phosphide or other specified toxicant with suitable bait; placed so as to attract the greatest possible number of rodents. The blitz application shall be applied prior to all other work except survey.
- C. Anticoagulant, such as Warfarin, must be applied in accordance with manufacturer's standard recommended practice and as follows:
 - 1. Place anticoagulant in sealed, moisture resistant containers such as glassine, paraffin blocks, or comparable protective material, and distribute as recommended.
 - 2. Place on moisture-resistant plate or pan, not in direct contact with earth, concrete, or masonry; protect from moisture, rain, snow or dust; in bait station or other suitable cover.
 - 3. Inspect anticoagulant bait a minimum of once each week and replenish with fresh material when necessary.
- D. Maintain accurate records of placement, type, and volume of rodent baits applied.

3.2 MAINTENANCE

- A. Within one week after initial application, institute a program of maintenance to rid structures and adjacent areas, within limits of this Contract, of rodents, and prevent their migration to abutting properties. Maintenance shall continue for the duration of the Contract.
 - 1. Apply Warfarin in a 2-1/2 per cent mixture with suitable cereal in structures and torpedo form in open areas.
 - 2. Renew toxic bait semi-monthly throughout maintenance period and as required by the Massachusetts Pesticide Bureau Requirements.

3.3 CLEANUP

- A. Remove carcasses daily and dispose of properly according to law.
- B. Upon completion of operations at site, remove remaining exposed bait or anticoagulant packages and dispose of properly according to law.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. The work of this Section will not be measured but will be an allowance under Item No. 0213.202. The allowance will be adjusted for the actual amount paid for the work without markup. The Contractor shall furnish itemized statements of the work performed and give the Engineer access to accounts, bills, and vouchers relating thereto, and unless the Contractor does furnish such itemized statements, bills and vouchers, he shall not be entitled to payment for related work. The allowance will be made to reimburse the Contractor for all services required for the work specified herein.

4.2 PAYMENT

- A. Payment for work of this Section will be used on itemized statements furnished by the Contractor to the Authority without any mark-up for overhead or profit. No other costs will be paid for the work of this Section.

4.3 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0213.202	RODENT CONTROL	AN

END OF SECTION

SECTION 01568

CONSTRUCTION SAFETY

PART 1 GENERAL

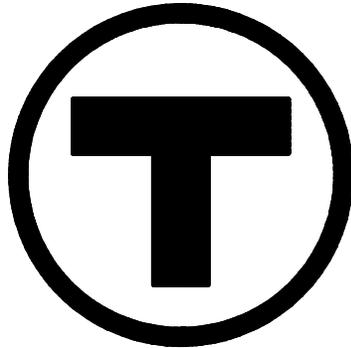
1.1 DESCRIPTION

- A. This Section specifies requirements to establish a practical, sound, and effective program for the prevention of accidents, and to assign specific responsibilities to Contractors for program compliance.
- B. This basic safety program has been designed to assist all site Contractors and their supervisors to recognize, evaluate and control hazardous activities and conditions within their respective areas of contract responsibility.
- C. The attached MBTA "Construction Safety Manual," including Safety policy/Procedure (Contractor Safety Violation Program) forms a part of the Contract Specifications and is hereby included on the following pages of this Section 01568.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item of work to which they pertain.

CONSTRUCTION SAFETY MANUAL



MASSACHUSETTS BAY TRANSPORTATION AUTHORITY BOSTON, MASSACHUSETTS

Prepared by:

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
SAFETY DEPARTMENT

Date Issued: October 26, 1995

Revision: 1.0

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DEFINITIONS

<u>TERM</u>	<u>ABBREVIATION</u>	<u>DEFINITION</u>
MBTA Project Manager	PM	Authorized representative of the MBTA responsible for specific contracts administered by the Resident Engineers.
MBTA	CM	The Authority is responsible for construction management
Contract		The written agreement executed by the Authority and the Contractor, setting forth the obligations of the Parties thereunder.
Contractor		The individual, firm, partnership, corporation, or combination thereof, private, municipal or public, including joint ventures, which, as an independent contractor, has entered into a Contract with the Authority, as Party or Parties of the Second Part, and who is referred to throughout the Contract Documents by singular number.
Subcontractor		The individual, firm, partnership, corporation, vendor, supplier, or combination therefore to whom the Contract, with written approval of the Authority, sublets any part of the Contract.
General Engineering Consultant	GEC	Specific for each contract.
Project		That specific portion of MBTA Transit System indicated in the Contract Documents.
Engineer		The General Manager of the Authority or designee Acting within the scope of the particular duties entrusted to this person.
Resident Engineer	RE	MBTA's field representative responsible for the completion of specific construction contracts.
Contractor Project Manager/Supintendent	CPM/CPS	Contractor's senior management official responsible for the Project beginning with preconstruction activities and extending to final completion of the work.
Safety Director	SD	MBTA's Director of Safety
Contractor Safety Supervisor	CSS	Representative of the Contractor whose sole responsibility is safety and loss prevention.

TERM**ABBREVIATION****DEFINITION**

Experience

Individual who possesses at least five years of heavy construction experience, three of which include full-tie on-site safety responsibility. Must be knowledgeable through education and training in occupational safety and health laws and regulations (construction and general industry). It is preferred that the individual possess the CSP designation.

MBTA Safety Manager

PSM

MBTA appointed representative responsible for safety implementation.

Foreman

F

Contractor's Craft Supervisor.

1.0 ADMINISTRATION AND ORGANIZATION

1.1 PURPOSE AND SCOPE

To establish a practical, sound and effective program for the prevention of accidents, and to assign specific responsibilities to Contractors for program compliance.

This basic safety program has been designed to assist all site Contractors and their supervisors to recognize, evaluate and control hazardous activities and conditions within their respective areas of contract responsibility.

The minimum accident prevention activity expected from each Contractor is indicated in each of the following program sections; fewer than these minimums will be considered substandard.

1.2 PROGRAM OBJECTIVES

The objective of this policy is to establish the concept that people and property are our most important assets.

To achieve this goal, all Project safety and loss control efforts shall be directed towards a single goal, the elimination of personal injuries and damage to property, and to minimize the effects of accidents on both the individuals and on the project. Beyond satisfying the obvious humanitarian and moral obligations, specific objectives of the program are:

- a. Increased efficiency and attendant cost reductions.
- b. Compliance with all statutory requirements.
- c. Maintenance of favorable labor and community relations.
- d. Improvements of relationship with regulatory agencies.
- e. Avoidance of penalties.

1.3 PROGRAM EFFECTIVENESS

The effectiveness of the MBTA Construction Safety Program will depend upon the active participation and personal cooperation of all supervisors and employees, and positive coordination of their efforts toward carrying out the following responsibilities:

- 1.3.1** Establishing and maintenance of a positive environment and attitude by all levels of management.
- 1.3.2** Proper planning of all work to minimize personal injury, property damages and loss of production efforts.
- 1.3.3** Provide constant and consistent safety.
- 1.3.4** Establish and maintain a system for early detection and correction of unsafe practices and conditions.
- 1.3.5** Provide adequate protection of adjacent public and private properties to provide for the safety of the public.

- 1.3.6** Establish and implement safety education programs designed to stimulate and maintain the interest and active participation of all personnel involved with the Project.
- a. Safety meetings and safety communications.
 - b. Investigations of accidents and safety incidents to determine cause, and the taking of necessary corrective actions.
 - c. Use of proper work procedures, personnel protection equipment and mechanical guards.
 - d. Safety instruction to individual employees and group safety training program.
 - e. Maintenance of records of accidents and losses and development of accident/loss experience summaries.

1.4 ORGANIZATION AND ADMINISTRATION

1.4.1 Project Safety Organization

See Exhibit 1-1, Project Safety Organization Chart.

1.4.2 General

This document establishes minimum standards of performance for the implementation and conduct of Safety Operations during the course of a Project.

Each contractor shall take all reasonable precautions in the performance of the work under his contract to protect the safety and health of its employees and members of the public and shall comply with all applicable MBTA, Local, State and Federal safety and health regulations and requirements (including reporting requirements).

The MBTA shall notify the Contractor of any non-compliance and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the non-compliance and corrective action required after receiving the notice, the contractor shall immediately take corrective action. If the contractor fails or refuses to take corrective action promptly, the MBTA may, without prejudice to other legal or contractual rights, issue an order stopping all or part of the work; and may subject contractor to safety violation assessments as deemed appropriate by the MBTA thereafter, resumption may be issued at the discretion of the MBTA.

The Contractor shall maintain an accurate record of exposure data on all accidents and incidents occurring under this contract and report this data in a manner prescribed by the MBTA.

The Contractor shall be responsible for all its lower-tier sub-contractor's and vendor's compliance.

Contractor management shall make a commitment for accident prevention and fire prevention. Safety shall take precedence over schedule and production. Enforcement action is mandatory.

1.4.3 Safety Responsibilities

a. Contractor

To assist Contractors in fulfilling their responsibility, a Construction Safety Inspection Check List (Exhibit 5.1) has been included in this manual for their use. Contractors are reminded that this list is not all-inclusive and must be considered only a minimum. Contractors should add to it for their particular type of work and work site conditions.

The key to an effective safety program is a proactive Contractor who is expected to take the initiative in accident prevention. Contractors, managers and supervisors will be held accountable for the Safety performance demonstrated by the employees under his/her supervision. The Contractor's responsibilities for safety cannot be delegated to Subcontractors, suppliers of other individuals. Each Contractor is required to designate a full-time; on-site Safety Supervisor who is charged with sole responsibility of on-site safety management under the direction of the Contractor's Project Manager/Superintendent. It is expected that potential safety hazards found to exist on the job will be promptly corrected through informal communications between the Contractor and the MBTA. Notwithstanding these informal procedures, it should be clearly understood that formal communications regarding accident prevention and safety enforcement shall be maintained between the Contractor and the MBTA. Such formal communications are necessary to provide follow-up action on the part of the Contractor and to prevent misunderstandings.

The Contractor is responsible for compliance with the accident prevention and safety requirements contained in this manual and its contract with the MBTA. To achieve this goal, the Contractor shall:

1. Within five (5) days after receipt of notification of contract award, submit to the MBTA a letter signed by the senior operating official of the Contractors organization setting forth the following:
 - a. A statement of its company's safety policy based upon compliance with the MBTA Construction Safety Program.
 - b. A detailed site specific safety plan which reflects the Contractor's intentions for full and complete compliance with the MBTA Construction Safety Program and the provisions of its contract with the MBTA.
 - c. A statement which will reflect its awareness and knowledge of all local, state and federal health and safety codes applicable to its contract with the MBTA.
2. Submit a resume of the qualifications and work experience of the designated Safety Supervisor proposed for assignment to the Project as specified by the Safety and First Aid requirements Section of the Contract. The resume shall be reviewed by the MBTA Safety Department. Contractor's designated Safety Supervisor may be required to appear for a personal interview before designated representatives of the MBTA Project staff and the MBTA Safety Department.

3. Establish and maintain an orientation program for new employees which shall include:
 - a. For each individual the hazards present in their work assignment and in the general area in which he will be working.
 - b. Personal protective equipment required.
 - c. Instruction in the proper procedure for reporting unsafe job conditions which he/she may encounter.
 - d. All workers employed by the Contractor who are to work within the Authority's track area, right-of-way or adjacent to the power traction system, shall be required to attend an up to four (4) hour safety awareness course at the Authority's Safety Training location. The location and time of such school will be at the sole discretion of the Authority. The intent of this course is to make the Contractor's personnel aware of the particular hazards related to the Authority's operations.

At the completion of the Safety Awareness Training, attendees will be issued a serialized sticker for the hard hat and a serialized certification card. The employee must display the hard hat sticker on the left side of their hard hat and carry the card certification on their person at all times when working on the Authority projects. (See Exhibit 1-2)
 - e. All personnel working in the immediate vicinity of, or within the right-of-way are required to wear orange safety vests similar to standard Authority equipment. In addition, all Contractors personnel or groups of personnel, working within the right-of-way or within eight (8) feet of track will require the presence of an Authority flagperson on duty at all times.
4. Furnish to the MBTA a copy of all citations and/or warnings of safety violations received from any state or federal jurisdiction agency by its organization or by any of its sub-tier Contractor organizations.

Contractor's Project Manager/Superintendent

As the direct representative of the Contractor at the site the Project Manager/Superintendent shall:

1. See that the Contractor's responsibilities set forth in the safety provisions are fully complied with.
2. Supervise the designated Safety Supervisor in the discharge of its duties and responsibilities.
3. Plan and execute all work in compliance with the stated objectives of the MBTA Construction Safety Program.
4. Assure cooperation with the MBTA Safety Project Manager.

5. Take immediate action to correct unsafe or unhealthful work practices or conditions as necessary.
6. Review and implement administrative actions required to maintain complete and accurate safety records as specified by the MBTA Construction Safety Program recordkeeping requirements.
7. Attend safety meetings as directed by the MBTA Safety Project Manager.
8. Assure that appropriate first aid plans and facilities are established and implemented as stated and outlined in contract.

c. Contractor's Safety Supervisor

1. Make daily safety inspections of the job site(s) and public area contiguous and adjacent thereto and take necessary and timely corrective action(s) to eliminate unsafe acts and/or conditions. Record observations as directed using Construction Safety Survey Report Form Exhibit 8-1 in conjunction with Job Site Daily Safety Checklist.
2. Construction Safety Audit Checklist (Exhibit 5-1) will be completed weekly by Contractor's Safety Supervisor.
3. Review Foreman accident and investigation reports, as required, to assure timely submission, and to initiate corrective action(s) to prevent recurrence.
4. Provide Foremen with material suitable for use in conducting weekly "tool box" safety meetings.
5. Review safety meeting reports submitted by Foremen to ensure adequacy of training as well as subject matter.
6. Assist Foreman in accident investigations and preparation of required reports.
7. Establish and implement a safety training program for Supervisors and employees as applicable to their specific job.
8. Encourage establishment of incentive programs designed to recognize individual employee safety efforts and contributions towards improved safety.
9. Attend safety meetings held by the MBTA.
10. Maintain copies of all required Contractor safety reports.
11. Safety Reports are required to be submitted to the MBTA monthly.

d. Foremen

Foremen are in first level of supervision. These are the key individuals in an effective safety program. Their initiative and efforts toward accident prevention on their daily assignments largely determines whether or not a required high degree of safety exists on the job.

A Foreman's responsibility includes:

1. Inspection of its assigned job area to assure that unsafe acts or conditions are identified and corrected.
2. Ensures that safety requirements are adhered to and enforced.
3. Provides and requires the use of proper personal protective equipment and suitable tools for the job.
4. Sets a good example for his/her crew in the matter of safety.
5. Sees that his/her assigned crew is properly instructed in safe work practices when they first arrive on the job and every day thereafter.
6. Investigates all accidents under his/her direct control to determine facts necessary for corrective action.
7. Promptly completes accident reports as required.
8. Conducts weekly "toolbox" safety meetings with personnel to:
 - a. Discuss type of work to be or being accomplished and potential risks and/or unsafe conditions to be aware of.
 - b. Discusses unsafe work practices and conditions noted.
 - c. Reviews accident experience with the crew and discuss corrective action(s).
 - d. Encourages personnel to make safety suggestions and to pass these onto the Safety Supervisor for evaluation and possible implementation.
 - e. Ensures that prompt first aid is administered.

e. **MBTA**

The MBTA is responsible for:

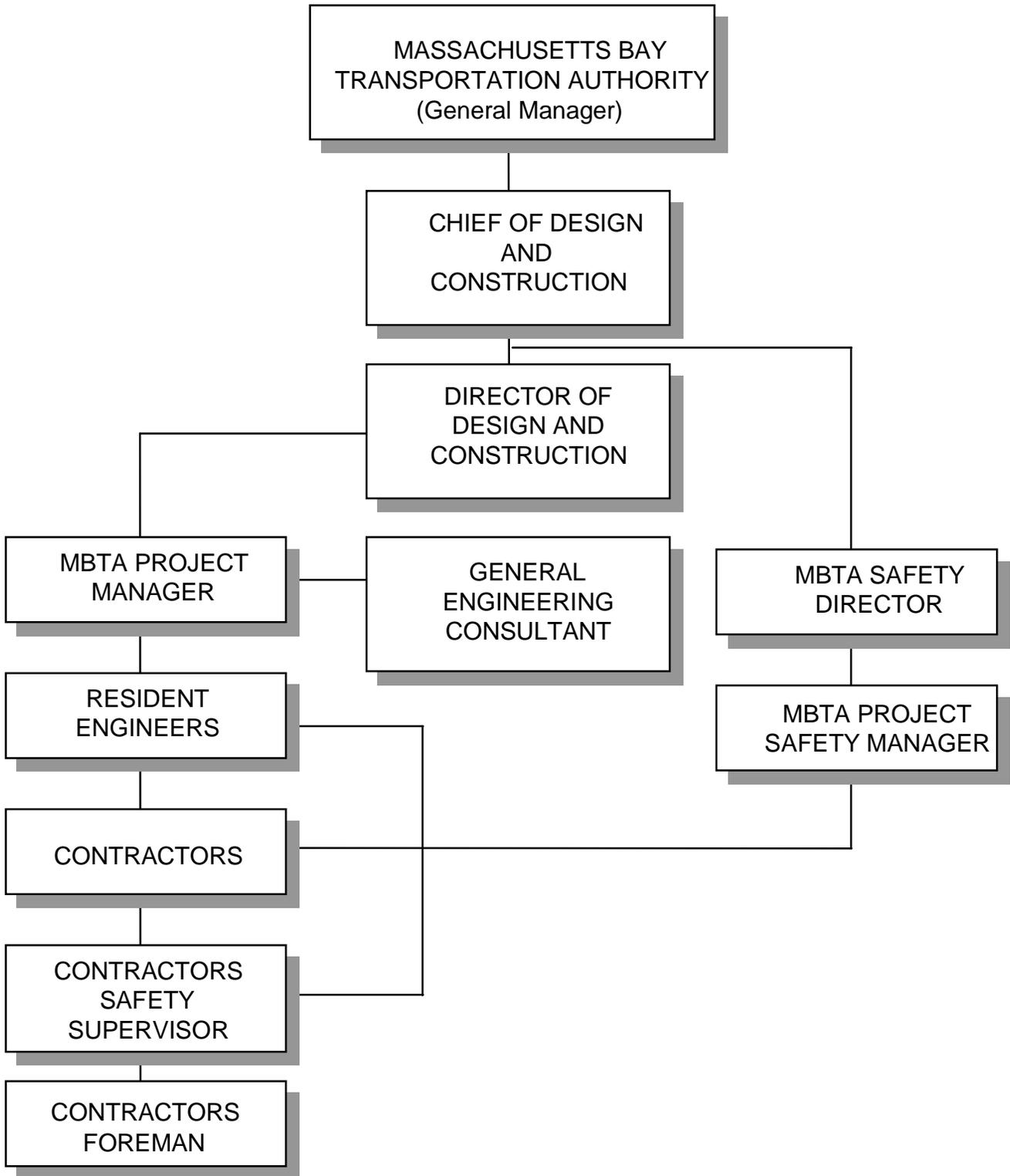
1. Inspection, surveillance, and monitoring the safety practices of the Contractor.
2. Requiring timely application of safety and accident prevention procedures to all job site activities and to all persons on the Project including Subcontractor, Visitors, Suppliers and other authorized personnel.
3. Documenting unsafe work conditions wherever observed and reports these conditions per internal MBTA guidelines and issuing citations when warranted, for willful safety violations.
4. Notifying Contractors, in writing, of persistent noncompliance with Project safety requirements.

5. Notifying Contractors or individuals who continually and deliberately violate safety regulations and where appropriate, initiate action to the Contractor or individual from the Project.
6. In the event of imminent danger requiring immediate corrective action(s). The MBTA, through its designated representative(s), is authorized to order a work stoppage until such time as the condition is corrected.
7. Arranging for or conducting safety training for both contractor and MBTA personnel.

f. Resident Engineer

The MBTA Resident Engineer provides on-site leadership to assigned inspection staff to determine that the construction work is accomplished safely and in accordance with contract plans and specifications.

CONSTRUCTION PROJECT SAFETY ORGANIZATION CHART



2.0 GENERAL SAFETY REQUIREMENTS

2.1 SUBMITTAL OF SAFETY PROGRAM AND QUALIFICATIONS

The contractor shall, within five (5) days after receipt of the award of a contract, submit for approval to the MBTA, a detailed operational Safety and Health Plan. Along with the Plan, the contractor shall submit the name and qualifications of the designated management official assigned responsibility for implementation and administration of the program. The contractor's safety supervisor shall attend MBTA Safety meetings as required. Also, the contractor shall submit its past three (3) years industrial injury/illness experience for review. Submittal of this experience may be in or obtained from OSHA Form 200. Note: Each employer is subject to record keeping requirements of OSHA 1970, thus must maintain logs and experience modification of all recordable occupational injuries and illnesses.

2.2 REQUIREMENTS

2.2.1 Emergency Action Plan

The Contractor shall establish in its safety plan procedures to handle emergencies created by the following:

- a. Injuries to employees.
- b. Injuries to the general public on or adjacent to the work site.
- c. Property damages with particular emphasis on utilities, pedestrian and vehicular routes.
- d. Fire
- e. Natural disasters such as earthquakes.
- f. Public demonstrations such as mobs, riots, etc.
- g. Bombs or other destructive threats.
- h. Hazardous material, exposures or other potential hazards that may occur at work site.
- i. Severe weather, particularly lightening storms and high winds. Emergency action plans shall be compatible with local police and fire procedures. Emergency procedures shall ensure that Contractor's most senior supervisor present take charge and directs the handling of the emergency.

Emergency procedures shall be reviewed frequently to ensure that Contractor personnel are familiar with the proper actions to take, and that emergency telephone numbers are current. All emergency procedures shall be reviewed and approved by, and coordinated with the MBTA Safety Department Emergency procedures and actions required shall be discussed regularly with the Contractor's supervisory personnel and at "tool box" safety meetings.

2.2.2 First Aid Facilities

In formulating the Emergency Action Plan, the Contractor shall provide for the establishment and staffing of appropriate first aid facilities for the treatment of on the job injuries.

Off-site medical treatment of employee injuries shall be performed at medical facilities named in the Contractor's Safety Submittal.

2.2.3 Serious Accidents

Serious accidents shall be reported immediately to the MBTA Resident Engineer. Contractors shall issue standing orders to all supervisors directly in charge of operations that the scene of the accident shall not be disturbed, except for rescue or other emergency measures, until otherwise directed. Contractor's forces either witnessing or party to the accident shall be detained at the site to provide detailed accounting of facts.

2.2.4 Posting of Emergency Telephone Numbers

To ensure that emergency actions are promptly taken, Contractors shall post emergency telephone numbers in a conspicuous place(s) (all telephone locations). See Exhibit 2-2.

2.2.5 Emergency Plan Implementation

Should an emergency occur, the Contractor shall:

- a. Immediately secure the area and implement the emergency action plan.
- b. Notify the MBTA Resident Engineer.
- c. Provide information regarding the emergency to authorized MBTA representatives only. Questions from the press and media should be referred to the Public Relations/Communications Department of the MBTA.

2.3 Protection of the Public

2.3.1 Protective Measures

All necessary precautions to prevent injury to the public or damage to property of others shall be taken. The public is defined as all persons not employed by or under contract or subcontract to the MBTA. Installation of temporary barriers and/or fencing designated to protect the public shall be reviewed and approved by the MBTA. Precautions shall include but not be limited to the following:

- a. Work shall not be performed in any area occupied by the public unless specifically permitted by the contract or in writing by the MBTA
- b. When necessary to maintain public use of work areas involving sidewalks, entrances to buildings, lobbies, corridors, aisles, stairways, vehicular roadways, etc., the Contractor shall protect the public in accordance with the applicable OSHA Construction Safety Standards 1926.
- c. Sidewalks, entrances to buildings, lobbies, aisles, doors or exits shall be kept clear of obstructions to permit safe ingress and egress of the public at all times.
- d. Appropriate warnings, signs and instructional safety signs shall be conspicuously posted where necessary. In addition, a policeman/flagperson shall control the moving of motorized equipment in areas where the public might be endangered.

- e. Sidewalks, sheds, canopies, catch platforms and appropriate fences shall be provided when necessary to maintain public pedestrian traffic adjacent to the erection, demolition or structural alteration of outside walls on any structure. The protection required shall be in accordance with all applicable laws and regulations.
- f. Whenever practicable, a temporary fence shall be provided around the perimeter of above ground operations adjacent to public areas except where a sidewalk shed or fence is provided by the Contractor as required by subparagraph e., above. Perimeter fences shall be at least six (6) feet high. They may be constructed of wood or metal or wood frame and sheathing, wire mesh, a combination of both, or as otherwise provided in contract documents. When the fence is adjacent to a sidewalk near a street intersection, at least the upper section of fence shall be open wire mesh from a point not over four (4) feet above the sidewalk and extending at least twenty-five (25) feet in both directions from the corner of the fence.
- g. Guard rails shall be provided on both sides of vehicular and pedestrian bridges, ramps, runways and platforms. Pedestrian walkways elevated above adjoining surfaces, or walkways within six (6) feet of the top of excavated slopes or vertical banks, shall be protected with guardrails, except where sidewalk sheds or fences are provided as required by subparagraph e., above. Guardrails shall be constructed in accordance with MBTA requirements.
- h. Barricades shall be provided where sidewalk shed, fences or guardrails as referenced above are not required between work areas and pedestrian walkways, roadways or occupied buildings. When a barricade is removed temporarily for the purpose of work, a policeman/flagperson shall be placed at all openings.
- i. Temporary sidewalks shall be provided when a permanent sidewalk is obstructed by the Contractor's operations. Guardrails shall be provided on both sides of temporary sidewalks.
- j. Warning signs and lights shall be maintained from dusk to sunrise along guardrails, barricades, temporary sidewalks and at every obstruction to the public. They shall be placed at both ends of such protection or obstructions and not over twenty (20) feet apart alongside of such protection or obstruction.
- k. Fuel-burning type lanterns, torches, flares or other open flame devices are prohibited within twenty (20) feet of open utility manholes until certified safe for entry.

2.4 Group Tours and Site Visitors

2.4.1 Conduct of Tours

It is particularly important that a high degree of protection be afforded all persons on authorized tours of construction worksites. The following instruction shall be complied with, as applicable, by the Contractor and those responsible for arranging such tours. Except for technical inspection tours, made by MBTA staff members and their sponsored guests, the following procedures shall be followed:

- a. Group tours must be cleared through the MBTA, allowing maximum advance notice and in compliance with MBTA Policy and Procedures.

- b. MBTA will coordinate the tour arrangements and ensure notification to the Contractors Project Manager.
- c. MBTA will coordinate the following with the individual or organization requesting the tour:
 - 1. Number of Visitors - Tour groups in non-hazardous areas will be limited to no more than 10 person per tour guide.
 - 2. Clothing - Visitors will be required to wear pants or slacks, shirt/blouse, and suitable work shoes.
 - 3. Children - Children under 12 not permitted on tours. Children ages 12 to 15 must be accompanied by an adult.
 - 4. Protective Equipment - Hard hats, raincoats, eye protection, earplugs, and other protective devices will be required as necessary.
 - 5. Release and Hold Harmless Agreement - Each visitor shall be required to sign the agreement prior to the commencement of the tour. MBTA staff members and guides shall familiarize their group(s) with the hazards to be encountered on the tour prior to entering the worksite.

2.5 Substance Abuse/Prevention/Testing Program

2.5.1 The Contractor shall establish a substance abuse policy and testing program that includes the following elements:

- . Deterrence
- . Treatment and Rehabilitation
- . Detection
- . Enforcement

The MBTA reserves the right to approve the proposed substance abuse program prior to commencing the contract.

2.6 Criteria for Substance Abuse Policy and Testing Programs for Construction Contractors

Each contractor will have in place a written policy on substance abuse that emphasizes the goal of maintaining a drug and alcohol free workplace. This policy should contain minimally the following elements:

2.6.1 Deterrence

Use of drugs and alcohol while on or near MBTA property is strictly forbidden. Each employee should receive a copy of the policy on substance abuse and appraised of the requirement that he/she is expected to be drug/alcohol free when reporting for work and at all times while on or near MBTA property or while acting in any capacity as an agent of the contractor.

2.6.2 Treatment and Rehabilitation

Information regarding treatment and rehabilitation programs must be made available to employees. This can be accomplished by providing information regarding such program that

are available through health insurance benefits, union health and welfare funds, Employee Assistance Programs, or community organizations. Employees are responsible for any costs related to rehabilitation or treatment that are not covered by health insurance or union health or welfare funds. Employees should be encouraged to seek help for drug and/or alcohol problems before their job performance is affected.

2.6.3 Detection

Each contractor, in order to promote and maintain a drug and alcohol free environment, will utilize a program of drug and/or alcohol screening which will be mandatory under the following conditions:

a. Pre-Employment

Prior to assignment, all contracted employees will be required to submit a drug and/or alcohol test as a condition of employment. Prior to the test, the employee must sign a release authorizing the procedure.

A urine test will screen for the presence of marijuana, cocaine, opiates, phencyclidine (PCP), amphetamines, barbiturates, benzodiazepenes, methadone, methaqualone, and propoxyphene. A blood test will screen for alcohol.

b. Probable Cause

An employee who reports to work in an unfit condition or is found to be unfit while on duty and/or who exhibits behavior which provides one (1) supervisor with probable cause that the employee is unfit for duty will be required to submit to a drug and alcohol screen. The employee will be given a urine test for marijuana, cocaine, opiates, phencyclidine (PCP), amphetamines, barbiturates, benzodiazepenes, methadone, ethoqualone and propoxyphene. A blood test will screen for alcohol.

c. Post Accident/Incident

Whenever any of the following occurs, the employee(s) involved will be required to submit to a drug and alcohol screen.

. Any MBTA-related event on/or involving MBTA property or personnel that results in a fatality.

. Any MBTA-related personal injury to an employee, or member of the public, which requires or should reasonably require medical attention.

. Any MBTA-related event causing significant or unusual property damage, as determined by an MBTA management official.

. Any MBTA event which appears to involve violation of Authority rules which poses a safety threat to employees or members of the public. The employee(s) in these situations must be tested unless at the time of the accident/incident the employee's performance can be completely discounted as a contributing factor to the accident/incident. The screen should be completed immediately, but absent unusual circumstances, not more than eight (8)hours after the accident/incident in question.

In the event of hospitalization and unless medical precluded, a drug/alcohol will be ordered at the treatment facility if treatment is expected to exceed eight (8) hours.

This drug and alcohol screen will be identical to that utilized in Probable Cause.

d. Return to Work

Whenever an employee returns to work under the conditions listed below, the employee will be required to submit to a drug/alcohol screen before returning to work.

This drug and/or alcohol screen shall be required when:

The employee has previously failed a post accident/incident, probable cause, return to work or random screen.

The employee is returning from a drug and/or alcohol rehabilitation program known to or arranged by the contractor or made known to the contractor.

The employee is returning to work for any reason from an absence longer than thirty (30) calendar days. This drug and alcohol screen will be identical to that utilized in Probable Cause.

e. Random

All employees will be submitted to drug screening on an unannounced and random basis. A scientifically valid method of selection must be utilized to ensure that each employee has an equal chance of being selected.

A urine test will be used to screen for the presence of marijuana, cocaine, opiates, phencyclidine (PCP) and amphetamines.

2.6.4 Enforcement

Enforcement of the policy and testing program is essential if deterrence, treatment, and detection are to be successful. Accordingly, the use, sale or possession of illegal drugs, and use of intoxicants resulting in unfitness for duty as well as the use or possession of intoxicants on any construction site is prohibited and will result in the employee's permanent removal from the project.

a. Consequences of Positive Test Result

1. Pre-Employment

A positive drug or alcohol test result in this category will render the individual not qualified for employment on an MBTA project. The individual can reapply for employment after one (1) calendar year. However, the applicant must provide documentation that he/she has received rehabilitation/treatment for substance abuse in order to be considered for employment after the one year period.

2. Post Accident/Incident

Any employee involved in an accident/incident who tests positive for drugs and/or alcohol will be discharged, regardless of the ultimate preventability determination or the extent of any damage or personal injury.

3. Probable Cause

Any employee who tests positive for drugs and/or alcohol pursuant to a probable cause screen will be discharged. The probable cause determination will be made by one Authority supervisor/manager.

4. Return to Work

Any employee who tests positive for drugs and/or alcohol pursuant to a return to work screen shall be suspended for forty (40) working days. During this period, he/she will be required to obtain an evaluation by a substance abuse professional (SAP). The substance abuse professional shall be an individual who is a licensed physician (medical doctor or doctor of osteopathy), or a licensed or certified psychologist, social worker, employee assistance professional or additional counselor (certified by the National Association of Alcoholism and Drug Abuse Counselors Certification Commission), with knowledge of an clinical experience in the diagnosis and treatment of drug and alcohol related disorders. The employee will be required to submit to any and all treatment recommendations made by the SAP. The cost of any recommendations made by the SAP. The cost of any recommended treatment or counseling as well as the initial evaluation by the SAP will be at the employee's own expense unless covered by health insurance or union health and welfare funds.

The employee will not return to work without documentation from the SAP that he/she has completed all treatment recommendations. In addition, the employee will be required to submit to and pass a return to work drug and alcohol screen. A second positive screen in this category will result in discharge.

5. Random

Any employee who fails a random drug screen will be subject to the disciplinary actions as outlined above under return to work.

6. Refusal to Take Test

Any employee who refuses to submit to any drug and/or alcohol test, either by word or action, will be discharged. This will include any employee who fails to provide a urine sample within a reasonable time period. However, employees who have difficulty providing a sample will be given liquids and an ample opportunity to produce a sample. This time period should not exceed two (2) hours from the time at which the employee arrived at the clinic or hospital unless there are extenuating medical circumstances. Employees who notify their supervisor that they are ill when they have been informed or are anticipating they will be informed they are required to take a drug and/or alcohol test will be given prompt medical attention, which will also include a drug and/or alcohol test.

7. Test Tampering and/or Non-Compliance with Testing Procedures

In situations where it has been determined that an employee has tampered with his/her urine sample or an employee refuses or fails after reasonable opportunity to complete any step in the drug testing process, he/she will be discharged.

EMERGENCY

AMBULANCE_____

FIRE-RESCUE_____

HOSPITAL_____

POLICE_____

**MBTA RESIDENT
ENGINEER**_____

ALTERNATE_____

(POSTING IS REQUIRED BY OSHA 1926.)

(EXHIBIT 2-2)

SAFETY STANDARDS

American Concrete Institute
American National Red Cross
American National Standards Institute
American Petroleum Institute
American Society of Mechanical Engineers
American Society for Testing Materials
American Welding Society
Associated General Contractors of America
Buildings Officials Conference of America
Department of Transportation
Federal Transportation Administration
E.I. DuPont de Nemours & Company
Federal Fire Council
Federal Safety Council
Industrial Hygiene Foundation of America, Inc.
Institute of Makers of Explosives
Interstate Commerce Commission
Massachusetts Division of Labor and Industries
National Bureau of Standards
National Fire Protection Association
National Safety Council
Occupational Safety and Health Act, U.S. Department of Labor
Underwriters Laboratories, Inc.
United States of American Standards Institute
Nuclear Regulatory Commission
U.S. Army, Corp. of Engineers
U.S. Department of Interior, Bureau of Mines
U.S. Government, General Services Administration
U.S. Urban Mass Transportation Administration

3.0 INSTRUCTION AND TRAINING

3.1 Basic Elements

The following areas of instruction and safety communication will promote satisfaction of the statutory as well as the Project requirements:

- . Indoctrinations
- . Right-of-Way Safety Awareness Assignments
- . Meetings
- . Personal Contact
- . Specific Instruction
- . Promotional Material
- . Bulletin Board

3.2 Procedures

The MBTA Safety personnel are available to assist Contractor's in carrying out their accident prevention instruction and training responsibilities.

3.2.1 Indoctrination

Newly employed, promoted and/or transferred personnel shall be fully instructed in the safety practices required by their new assignments. Initial instructions for new project personnel will include discussion of the project's basic safety regulations.

3.2.2 Right-of-Way Safety Awareness

Newly employed, promoted and/or transferred personnel shall be fully instructed in the right-of-way safety practices required by their new assignments. Personnel will not be allowed on the job site unless they have attended the Right-of-Way Safety Awareness training session. They must display the Hard Hat sticker, and carry a certification card.

3.2.3 Work Assignments

All work assignments, regardless of level, should include specific instruction on safety, especially in instances where experience or the nature of the assignment indicates the possibility of personal injury or property damage.

3.2.4 Meetings

Holding properly conducted safety meetings of reasonable length is an effective means of communicating with employees. To be effective, the material presented must be specific as well as practical.

a. Operational or Progress Meetings

Whether these meetings are held at a Project or Contractor level, accident prevention shall be an agenda item and the record of these meetings should reflect the specific items discussed.

b. Crew Training Meeting

Each Foreman shall hold a weekly safety training meeting in its work area with its entire crew. These meetings often called "tool box" or "tail gate" meetings are ideally held on Monday morning and should usually last five to ten minutes. Subject matter should cover specific safety procedures pertinent to the crew's on-going activity. Following these meetings, "Report of Safety Meeting" Form (Exhibit 3-1) shall be completed. The Contractor's designated Safety Supervisor shall periodically attend and participate in these meetings.

3.2.5 Personal Contact

All levels of supervision shall make a specific effort to call to the attention of individuals under their direction, pertinent safety items relative to work. This personalized "on the spot" instruction is an extremely valuable training technique, as well as continuing indication of management's awareness and concern for safety.

3.2.6 Specific Instruction

OSHA's Construction Safety Standards require that varying degrees of training and instruction be afforded Project personnel engaged in specific areas of performance. Among the requirements listed are:

- a. Unsafe Conditions (All Employees)
- b. Use of Poison or Caustics (Exposed Employees)
- c. Use of Flammable Liquids, Etc. (Employees Using)
- d. Use of Respiratory Protection (As Required)
- e. Gas Welding and Cutting (Employees Performing)
- f. Arc Welding (Employees Performing)
- g. Toxic Substance (Employees Using)
- h. Hazardous Material Communication Program (All Employees)

3.2.7 Promotional Material

Posters and signs are useful means for wide dissemination of instruction and training. The value of both have been repeatedly demonstrated.

Basic safety signs are normally permanent while posters are temporary and should be changed frequently to maintain relevance with the changing job site environment.

3.2.8 Bulletin Board

The Contractor shall provide a bulletin board at the work site(s) in an area accessible to all employees. The Bulletin Board shall be utilized for the required OSHA and other MBTA distributed information, safety information and posters.

MBTA CONSTRUCTION SAFETY
"WEEKLY TOOLBOX SAFETY MEETING"

DATE: _____

MBTA CONTRACT NO. _____

PROJECT: _____

CONTRACTOR: _____

CRAFT: _____

NO. ATTENDING: _____

TOPIC(S) DISCUSSED:

SUGGESTIONS FOR IMPROVEMENTS:

FOREMAN'S SIGNATURE

SAFETY REPRESENTATIVE

(EXHIBIT 3-1 (B))

ATTENDANCE ROSTER DATE: _____

	<u>NAME (PRINTED)</u>	<u>SIGNATURE</u>	<u>CRAFT</u>
1.			
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4.0 WORK PRACTICES CONTROL

4.1 Procedures

The techniques to be applied by the Contractor in the control of employee unsafe acts are identical to those that are utilized in the achievement of production quality and quantity control.

4.1.1 Supervisory Controls

- a. Contractor - Each Contractor shall be responsible for continuous surveillance of its operations, so that he is aware of the probable sources of potential injury or loss due to unsafe acts or procedures.
- b. Contractor Supervisor - The practical safety experience of project supervision must be utilized in directing the actions of those under their direction.

4.1.2 Project Controls

Frequent monitoring surveillance and audit of the performance of Contractors and its supervision will be made by MBTA Inspectors, Resident Engineers, the Project Safety Manager and/or its designated representative(s). In all instances, Contractors will be notified in writing of any serious unsafe practices observed. Failure to notify the Contractor shall not relieve the Contractor of its obligation to identify and correct unsafe practices. The Contractor's Safety Supervisor, the MBTA Project Safety Manager and other designated safety personnel shall utilize Exhibit 8-1, "Construction Safety Survey", to record unsafe practices and/or conditions. Instructions for completing Exhibit 8-1 are contained in Section 8.0.

4.1.3 Working On Or Near Third Rail

When working on or near the third rail, when the power is off, the contractor must have a third rail high-voltage warner device (Julian A. McDermott Corp. Mod RR4WL-WSAD-LI or MOD RRail-WSAD-LI-DP). This device will warn work crews if the third rail becomes energized at any time during work activity involving the right-of-way.

5.0 PHYSICAL CONDITIONS CONTROL

5.1 Procedures

5.1.1 Planning

It is an accepted principle of accident prevention that effective control of physical conditions must begin with planning. Many more serious accidents result from poor planning (or worse, lack of planning) than from any other cause. Planning, for the safety of personnel and for equipment being used, must begin with design and continue through Project completion. Contractors shall plan the safety procedures to be followed for each phase of construction. Planning meetings must include the involved Contractor, its responsible members of the MBTA's staff, and any other responsible party who may contribute to the safety of the operation.

Personnel chosen to perform any such planned operation shall be thoroughly instructed in all aspects of the procedure, including emergency actions to be taken in the event of a mishap.

5.1.2 Responsibility

The Contractor is ultimately responsible for effective performance under this section through its Superintendent or Foremen. This is because the Superintendent or Foreman has direct control of the work being performed. As such, he has the last opportunity to observe and correct any unsafe acts and/or conditions that may exist.

5.1.3 Inspections

There are a number of physical equipment inspections required by OSHA. One example is crane inspection: A "competent person" must be responsible for the regular inspection of cranes, including all wire rope. A written record of these inspections must be maintained on the site.

a. Contractor's Safety Supervisor

The Contractor shall ensure that its Safety Supervisor regularly inspects each of the work areas (including storage, office and shop facilities) to ensure compliance with MBTA and OSHA requirements. "Construction Inspection Check List", (Exhibit 5-1) is to be used on a weekly basis.

b. Crane Inspection Record

(Exhibit 5-2) and Wire Rope Inspection Record (Exhibit 5-3) are to be completed by the MBTA competent person prior to use on the job site.

c. Crane and Wire Rope Inspections

Shall be performed by the Contractor per OSHA requirements.

d. OSHA Compliance Officers

Contractors may expect periodic safety inspections from OSHA Compliance Officers. Contractors shall promptly notify the Resident Engineer whenever an OSHA Compliance Officer arrives on the Project.

- e. Inspectors, Resident Engineers, Construction Project Manager, Safety Director, Project Safety Manager

Contractors may expect continuous surveillance, monitoring, and audit of the safety practices and procedures by the MBTA staff above. Full cooperation of the Contractor shall be given to correct in a timely manner any safety discrepancies noted verbally or in writing by the MBTA staff above. Surveillance, monitoring, and audits shall not relieve the Contractor of any of its safety obligations.

5.1.4 Information Exchange

The free flow and exchange of any information that may contribute to safe operations between the Contractor's Safety Supervisor and the MBTA staff is strongly encouraged.

5.1.5 Equipment and Facilities

Contractor operating equipment and facilities shall be used, inspected, and maintained as directed in this manual and as dictated by the applicable federal and state safety and health regulations. In the event of conflict the more stringent requirement will take precedence.

5.1.6 Notification of Hazards

Contractors shall notify the Resident Engineer/Project Safety Manager, in writing, of the existence of any hazardous conditions, property or equipment at the work site which are not under the Contractor's control. However, it is the Contractor's responsibility to take all necessary precautions against injury to persons or damage to property from such hazardous conditions until corrected by the responsible party.

5.1.7 Work Authorizations

The following work authorizations will be issued by the MBTA:

- a. Excavation
- b. Hotwork
- c. Confined Space Entry
- d. Crane-Suspended personnel platforms

Construction Safety Monthly Inspection Check List

Contractor: _____

Contract No. _____

Jobsite Location: _____

Person in Charge: _____

Date: _____

Time: _____

Person(s) making inspection:

Contractor Safety Representative
(Must be signed)

		Column: A=Adequate: B=Inadequate		Remarks
		A	B	
(1)	PROGRAM ADMINISTRATION:			
	(a) Posting OSHA and other jobsite warning posters.			
	(b) Do you have safety meetings?			
	(c) Do you have job safety training, including first-aid training?			
	(d) Are there medical service and first-aid equipment, stretchers, and emergency vehicles available?			
	(e) Are jobsite injury records being kept?			
	(f) Are emergency telephone numbers, such as police department, fire department, doctor, hospital, and ambulance posted?			
(2)	HOUSEKEEPING AND SANITATION:			
	(a) General neatness of working areas.			
	(b) Regular disposal of waste and trash.			
	(c) Passageways and walkways clear?			
	(d) Adequate lighting.			
	(e) Projecting nails removed.			
	(f) Oil and grease removed.			
	(g) Waste containers provided and used.			
	(h) Sanitary facilities adequate and clean.			
	(i) Drinking water tested and approved.			
	(j) Adequate supply of water.			
	(k) Disposal drinking cups.			
	(b) Fire extinguishers identified, checked, lighted.			
	(c) Phone number of fire department posted.			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(d) Hydrants clear, access to public thoroughfare open.			
	(e) Good housekeeping.			
	(f) "No smoking" posted and enforced where needed.			
	(g) Fire brigades.			
(4)	ELECTRICAL INSTALLATIONS:			
	(a) Adequate wiring, well insulated.			
	(b) Fuses provided.			
	(c) Fire hazards checked.			
	(d) Electrical dangers posted.			
	(e) Proper fire extinguishers provided.			
	(f) Are terminal boxes equipped with required covers? Are covers used?			
(5)	HAND TOOLS:			
	(a) Proper tool being used for each job.			
	(b) Neat storage, safe carrying.			
	(c) Inspection and maintenance.			
	(d) Damaged tools repaired or replaced promptly. Are employee's tools inspected and repaired?			
(6)	POWER TOOLS:			
	(a) Good housekeeping where tools are used.			
	(b) Tools and cords in good conditions.			
	(c) Proper grounding.			
	(d) Proper instruction in use.			
	(e) All mechanical safeguards in use.			
	(f) Tools neatly stored when not in use.			
	(g) Right tool being used for the job at hand.			
	(h) Wiring properly installed.			
(7)	POWER-ACTUATED TOOLS:			
	(a) Local laws and ordinances complied with.			
	(b) All operators qualified.			
	(c) Tools and charges protected from unauthorized use.			
	(d) Competent instruction and supervision.			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(e) Tools checked and in good working order.			
	(f) Tools not used in any, but recommended materials.			
	(g) Safety goggles or face shields.			
	(h) Flying hazard checked by backing up, removal of personnel, or use of captive stud tool.			
(8)	LADDERS:			
	(a) Ladders inspected and in good condition?			
	(b) Properly secured to prevent slipping, sliding, or falling?			
	(c) Do siderails extend 36" above top of landing?			
	(d) Rungs or cleats not over 12" on center.			
	(e) Stepladders fully open when in use.			
	(f) Metal ladders not used around electrical hazards.			
	(g) Proper maintenance and storage.			
	(h) Are ladders painted?			
	(i) Are safety shoes in use?			
(9)	SCAFFOLDING:			
	(a) Is erection properly supervised?			
	(b) Will all structural members meet the safety factor?			
	(c) Are all connections secure?			
	(d) Is scaffold tied into structure?			
	(e) Are working areas free of debris, snow, ice, grease?			
	(f) Are foot sills and mud sills provided?			
	(g) Are workers protected from falling objects?			
	(h) Is scaffold equipment in good working order?			
	(i) Are guard rails, intermediate rails, and toeboards in place?			
	(j) Are ropes and cables in good condition?			
(10)	HOISTS, CRANES AND DERRICKS:			
	(a) Inspect cables and sheaves.			
	(b) Check slings and chains, hooks, and eyes.			
	(c) Equipment firmly supported.			
	(d) Outriggers used if needed.			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(e) Power lines inactivated, removed, or at safe distance.			
	(f) Proper loading for capacity at lifting radius.			
	(g) All equipment properly lubricated and maintained.			
	(h) Signalmen where needed.			
	(i) Signals understood and observed.			
	(j) Are inspection and maintenance logs maintained?			
(11)	HEAVY EQUIPMENT			
	(a) Regular inspection and maintenance.			
	(b) Lubrication and repair of moving parts.			
	(c) Lights, brakes, warning signals operative.			
	(d) Wheels chocked when necessary.			
	(e) Haul roads well maintained and laid out properly.			
	(f) Protection when equipment is not in use.			
	(g) Are shut-off devices on hose lines in case of hose failure?			
	(h) Are noise arresters in use?			
(12)	MOTOR VEHICLES:			
	(a) Regular inspection and maintenance.			
	(b) Qualified operators.			
	(c) Local and state vehicles laws and regulations observed.			
	(d) Brakes, lights, warning devices operatives.			
	(e) Weight limits and load sizes controlled.			
	(f) Personnel carried in a safe manner - seated.			
	(g) Is all glass in good condition?			
	(h) Are back-up signals provided?			
	(i) Are fire extinguishers installed where required?			
(13)	GARAGES AND REPAIR SHOPS:			
	(a) Fire hazards.			
	(b) Dispensing of fuels and lubricants.			
	(c) Good housekeeping.			
	(d) Lighting.			
	(e) Carbon monoxide dangers.			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(f) Are all fuels and lubricants in proper containers?			
	(g) Proper ventilation.			
	(h) Proper grounding and bonding.			
(14)	BARRICADES:			
	(a) Flood openings planked over or barricaded.			
	(b) Roadways and sidewalks effectively protected.			
	(c) Adequate lighting provided.			
	(d) Traffic controlled.			
(15)	HANDLING AND STORAGE OF MATERIALS:			
	(a) Are materials properly stored or stacked?			
	(b) Are passageways clear?			
	(c) Stacks on firm footings, not too high.			
	(d) Proper number of men for each operation.			
	(e) Are men lifting loads correctly?			
	(f) Are materials protected from weather conditions?			
	(g) Protection against falling into hoppers and bins.			
	(h) Is dust protection observed?			
	(i) Extinguishers and other fire protection.			
	(j) Is traffic controlled in the storage area?			
(16)	EXCAVATION AND SHORING:			
	(a) Are adjacent structures properly shored?			
	(b) Is shoring and sheathing used for soil and depth?			
	(c) Are roads and sidewalks supported and protected?			
	(d) Is material stored too close to excavations?			
	(e) Is excavation barricaded and lighting provided?			
	(f) Is equipment a safe distance from edge of excavation?			
	(g) Are ladders provided where needed?			
	(h) Are equipment ramps adequate?			
	(i) Is job supervision adequate?			
(17)	DEMOLITION:			
	(a) Are operations planned ahead?			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(b) Is there shoring of adjacent structures?			
	(c) Are material chutes used?			
	(d) Is there sidewalk and other public protection?			
	(e) Clear operating space for trucks and other vehicles.			
	(f) Adequate access ladders or stairs.			
(18)	FILE DRIVING:			
	(a) Are there proper storage procedures?			
	(b) Is unloading only by properly instructed workmen?			
	(c) Are steamlines, slings, etc., in operating condition?			
	(d) Are piled riving rigs properly supported?			
	(e) Are ladders on frames?			
	(f) Are cofferdams maintained and inspected?			
	(g) Is adequate pumping available?			
	(h) Is man protection adequate?			
(19)	EXPLOSIVES:			
	(a) Qualified operators and supervision.			
	(b) Proper transport vehicles.			
	(c) Local laws and regulations observed.			
	(d) Storage magazines constructed per regulations or as recommended.			
	(e) Experienced personnel handling explosives at all times.			
	(f) Cases opened properly.			
	(g) "No smoking" posted and observed where appropriate.			
	(h) Detonators tested before each shot.			
	(i) All personnel familiar with signals and signals properly used at all times.			
	(j) Inspection after each shot.			
	(k) Proper protection and accounting for all explosives at all times.			
	(l) Proper disposition of wrappings, waste, and scrap.			
	(m) Advise residents nearby of blasting cap damage, and inspect potential damage points.			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(n) Check radio frequency hazards.			
(20)	FLAMMABLE GASES AND LIQUIDS:			
	(a) All containers clearly identified.			
	(b) Proper storage practices observed.			
	(c) Fire hazards checked.			
	(d) Proper storage temperatures and protection.			
	(e) Proper types and number of extinguishers nearby.			
	(f) Carts for moving cylinders.			
(21)	WELDING AND CUTTING:			
	(a) Are operators qualified?			
	(b) Screens and shields.			
	(c) Goggles, gloves, and clothing.			
	(d) Equipment in operating condition.			
	(e) Electrical equipment grounded.			
	(f) Power cables protected and in good repair.			
	(g) Fire extinguishers of proper type nearby.			
	(h) Inspection for fire hazards.			
	(i) Flammable materials protection.			
	(j) Gas cylinders chained upright.			
	(k) Gas lines protected and in good condition.			
	(l) Are cylinders caps in use?			
(22)	STEEL ERECTION:			
	(a) Safety nets or planked floors.			
	(b) Hard hats, safety shoes, gloves.			
	(c) Taglines for tools.			
	(d) Fire hazards at rivet forge and welding operations.			
	(e) Floor opening covered and barricaded.			
	(f) Ladders, stairs, or other access provided.			
	(g) Hoisting apparatus checked.			
	(h) Safe man position.			
(23)	CONCRETE CONSTRUCTION:			
	(a) Forms properly installed and braced.			

		Column: A=Adequate: B=Inadequate		
		A	B	Remarks
	(b) Adequate shoring, plumed, and cross braced.			
	(c) Shoring remains in place until strength is attained.			
	(d) Proper curing period and procedures.			
	(e) Check heating devices.			
	(f) Mixing and transport equipment supported and traffic planned and routed.			
	(g) Adequate runways.			
	(h) Protection from cement dust and concrete contact.			
	(i) Nails and stripped form material removed from area.			
(24)	MASONRY:			
	(a) Proper scaffolding.			
	(b) Masonry saws properly equipped, dust protection provided.			
	(c) Safe hoisting equipment.			
(25)	HIGHWAY CONSTRUCTION:			
	(a) Laws and ordinances observed.			
	(b) Competent flagmen properly dressed, instructed, posted.			
	(c) Adequate warning signs and markers.			
	(d) Equipment not blocking right-of-way.			
	(e) Traffic control through construction site.			
(26)	PERSONAL PROTECTION EQUIPMENT:			
	(a) Eye protection.			
	(b) Face shields.			
	(c) Respirators and masks.			
	(d) Helmets and hoods.			
	(e) Head protection.			
	(f) Gloves, aprons, and sleeves, rubber or plastic, designed to afford protection from alkalis and acids, electricians' rubber gloves with protectors.			



NIBTA SAFETY DEPARTMENT EQUIPMENT INSPECTION PROGRAM

✓

CRANE ID# _____

CONTRACT # _____

DATE INSPECTED

ISSUED BY: _____

SN # _____

CRANE SAFETY INSPECTION REPORT



**MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY**

CRANE SAFETY INSPECTION REPORT

CONTRACTOR		SUB CONTRACTOR				JOB. NO.	CFSR #
ADDRESS		TELEPHONE	LOCATION		INSPECTION DATE	INSPECTION STICKER #	
MANUFACTURER	CAPACITY	SER. #	MODEL #		UNIT #	TIME	
OPERATOR'S INFORMATION NAME _____ LICENSE # _____ EXPIRATION DATE _____		ITEM #	SAT.	UNSAT.	N/A	DEFICIENCIES	
RECORDS/SIGNS							
Current Annual Inspection Report							
Preventive Maintenance Records							
Operator's Manual/Instructions							
Marked Operator Controls							
Load Charts							
Caution or Informational Signs							
Hand Signal Chart							
High Voltage Warning Signs							
Counterweight Warning Signs							
SAFETY EQUIPMENT							
Handrails, Steps, Non-Skid Surfaces, Mirrors							
Heater/Defroster							
Windshield Wipers/Blades							
Fire Extinguisher							
Warning Devices: Back-up Alarm, Horn							
Anti-two Block System/Device							
ELECTRICAL CONTROL AND ENGINE SYSTEMS							
Electrical System							
Air Pressure System							
Hydraulic System							
Controls and Instructions: Levers, ???, Switches, Buttons and Knobs							
Holding and Locking Systems							

Indicators: Level Boom Angle/Length					
Load ?? Drum Rotation Swing/Boom Warning					
Engine Operation: Upperworks/Carrier					
Clutch and Brake Systems: Pads					
Safety and Machinery Guards					
Muffler/Exhaust System					
HYDRAULIC					
Radiator					
Boom Extension Hoses and Reel					
Hoses and Fittings					
Hoist Cylinders: Foot Pins and Seals					
Boom Sections/Base/Intermediate/Tip					
Rollers/Wear Pads					
Point Sheaves/Bearings					
Cable Keepers On All Sheaves					
Jib/Extensions					
LATTICE BOOM/JIB					
Gantry Bridle or Equalizer Systems					
Foot Connections/Pins					
Automatic Boom/Hoist Kickout					
Boom Stops					
Chords					
Lacings					
Welds					
Pins/Keepers/Lugs					
Rollers					
Cable Keepers On All Sheaves					
Sheaves/Bearings					
Jib: Connections, Hinge Pins					
LUBE SYSTEMS GAUGES					

Automatic/Manual Lubrication					
Fluid Levels					
Gauge/Gauge Ports					
DRUMWIRE ROPE HOOK/BLOCK ASSEMBLERS					
Glazing					
Superstructure: Frame, Cracks and Welds					
Steering System					
Lights: Head, Tail, and Brake					
Signal Indicators/Markers/Flashers					
Fuel Tank/Cap					
Tires: Condition/Pressure					
Wheel Lugs/Cylinders					
Cranes/Chains?? Sprockets, Hobbers and Pins					
Outriggers: Boxes, Beams, Cylinders					
Pads, Pins and Keepers					
Mounts, Bolts, Nuts, Rivets, and Brackets					
Muffler/Exhaust System					
Counterweight Hooks and Bolts					
Housekeeping/Toolbox or Storage Area					
Drums	Wedge Sockets				
Anchoring of Rope	Hends On Ball/Swivel				
Ropes Spooling on Drums	Blocks: Sheaves, Sheave				
Boom Hoist	Bearings Guard Plates				
Pendants	Swivel, Pins, and Keepers				
Main Hoist	Hook: Tram/Throad				
Auxiliary Hoist	Hook NOT				
Whip or Jib Hoist	Safety Latch				
Rope End Fittings					

All unsatisfactory wire rope shall be replaced as per original manufacturer's recommendations.

NOTE:

As of this date _____ the unit described above has been found to be in the above condition. It is understood that this inspection does not provide?? The necessary to perform frequent and periodic inspections in conjunction with a regular maintenance program in accordance with manufacturer's specifications and/or Federal, State and local guidelines, as applicable. This inspection does not constitute a warranty or guaranty of the performance on above equipment.

EXHIBIT 5-3

MBTA

WIRE ROPE INSPECTION REPORT

CRANE NO. _____ MILEAGE _____ HOURS _____ DATE INSPECTED _____

WIRE ROPE	(A) Number Broken Wires Per:	(B) Diameter reduction (wear or core damage)	(C) Kinked, Crushed, Cut, Loss of Lay, Etc.?	(D) Lubed, Corrosion, (internal or external), Heat damage?	(E) Terminal, Tackle, Blocks, Hooks, Etc.?
TYPE SIZE	(1) (2) Lay? Strand?	(1) (2) Ind. Wire Tot. Rope?			
Main Hoist (Td. Line)					
Boom Hoist (Top Lift)					
Jib Hoist (Whip Line)					
Pendants (Main)					
Pendants (150 Foot Boom)					
Jib Guys (Upper)					
Jib Guys (Lower)					

Replacement of hoisting rope shall be done in compliance with the replacement criteria by manufacturers recommendations.

INSPECTED AT LOCATION: _____ INSPECTED BY _____

COMMENTS: _____

6.0 SAFE PRACTICE STANDARDS

6.1 PROCEDURES

6.1.1 Housekeeping

A basic concept in any effective accident prevention program is "good housekeeping." No one item has a great impact on the overall success of a safety program for a construction project. The importance of good housekeeping is such that it must be planned from the beginning of the job and carefully supervised through the final cleanup.

- a. During the course of construction, work areas, passageways and stairs, in and around buildings and structures, shall be kept clear of debris. Construction materials shall be stored in an orderly manner. Storage areas and walkways on the site shall be maintained free of depressions, obstructions and debris.
- b. The essential elements of good housekeeping include:
 1. Orderly placement of materials, tools, equipment, cords, and electric lines.
 2. Placing receptacles at appropriate locations for the disposal of rubbish and debris.
 3. Prompt removal and disposal of trash and waste materials.
 4. Locating air and water lines, welding and burning leads, to eliminate tripping hazards.

6.1.2 Equipment Standards

Adherence to the standards listed below will aid the Contractor in the prevention of personal injury and property damage accidents.

a. Motor Vehicles

1. Each operator is responsible for the safe operation of its vehicle. Drivers should make a daily inspection of the following: steering, brakes, mirrors, lights, horn, seat belts, backup alarm, tires and windshield wipers. Noted defects must be reported for prompt repair.
2. Preventative maintenance shall be regularly scheduled for all vehicles to assure their safe operating condition. All vehicles must be in compliance with federal and state requirements.
3. Trucks shall never be loaded beyond their rated capacities, or in a manner that will obscure the driver's vision. To prevent shifting or loss of material, all loads shall be securely fastened.
4. Motor vehicles shall be fueled only at established locations and by approved methods. When a vehicle is being fueled, smoking or open flames will not be permitted. Gasoline-powered equipment shall not be refueled while engine is running or hot. Gasoline will only be dispersed from approved acceptable

safety containers. Grounding straps shall be utilized during transfer of flammable liquids.

b. Material Handling Equipment (Cranes)

1. The Contractor shall notify the Resident Engineer 48 hours prior to bringing in any hoisting equipment on the Authority's property.
2. Operators are responsible for the exercise of caution necessary for the safe operation of their equipment. Operators shall immediately report unsafe conditions, including defects in the machine, to their supervisor.
3. Operators shall not permit anyone to ride the hook or load.
4. When the operator leaves its machine or repairs are being made, it is his/her responsibility to set the brakes, secure the boom, take the machine out of gear and turn off the engine.
5. When making a lift, the operator will take operational signals only from the person authorized to give them. An emergency stop signal, given by anyone, will be acted upon by the operator.
6. It is the joint responsibility of the operator and the riggers to see that all hitches are secure and that all loose material is removed before the loads are lifted.
7. Safety hooks, or properly "moused" hooks, shall be used on all operations where loads are being handled. Suspended loads shall be controlled by tag lines.
8. Booms shall be equipped with a boom angle indicator and approved boom stops. Boom heads, load blocks and hooks shall be painted with a high visibility paint.
9. Where necessary to increase stability, cranes, except crawler cranes and boom type excavators, shall be equipped with outriggers of a design and strength suitable for the work being performed. Outrigger shall be used in accordance with the manufacturers instructions.
10. Hooks, wire rope, bearings, gears, friction clutches, chain drivers and other parts subject to wear must be inspected at regular intervals and repaired or replaced as required. Records of such inspections shall be maintained by the contractor.
11. A thorough annual inspection of each crane or hoisting device shall be made by a competent person. Written records of such inspections be maintained by the contractor.

6.1.3 Electrical

- a. All electrical work, installation and wire capacities shall be in accordance with the pertinent provisions of the National Electrical Code (NFPA 70-1984), unless otherwise provided by applicable regulations. (GFS or GFT's are required on all circuits)

- b. All switches shall be enclosed and grounded. Panel boards shall have provisions for closing and locking the main switch and fuse box compartment.
- c. Cables passing through work areas shall be covered or elevated to protect them from damage and to eliminate tripping hazards to employees.
- d. Extension cords used with portable electric tools and appliances shall be heavy duty and of the three wire grounding type, and shall conform to the type and configuration required by the applicable OSHA Construction Safety Standards Part 1C.
- e. Suitable means shall be provided for identifying all electrical equipment and circuits, especially when two or more voltages are used on the same job. All circuits shall be marked for the voltage and the area of service they provide.

6.1.4 "Lock-Out" "Tag-Out" Clearance Procedure

The following procedure is intended to provide a controlled method for rendering inactive electrical equipment or operating systems (including mechanical or piped) when equipment is down for any reasons, such as repair, removal or replacement of equipment and installation of new equipment.

This procedure includes the three basic phases of work on any system:

- a. Shutting down equipment
- b. Repairing or installing equipment
- c. Start-up equipment

It is likely that some situations will not include all three phases as such; however, regardless of the operation and the phase or phases involved, the "lock-out" "tag-out" clearance procedure must be observed to ensure that safety of the operation.

It is pointed out that even though this procedure generally provides for locking and tagging of equipment, the danger tag alone is to be considered a lock-out device and any equipment bearing such a tag shall not be operated under any circumstances.

Prior to starting any major operation which would involve locking and tagging procedures, a meeting should be set up involving the Contractor's Safety Supervisor and the Cognizant MBTA Representative. Specific procedures should be adopted and reviewed by all concerned with the operation prior to commencement of work

- a. Shutdown of Equipment or System
 - 1. The Foreman shall cause equipment to be shut down in a manner consistent with good operating practice.
 - 2. The main disconnect shall be opened in addition to any remote control switches. On electrical work, it is advisable as a further precaution that the electrician shall remove all of the supply fuses. On piped hydraulic/pneumatic systems, the main valves shall be closed, pressures relieved and blocked before initiating repair or maintenance.

3. After assuring himself that the equipment has been properly shut down in accordance with prescribed procedures, the craft supervisor shall positively determine that the equipment or system has been locked and tagged as follows:

Tags shall be affixed in a clear view (signed and dated).

Padlocks, to which only the craft supervisor shall have access keys, shall be placed on the equipment in such a manner as to render operation of the equipment impossible.

If a shutdown is ordered by the MBTA, custody of keys will be by the MBTA only.

b. Repair or Installation

1. Each individual craftsman assigned to the repair or installation shall attach to the equipment or system a separate standard danger tag. The tag shall be dated and signed. Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area in order to be effective.
2. The craft supervisor responsible for the work must assure that the equipment has been deactivated and properly tagged before permitting its personnel to perform any work.

c. Starting Up Equipment or System

1. As soon as the work is completed, the tags shall be removed only by the individuals installing them.
2. In the event the shift ends before the work is completed, the status of the work is to be reported in detail to the oncoming shift Superintendent/Manager/Supervisor and the names on the tags jointed hanged.
3. Upon completion of the work, the supervisor will make certain all worker's tags have been moved and that everyone is clear of the equipment or system. Return the equipment to normal operating conditions.

d. General

1. In an emergency, the Contractor's Project Manager/Superintendent shall have the authority to remove the tags and locks only after positively determining whether or not the equipment or system is safe for operation and that all personnel are in the clear.
2. Personnel deviating from these instructions or unauthorized persons removing danger tags shall be subject to immediate dismissal.

6.1.5 Tools

All hand tools, power tools and similar equipment, whether furnished by the Contractor or the employee, shall be maintained in a safe condition. Supervisors and craft employees shall be responsible for the inspection and repair of tools under their control. The use of many tools

requires the use of a variety of personal protective equipment. See OSHA for specific requirements.

a. Hand Tools

1. Insulated or non-conducting tools should be used when working near energized electrical circuits.
2. Tool handles should be tightly fitted. Wooden handles should be carefully checked; tightened with wedges, if necessary, and replace split or splintered handles.
3. All impact tools, such as chisels, punches and wedges shall be regularly dressed to eliminate "mushrooming."

b. Power Tools

The majority of power tools accidents are caused by improper handling or poor maintenance. The following applies to all types of power tools.

1. Only authorized personnel should be permitted to operate or repair power tools.
2. Maintenance of power tools should be systematic. All worn or damaged tools should be promptly repaired or replaced. All tools should be cleaned, tested and inspected regularly.
3. Power tools shall not be used if safety equipment, such as shields, tools rests, hoods and guards have been removed or otherwise rendered inoperative.
4. Employees using tools under conditions that expose them to the hazards of flying objects or harmful dusts shall be provided with the required personal protective equipment.
5. All electrically powered tools shall be properly grounded.
6. Gasoline powered tools shall not be used in unventilated areas. Gasoline shall be dispensed only in U.L. approved safety cans. No gasoline powered tools shall be used in the tunnel areas during revenue hours, and they must be removed prior to beginning revenue service (storage of flammable material is prohibited).
7. Portable grinders should be provided with hood type guards with side enclosures that cover the spindle and at least 50% of the wheel. All wheels should be inspected regularly for signs of fractures.
8. Bench grinders shall be equipped with deflector shields and side cover guards. Tools rests shall have a maximum clearance of 1/8 inch from the wheel.
9. Hoses supplying pneumatic tools shall have coupling secured to prevent accidental disconnection.
10. Air supply lines should be protected from damage, inspected regularly and maintained in good condition.

11. Air sources supplying hoses exceeding 1/2 inch ID shall be protected by excess flow valves to prevent "whipping" in the event of hose separation or failure.
12. The pressure of compressed air used for cleaning purposes must be reduced to 30 psi or less (does not apply for cleaning for forms, etc.).
13. The use of compressed air for cleaning purposes is encouraged, so as to reduce the employee exposure to potential airborne contaminants.

c. Powder-Actuated Tools

1. Only employees who have furnished evidence of having been trained in its use shall be allowed to operate a powder-actuated tool. Eye protection shall be worn by all personnel using the tool.
2. Tools shall not be loaded until just prior to use. Loaded tools shall not be left unattended.
3. Tools shall not be used in an explosive or flammable atmosphere. Cartridges (powder source) shall be kept separated from all other material.
4. Powder actuated tools used on this project shall meet all applicable requirements of ANSI A10.3-1970.

6.1.6 Welding and Cutting

a. Welding

1. A suitable, approved fire extinguisher shall be available for instant use in locations where welding is done. Screens, shields or other safeguards should be provided for the protection of personnel or materials below or otherwise exposed to sparks, slag, falling objects or the direct rays of the arc.
2. The welder shall wear approved eye, head protection, gloves and respirators if required. Persons assisting the welder shall wear protective glasses and respirator if required.
3. Electric welding equipment, including cable, shall meet the requirements of the National Electric Code. Welding practices shall comply with all applicable regulations.

b. Burning or Cutting

1. When gas cylinders are stored, moved or transported, the valve protection cap shall be in place.
2. When cylinders are hoisted, they shall be secured and upright in an approved cage or basket.
3. All cylinders shall be stored, transported and used in an upright position. If the cylinder is not equipped with a valve wheel a key shall be kept on the valve stem while in use. Gas cylinders must be stored 20 feet from propane.

4. An approved fire extinguisher shall be readily available in the event of fire.
5. Appropriate personal protective equipment, such as burning glasses, shields and/or gloves must be used.

6.1.7 Ladders

a. Manufactured Ladders

Manufactured ladders on the project shall comply with the regulations of ANSI A14.1-1990, Safety Code for Portable Wood Ladders or ANSI A14.2-1990, Safety Code for Portable Metal Ladders are required by OSHA.

1. Ladders with broken or missing rungs, broken or split side rails, or otherwise damaged, shall not be used.
2. All portable ladders shall be equipped with non-skid safety feet and shall be placed on a stable base. The access areas at the top and bottom of ladders shall be kept clear.
3. The side rails shall extend 36 inches above the landing. When this is not practical, grab rails shall be installed. All ladders in use shall be tied, blocked or otherwise secured to prevent accidental displacement.

b. Job Made Ladders

1. Job made ladders shall be fabricated in compliance with OSHA 1926 Subpart X.
2. The general rules applying to the use of manufactured ladders also apply to the use of job made ladders.

6.1.8 Scaffolding

- a.
 1. Scaffolds should be designed, built and inspected by competent persons. To avoid the use of makeshift platforms and scaffolding, each job should be carefully planned to assure that scaffolding is used where required and that such scaffolding conforms to its length and be made of at least 2 inch by 4 inch stock or its equivalent.
 2. Guard rails shall be installed on all open sides and ends of platforms more than six feet (6') above the ground or floor and shall be approximately forty two inches (42") high. Guard rails shall be made of lumber not less than two inches (2") by four inches (4") material.
 3. The midrail shall be halfway between the top rail and the floor, runway, platform or ramp. The ends of the rail shall not overhang the terminal posts except when it does not constitute a projected hazard. The midrail shall be made of at least 1 inch by 6 inch stock or its equivalent.
 4. The toeboard, 4 inch minimum height, shall be securely fastened in place.

5. Wooden Railing Posts (verticals) shall be made of at least 2 inch by 4 inch stock or its equivalent, and be spaced so as not to exceed 8 feet on center.
- b. Other types, sizes and arrangements of railing construction are acceptable, provided they meet the following requirements:
1. A smooth surfaced top rail approximately 42 inches above the floor.
 2. A strength to withstand the minimum of 200 lbs. applied within two inches (2") of the top edge in any downward or outward direction at any point along the top edge
 3. For specific material requirements, refer to current OSHA Standards 1926 Subpart L.

c. Stair Railings

A stair railing shall be constructed similar to a standard railing, but the vertical height shall be not more than 34 inches nor fewer than 30 inches from the top rail to the surface of the tread in line with the face of the riser at the forward edge of the riser. All hand rails shall be provided with a clearance of approximately three inches (3") between the hand rail and any other surface or object.

d. Covered Floor Opening

Floor opening covers shall be capable of supporting the maximum intended load and so installed as to prevent accidental displacement. Covers on larger floor openings shall be distinctively marked.

e. Stairways

During construction, stairs shall be provided on all structures that are two or more floors or more than 20 feet in height.

1. Stairway placement should follow as soon as practical.
2. All parts of stairways shall be free of hazardous projections. Debris and other loose material shall not be allowed to accumulate on stairways.
3. Permanent steel stairways having hollow pan type treads and landings that are to be used prior to concrete placement shall have the pans filled with solid material to the level of the nosing.
4. Temporary stairs shall have a landing not fewer than 30 inches wide, in the direction of travel, for every 12 feet of vertical rise. Wooden treads for temporary service shall be full width.
5. Riser height and tread width shall be uniform throughout any flight of stairs.

6.1.9 Concrete and Concrete Forms

All equipment and materials used in concrete construction and masonry work shall meet the applicable requirements as prescribed in ANSI A10.9-1970 "Safety Requirements for Concrete Construction and Masonry Work."

- a. Employees working more than 6 feet above any adjacent working surface, placing reinforcing steel in walls, piers, columns, etc. shall be provided with fall protection such as a safety harness or equivalent device
- b. Employees shall not be permitted to work above vertically protruding reinforcing steel unless such steel has been protected to eliminate the implement hazard.
- c. The riding of concrete buckets for any purpose shall be prohibited.

6.1.10 Floor and Wall Openings

To control conditions where there is danger of employees or materials falling through floor, roof or wall openings, such openings shall be protected by standard railings and toeboards or covered over as follows:

- a. A standard railing shall consist of a top rail, intermediate (midrail) rail, toeboard and posts.
 1. The top rail shall be approximately 42 inches from the upper surface of the rail to the floor, platform or ramp level. The top rail shall be smooth surfaced throughout.

6.1.11 Steel Erection

- a. Permanent floors shall be installed as soon as practical following the erection of structural members. At no time shall there be more than four floors or 48 feet of unfinished bolting or welding above the foundation or uppermost secured floor.
- b. Temporary Flooring
 1. The erection floor shall be solidly planked over its entire surface except for access openings. Planking shall be not fewer than 2 inches thick, full size undressed, and shall be laid tight and secured against movement.
 2. On structures not adaptable to temporary floors, safety nets shall be installed and maintained whenever the potential fall distance exceeds two stories or 25 feet.
 3. A safety railing shall be installed, approximately 42 inches high, around the periphery of all temporary planked floors during structural steel erection.
- c. General Requirements
 1. Bundles of sheets or small material shall be so secured as to prevent their falling.

2. When setting structural steel, each piece shall be secured with not fewer than two bolts at each connection and drawn up wrench tight before the load is released.
3. 100% full protection is a mandatory project requirement. Avoid walking on the top flange of beams. Beams must be "cooned", using the lower flange. When engaged in work from a fixed position, a safety harness shall be used.
4. When loads are being hoisted, avoid walking under the lift or permitting an employee to be exposed to the swing of the lift.
5. A tag line shall be used to control all loads.
6. For the protection of other crafts on the project, signs shall be posted in the erection area, "Danger Men Working Overhead."

6.1.12 Excavations, Trenching and Shoring

- a. The determination of the angle of repose and design of the supporting system shall be based on careful consideration of the following: depth of the cut; anticipated changes in the soil due to air, sun and water; and ground movement caused by vehicle vibration of blasting, and earth pressures.
- b. Trenches 5 feet and over in depth shall be shored or walls cut back to protect employees from cave-ins.
- c. Ladders or other means of egress shall be provided in each excavation. No more than 25 feet of lateral travel shall be required to reach any such ladder.
- d. Soil piles must be kept back 2 feet from excavation.
- e. Contractor must ensure that at a minimum for any excavation or open trench on MBTA property, a snow fence must be installed and maintained by the contractor at all times. Caution tape on any open excavation is not a sufficient barrier.

6.1.13 Personal Protection Equipment

This section establishes the minimum requirements of personal protective equipment to be used. Only equipment complying with OSHA Safety Standards shall be used. All Contractors shall be responsible for the compliance by their employees. The Contractor's Safety Coordinator shall make regular field inspections to audit compliance.

a. Head Protection

Hard hats shall be mandatory. Hard Hats shall meet the requirements of ANSI Z89.1 or ANSI Z89.2, as appropriate, as specified by OSHA 1926 Subpart E.

b. Eye Protection

When working on or visiting the project, all employees or visitors shall wear eye protection. Eye and face protection shall meet the requirements of ANSI Z87.1 as specified by OSHA 1926 Subpart E.

c. Respiratory Protection

Respiratory protection devices approved by the National Institute of Occupational Safety and Health (NIOSH) shall be supplied by the Contractor and worn by all employees when exposed to hazardous concentrations of toxic or noxious dust, fumes or mists as required by OSHA regulations.

d. Hearing Protection

Approved hearing protection shall be made available by Contractors, and such protection shall be worn by all employees exposed to sound levels in excess of OSHA's Permissible Exposure Limits (PEI).

e. Safety Harnesses

Safety harnesses meeting OSHA safety standards shall be made available by the contractor and shall be worn by all employees exposed to falls from and unprotected height of six feet or more. Safety harness lanyards shall be a minimum of 1/2 inch nylon or equivalent with a maximum length to provide for a fall of no greater than six feet.

f. Safety Shoes

While the Contractor may not be responsible for furnishing safety shoes to its employees, the Contractor is required to assure that its employees wear suitable work shoes on the project. No tennis, canvas shoes of any kind will be permitted.

g. Other Personal Protective Equipment

Other such required equipment to be used under unusual circumstances, such as high temperature work, handling corrosive liquids, etc., not specifically covered in this section shall be reviewed with the Safety Director.

h. Maintenance

Personal protective equipment which has been altered in any manner so as to reduce its effectiveness shall be repossessed, repaired or destroyed. Personal protective equipment which has been worn or used previously shall not be reissued to another employee until the article has been cleaned and sterilized.

6.1.14 Blasting

The "Blaster's Handbook" by E.I. DuPont is an excellent guide in the use, storage and handling of explosives. Only qualified personnel shall transport, handle or use explosives. For specific blasting requirements, refer to OSHA 1926 Subpart U.

6.1.15 Fire Prevention

Fire prevention is of special importance during construction. There are considerably more hazards present during construction that will be present in the completed facility. Constant attention to the fundamentals of fire prevention is vital. The Contractor's Safety Representative shall make fire hazard inspections of the entire project on a regular basis. Immediate correction of substandard conditions is mandatory.

- a. Provide sufficient quantities of portable fire extinguishers appropriate for the type of possible fire, at the work area. Where hose lines are available, connect them so they are ready for service.
- b. Particular care shall be taken when welding and cutting in locations where combustibles are exposed. When such welding or cutting is done, the surrounding area must be protected with fire retardant blankets, and an adequate number of approved fire extinguishers must be immediately available.
- c. The operation and maintenance of temporary heating equipment shall create no fire hazards. The use of solid fuel salamanders shall be prohibited. Clothing must not be dried by placing on or near heaters.
- d. All flammable and combustible materials shall be stored, piled and handled with due regard to their fire characteristics. Flammable liquids must be stored in an approved manner, and dispensed only in acceptable safety containers. Welding gases shall be stored and segregated by type of gas. Lumber should be stacked in small piles that are interspersed with wide aisles. Lumber storage should be as far as possible from any structure.
- e. Temporary shacks or similar structures shall be constructed of fire resistant materials.
- f. Rubbish and debris shall not be allowed to accumulate.

6.2 HOT WORK REQUIREMENTS

6.2.1 Description

This section specifies "Hot Work" fire control procedures for Contractors and their personnel, including cutters, welders and operators of heating equipment. Hot Work is any work that utilizes or produces an ignition source.

6.2.2 Submittals

- a. Perform "Hot Work" operations as follows:
 - 1. Ensure the safe handling of "Hot Work" equipment and the safe use of the particular "Hot Work" process.
 - 2. Determine the combustible materials and hazardous areas present or likely to be present in the work locations.
 - 3. Protect combustibles from ignition by the following.
 - a. Have work moved to a location free from dangerous combustibles.
 - b. If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustible properly shielded against ignition.

4. Give notice to the Project Office of the need to perform "Hot Work" operations and secure authorization from the Resident Engineer and the local fire department as applicable.
 5. Ensure that the cutter or welder secures his or her supervisor's approval that conditions are safe before going ahead with the work.
 6. Ensure that fire protection and extinguishing equipment are properly located at the site.
 7. Where fire watchers are required, see that they are available at the site.
 8. Procure all required permits.
- b.** Ensure the worker handles the "Hot Work" equipment safely and uses it so as not to endanger lives or property and:
1. Has the approval of his or her supervisor and the MBTA Project Office starting any "Hot Work";
 2. Does not perform any "Hot Work" where conditions are not safe;
 3. Continues to perform "Hot Work" only so long as conditions are unchanged from those under which approval was granted.

6.2.3 Fire Prevention Precautions

Permit "Hot Work" only in areas that are or have been made firesafe. Within the confines of a building or other enclosed structure, perform cutting and welding operations preferably in a specific area designed or approved for such work, such as a maintenance shop or a detached outside location. Ensure that such areas are of non-combustible or fire-resistant construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. When work cannot be moved practicably, as in most construction work, make the area firesafe by removing combustibles or protecting combustibles from ignition sources.

- a.** Do not permit "Hot Work" in the following situations:
1. In areas not authorized by the MBTA;
 2. In sprinklered buildings while such protection is impaired;
 3. In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts;
 4. In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulphur, baled paper or cotton.
- b.** Before "Hot Work" is permitted, the Resident Engineer will give notification authorizing the "Hot Work" and designate precautions to be followed. He will have designated MBTA personnel to inspect the work area for fire safety, as indicated herein,

and which personnel will complete a "Hot Work" check off list. The Resident Engineer will also assure himself of the following:

1. The "Hot Work" equipment to be used is in satisfactory operating condition and in good repair.
 2. Where there are combustible materials such as paper clippings, wood shavings or textile fibers on the floor, sweep the floor clean for a radius of 35 feet. Keep combustible floors wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, protect personnel operating arc welding or cutting equipment from possible shock.
 3. Where practicable, relocate combustibles at least 35 feet from the work site. Where relocation is impracticable, protect combustibles with flame-proofed covers or otherwise shield with metal or fire-resistant guards or curtains. Secure edges of covers at the floor so they are tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile.
 4. Tightly cover wall or floor openings or cracks within 35 feet of the site to prevent the passage of sparks to adjacent areas.
 5. Suitably protect or shut down ducts and conveyor systems that might carry sparks to distant combustibles.
 6. Where "Hot Work" is done near walls, partition, ceiling or roofs or combustible construction, provide fire-resistant shields or guards to prevent ignition. If welding is to be done on a metal wall, partition, ceiling or roof, take precautions to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, provide a fire watch on the opposite side of the work. Do not attempt welding on a metal partition, wall, ceiling or roof having a combustible covering, nor on walls or partitions of combustible sandwich-type panel construction.
 7. Do not undertake to perform "Hot Work" on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs if the work is close enough to cause ignition by conduction.
 8. Provide sufficient quantities of portable fire extinguishers, appropriate for the type of possible fire, at the work area. Where hose lines are available, connect them so they are ready for service.
 9. Suitably protect nearby personnel against heat, sparks, slag, etc.
- c. Require the services of Fire Watcher whenever "Hot Work" is performed in locations where other than minor fire might develop, or where the following conditions exist:
1. Appreciable combustible material in the building construction or contents is closer than 35 feet to the point of operation.
 2. Appreciable combustibles are more than 35 feet away, but are easily ignited by sparks.

3. Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
4. Combustible materials are adjacent to the opposite end of metal partitions, walls, ceilings or roofs, and are likely to be ignited by conduction or radiation.

Fire Watcher's responsibilities include:

1. Have fire extinguishing equipment readily available and be trained in its use.
 2. Be familiar with facilities for sounding an alarm in the event of a fire.
 3. Watch for fires in exposed areas, and try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm.
 4. Maintain a fire watch for at least one-half hour after completion of "Hot Work" operations to detect and extinguish possible smoldering fires.
- d. Where a Fire Watch is not required, make a Final Check-Up one-half hour after the completion of "Hot Work" operations to detect and extinguish possible smoldering fires.
- e. Have "hot tapping" operations or other cutting or welding on a flammable gas or liquid transmission or distribution utility performed only by a crew qualified to make hot taps.

6.3 CONFINED SPACE ENTRY PROCEDURE (CSEP)

6.3.1 Purpose

This confined space entry procedure (CSEP) has been designed with the objective of preventing serious physical injury or death caused by employees attempting to perform work in confined space areas without proper testing and evaluation being performed. Contractors shall ensure that their employees and supervisors are trained in this procedure and that it is used where appropriate.

6.3.2 Confined Space Identification

A key element is CSEP is to identify areas that are considered confined spaces. A confined space is any area that:

- a. has limited openings for entry and exit;
- b. which may contain or produce toxic air contaminants;
- c. has a high concentration of an inert gas;
- d. is not intended for continuous occupancy; and
- e. may have an oxygen deficient atmosphere (less than 19.5%)

Examples include, but are not limited to, storage tanks, process vessels, pits, vats, vaults, sewers, tunnels, manholes, cells, ducts, and rooms with less than proper size openings for easy access with no mechanical ventilation.

6.4 Responsibilities

Confined space areas must be evaluated prior to employee entry by supervision and/or qualified safety personnel. Once the evaluation is complete, supervision will draft its plan for ensuring that the elements of the CSEP are met.

6.4.1 Implementation and Pre-Entry Requirements

Personnel shall not enter the confined space area until the following are accomplished:

- a. Lines which may convey flammable, injurious, or incapacitating substances into the space shall be disconnected, blinded or blocked off by other positive means to prevent the development of dangerous air contamination and/or oxygen deficiency within the space.

The disconnection or blind shall be so located or completed in such a manner that inadvertent reconnection of the line or removal of the blind are effectively prevented. (See lockout tagout procedures).

- b. The confined space shall be emptied, flushed or otherwise purged of flammable, injurious or incapacitating substances.
- c. Qualified Contractor personnel shall test the atmosphere with an approved calibrated device to determine whether dangerous contaminants and/or oxygen deficiency exists. Written records of such testing results shall be made and posted adjacent to the identified confined space. The date, time, and the name of the testing official shall also be recorded. Contractor personnel who may either be supervision of safety personnel shall perform these tests on an "as needed" basis. Records of these tests must remain a permanent record of construction site operations.
- d. Where interconnected spaces are blinded off as a unit, each space shall be tested, results recorded, and the most hazardous conditions found shall govern the operation.
- e. If dangerous air contamination and/or oxygen deficiency does not exist within the space, as demonstrated by the tests, entry into and work within the space may proceed subject to the following provisions:
 1. Frequent testing shall be conducted to ensure that a dangerous air contamination and/or oxygen deficiency does not develop during the performance of any operation.
 2. If this does occur during the operation, the requirements covered in "Confined Space Operations" shall apply.
 3. Where the existence of either dangerous air contamination and/or oxygen deficiency is demonstrated by tests, existing ventilation shall be augmented by appropriate means (usually additional ventilation).

4. When additional ventilation has removed the dangerous air contamination and/or oxygen deficiency as demonstrated by additional tests (and recorded), entry into and work within the space may proceed.
- f. No source of ignition shall be introduced until the implementation of appropriate provisions has ensured that dangerous air contamination due to flammable and/or explosive substances does not exist.
- g. Whenever oxygen-consuming equipment such as salamanders, plumbers, torches, or furnaces and the like are to be used, measures shall be taken to ensure adequate combustion air and exhaust gas venting.
- h. To the extent feasible, provision shall be made to permit ready entry and exit.
- i. Where it is not feasible to provide ready exit from spaces equipped with automatic fire suppression systems employing harmful design concentrations of toxic or oxygen-displacing gases, or total foam flooding, such systems shall be deactivated. Where it is not practical or safe to deactivate such systems, the provisions of "Confined Space Operations" related to the use of self-contained breathing equipment shall apply during entry into work within such spaces.

Contractors Must Remember:

Surveillance of the surrounding areas must be considered to avoid drifting vapors from tanks, piping and swears which might adversely affect the atmosphere of the confined space, and Respirators are of no use in an oxygen-deficient atmosphere. Either an air-line respirator or self-contained breathing equipment is effective for use in an oxygen-deficient atmosphere.

6.4.2 Requirements, Confined Space Operations

Contractor personnel shall not be allowed to enter a confined space with an oxygen deficient or potentially toxic/explosive atmosphere, except for emergency or rescue personnel as directed by the Contractor's Safety Representative.

6.4.3 Entry Into and Work Within Confined Spaces

- a. Tanks, vessels, or other confined spaces with side and top openings shall be entered from side openings when practicable.

Note: Side openings are those within 3 and 1/2 feet of the bottom.
- b. Approved respiratory protective equipment shall be provided and worn when needed; this equipment may include self-contained breathing equipment.
- c. An approved safety harness with attached line shall always be used. The free end of the line shall be secured outside the entry opening. The line shall be at least 1/2 inch diameter and 2,000 pounds test.
- d. At least one employee shall stand by on the outside of the confined space, ready to give assistance in case of emergency. At least one additional employee who may have other duties shall be within sight of call of the standby employee(s).

1. The standby employee shall have appropriate, approved respiratory equipment which may include an independent source of breathing air, and adequate communications.
 2. The standby employee shall be equipped with an emergency light source.
 3. A standby employee(s), protected as prescribed, may enter a confined space. In case of emergency, the employee must alert an additional employee of the pending emergency, and the standby employee's intention to enter the confined space.
- e. When entry must be made through a top opening, the following requirements shall apply:
1. The safety belt shall be of the harness type that suspends a person in an upright position.
 2. A hoisting device or other effective means shall be provided for lifting employees out of the space.
- f. Work which involves the use of a flame, arc, sparks, or other sources of ignition is prohibited within a confined space (or any adjacent space having common walls, floor or ceiling with the confined space) which contains, or is likely to develop, dangerous air contamination due to flammable and/or explosive substances, i.e., repair of gas tanks, etc.
- g. Whenever gases such as nitrogen are used to provide an inert atmosphere for preventing the ignition of flammable gases or vapors, no flame, arc, spark or other source of ignition shall be permitted unless the oxygen concentration is maintained at less than 20% of the lower explosive limit (LEL). Contractor and Subcontractor's supervision must be aware of operations of this description.
1. Atmosphere testing shall be conducted by a competent subcontract person with sufficient frequency to ensure conformance with this paragraph.
 2. A written record of the results of such testing shall be made and a copy posted adjacent to the confined space.
- h. Only approved lighting and electrical equipment (12 volt, explosion-proof) shall be used in confined spaces subject to dangerous air contamination by flammable and/or explosive substances.
- i. Employees working in confined spaces which had contained substances corrosive to the skin or substances which can be absorbed through the skin shall be provided with, and shall be required to wear, appropriate personal protective clothing.
- j. An effective means of communication between standby employees and employees in a confined space shall be provided and used whenever the provisions of confined space operations require the use of respiratory protective equipment or whenever employees inside a confined space are out of sight of the standby employee(s). All affected employees shall be trained by the Contractor in the use of such communications system. The system shall be tested before each use to confirm its effective operation.

7.0 HAZARDOUS SUBSTANCES/COMMUNICATIONS

7.1 Purpose and Scope

The purpose of this section is to establish a procedure for the identification and notification of hazardous substances as provided under the OSHA CFR 1926 Safety and Health Regulations for Construction.

7.2 General Requirements

7.2.1 Any Contractor who uses substances on the hazardous substances list to which workers might be exposed under either normal work conditions or reasonable foreseeable emergency conditions resulting from work place operations must provide those workers with the required hazardous substance information.

7.2.2 Contractors must provide their employees, upon request, information based on the Material Safety Data Sheet (MSDS) and a copy of the MSDS. (Note: MSDS must be readily available at the job site).

7.2.3 Contractors are required to train employees to work safely with hazardous substances to include informing them what an MSDS is and where they are located.

7.2.4 Contractors are required to adhere to current minimum MBTA contract work practice requirements for the removal, containment, recovery and disposal of lead based paint, and associated waste.

7.3 Reporting of Hazardous Substances

Each Contractor working on MBTA projects is required to provide the MBTA with a list of hazardous substances and copies of the MSDS that they will be using in their work site operations. Contractors are required to provide a copy of their training program to the Safety Director for review.

8.0 OCCUPATIONAL SAFETY AND HEALTH ACT **1926 SAFETY AND HEALTH REGULATIONS FOR** **CONSTRUCTION**

8.1 OSHA

Employees must comply with current OSHA Safety Standards that apply to their type of business. All employers must meet reporting requirements and employers with eleven (11) or more employees must meet recordkeeping requirements specified in booklet "Recordkeeping Requirements Under Occupational Safety and Health Act."

8.2 Familiarization with OSHA Safety Standards

Each Contractor must be familiar with Occupational Safety and Health Act (OSHA) as it pertains to its work responsibility.

8.3 Reporting of Fatal/Serious Accidents to OSHA

All fatality cases and/or serious accidents and illness shall be reported to OSHA immediately by phone to an Occupational Safety and Health Area Office. Employers must report immediately all blasting accidents.

8.4 OSHA Poster

Part of the OSHA requirements is that each employer must post in a prominent location the "Safety and Health Protection on the Job" poster. The poster briefly states the intent and coverage of the Act. Failure to post this document is a citable offense under the Act.

EXHIBIT 8-1

CONSTRUCTION SAFETY SURVEY FORM

1. This form is required for recording any unsafe condition and/or action noted by the Contractor's Safety Supervisor, and the MBTA Safety Manager.
2. This form is primarily intended for preparation and use by the Contractor's Safety Supervisor, who is appointed to perform safety audit services in accordance with the requirements of the MBTA Construction Safety Program. Unsafe conditions and/or actions should be corrected immediately and duly reported on this form.
3. Completed copies indicating action taken and date completed shall be submitted to the MBTA Safety Project Manager.
4. This form shall also be used by the MBTA Project Safety Manager to record any unsafe action and/or condition noted. The MBTA Project Safety Manager will make known his recommendations to the Contractor's Safety Supervisor and/or Project Manager/Superintendent for immediate corrective action.
5. This form shall be used by the representatives performing safety audit services on all projects. They shall prepare this form, noting all unsafe acts and/or conditions observed during field audits. These reports shall be distributed as noted on Exhibit 8-1.

Exhibit (8.1)

CONSTRUCTION SAFETY SURVEY

Report No.: _____
 Contract No.: _____
 Contractor No.: _____

FILE NO.	DESCRIPTION	SAFETY REGULATION REFERENCE	ACTION AND/OR DATE COMPLETED

<p>SURVEY MADE BY (PRINT):</p> <p>_____</p> <p>Signature</p> <p>_____</p> <p>Title</p> <p>_____</p> <p>Date</p>	<p>_____</p> <p>Signature of contractor ' s Project Manager/Supervisor</p> <p>Date: _____</p> <p>_____</p> <p>Signature of MBTA Resident Engineer</p> <p>Date: _____</p>	<p>DISTRIBUTION</p> <p>9 Project Mgr./Superintendent</p> <p>9 Resident Engineer</p> <p>9 Project Safety Manager</p> <p>9 Project Risk Mgmt. Consultant</p> <p>9 MBTA Chief of Design and Construction</p>
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REPORT OF ACCIDENT OR DAMAGE TO EQUIPMENT OR PROPERTY

1. This form shall be prepared covering every accident to equipment or property.
2. The form shall be prepared from information as a result of investigation or direct reports by the person or persons involved or responsible.
3. Reports shall be completed promptly.
4. All accidents involving damage to property, including raw materials or equipment, installed equipment, motor vehicles and heavy construction equipment are reportable.
5. Investigation of alleged damage to private property:
 - a. Buildings that may be affected by construction shall have been inspected by outside consultant (selected by the Risk Management Consultant and the MBTA).
 - b. If, in the course of construction work, property damage occurs which is allegedly due to construction operations, this reporting procedure is to be followed.
 - c. If, however, a property owner reports damage to its property, of which it's compliant is the first intimation, and alleges that it is due to construction, he will probably request prompt inspection.
 - d. In complying with an owner's request for report of damage allegedly due to construction work, particular care is required to see and record only the facts and to avoid expressing opinion. The owner's opinion shall be recorded as "remarks by owner".

"EXHIBIT 8-3

**REPORT OF ACCIDENT OR DAMAGE
TO EQUIPMENT OR PROPERTY**

CONTRACTOR _____

DATE _____

SUBCONTRACTOR _____

MBTA CONTRACT NO. _____

SECTION DESIGNER _____

LOCATION OF ACCIDENT) _____

EQUIPMENT INVOLVED (DESC. & SERIAL NOS.) (OWNER) _____

WERE THERE PERSONAL INJURIES YES _____ NO _____

DAMAGES \$ _____

WITNESS TO ACCIDENT

WERE THEIR STATEMENT (S) OBTAINED
FROM WITNESS(ES) YES ___ NO ___

ARE STATEMENTS ATTACHED
YES ___ NO ___

REMARKS

TIME OF ACCIDENT ___ A.M. ___ P.M. DATE _____

WEATHER CONDITIONS _____ TEMPERATURE _____

ROADWAY OR SURFACE _____ WET ___ DRY ___ ICY ___ OTHER _____

IF OTHER, EXPLAIN _____

**IF MORE SPACE IS REQUIRED, USE BACK OF THIS SHEET FOR ADDITIONAL INFORMATION
AND SKETCHES**

SIGNED _____

TITLE _____

SUPERVISOR'S REPORT OF ACCIDENT/UNUSUAL OCCURRENCE

1. This form shall be submitted by the Contractor to the MBTA Resident Engineer for each job-related accident involving any of the following:
 - a. Any injury to an employee of the Contractor or any Subcontractor.
 - b. Any injury to persons not directly connected with the project (including any alleged injuries reported by a member of the general public).

Submittal shall be made as soon as possible, but in no case later than twenty-four (24) hours after the accident. Pertinent facts which are not available within the above time shall be submitted as soon as available in a supplemental report.

**SAFETY DEPARTMENT
CONSTRUCTION PROJECT ACCIDENT/INCIDENT
FIRST REPORT**

Project Number _____

Contract Description _____

_____	Name of Injured: _____
_____	Employer: _____
_____	Job Title: _____
Location: _____	Type of Accident: _____
Type: _____	Type of Injury: _____
Name: _____	Witness(es): _____
Person(s) Injured: _____	

DESCRIPTION OF ACCIDENT/INCIDENT: *(Attach additional sheets if necessary)*

PREVENTION RECOMMENDATIONS:

PREPARER'S NAME: _____	PREPARER'S TITLE: _____
PREPARER'S SIGNATURE: _____	PREPARER'S PHONE: _____

COPY TO SAFETY DEPT. FAX #(617) 222-5127 *and* CONSTRUCTION DEPT. FAX #(617) 723-1969

Forward copies of additional reports to:

MBTA Safety Department
10 Park Plaza
Room #8350
Boston, MA 02116
Attn: Mgr. Of Industrial, Construction,
Safety & Design

MBTA Design & Construction Department
10 Park Plaza
Room #6720
Boston, MA 02116
Attn: Chief of Design and Construction

SUPERVISOR'S REPORT OF ACCIDENT/UNUSUAL OCCURRENCE

1. Contract Number	2. Date of Accident - Time (AM or PM)	
3. Project Section	4. Location of Accident	
5. Reporting Organization	6. Contractor or Subcontractor Involved	
7. Injury 8. Damage*		
___ Reportable ___ Lost Time ___ Fatal ___ Fire ___ Property ___ Equipment		
9. Injured person and address	10. Occupation of Injured	
	___ Male ___ Age ___ Female	
	Employer	
	Address	
11. Nature of Injury	12. Date stopped work	13. Date Returned
14. First aid by	15. Ambulance	
16. Hospital	17. Attending Physician	
18. Witnesses or persons responding, including addresses		
19. Fire Department	20. Police Department	
21. Equipment and/or materials involved		
22. Primary cause of accident		
23. Secondary cause		
24. Contributing factors		
25. Supervisor's corrective action	Supervisor's signature	
26. Project Supt.'s corrective action	Project Supt.'s signature	
27. Date this report *Attach a list of damaged property and/or equipment excluding motor vehicles. Indicate		
Owner's names and addresses.		
28. MBTA safety regulations involved	Part _____	Chapter _____
Par. _____		
29. OSHA regulations involved	Part _____	Chapter _____
Par. _____		
30. Photographs attached _____		
31. Sketch showing location of nearby structures, materials, equipment, etc., with approximate scale of distances.		
32. Narrative description of events previous, during and immediately after the accident.		

MONTHLY ACCIDENT EXPERIENCE SUMMARY

1. This form shall be submitted monthly by the Contractor to reflect the cumulative accident experience of the Contractor and each Subcontractor.
2. This report must be submitted no later than three (3) days after end of the month being reported.
3. These report forms and their completion do not, in any way, relieve the Contractor from completing OSHA Form 200 or Employers Report of Occupational Injury or Illness.

**MONTHLY
ACCIDENT EXPERIENCE SUMMARY**

MBTA Contract No.	
CONTRACTOR/SUBCONTRACTOR Name:	
MONTH	YEAR
REPORTING PERIOD: THROUGH	

	THIS MONTH	YEAR TO DATE	PROJECT TO DATE
Hours Worked			
First Aid Cases			
A. OSHA Recordable Cases			
B. Lost Time Cases (List each under comments)			
C. Days Lost			
A. OSHA Recordable Incidence Rate <i>$\frac{\text{No. Of Recordables} \times 200,000}{\text{Hours Worked}}$</i>			
B. Lost Time Incident Rate <i>$\frac{\text{No. Of Incidents Resulting in Lost Time} \times 200,000}{\text{Hours Worked}}$</i>			
C. Lost Time Severity Rate <i>$\frac{\text{Total Days Lost} \times 200,000}{\text{Hours Worked}}$</i>			
AVERAGE MONTHLY EMPLOYEES			DAYS LOST
COMMENTS:			
LOST			TOTAL DAYS
Prepared By	Date	PM/Superintendent	Date

OSHA RECORDKEEPING REQUIREMENTS

The following forms are required by OSHA for recordkeeping. The forms and the instructions for completing the forms are in the OSHA booklet entitled "Recordkeeping Requirements under the Occupational Safety and Health Act."

- a. OSHA Form 200, Log Summary of Occupational Injuries and Illness; and
- b. Employer's Report of Occupational Injury or Illness, CDLSR Form 5020 (Rev. 3); or
- c. OSHA Form 101, Supplementary Record of Occupational Injuries and Illness.

Each Contractor shall be responsible for its own records. A copy of these reports shall be made available to the MBTA and to the Risk Management consultant on request.

9.0 ACCIDENT INVESTIGATION, REPORTING AND RECORDKEEPING

9.1 First Aid

All accidents/incidents which result in on-site first aid treatment shall be investigated by the Contractor's Safety Supervisor, and submit a report of accident (Exhibit 8-3) to the MBTA within twenty four (24) hours of the occurrence.

9.2 OSHA Recordable

Accidents and incidents resulting in medical treatment by a licensed physician shall be thoroughly investigated by the Contractor's Safety Supervisor and reports of Accident (Exhibit 8-3) and Workers Compensation Report completed within twenty four (24) hours.

All reports must be submitted to the MBTA. The accident investigation should generate appropriate recommendations for corrective actions to prevent recurrence of similar accidents.

9.2.1 Analysis and Corrective Action

Corrective actions can only be taken when specific factors of an accident/unusual occurrence have been accurately developed and the resulting recommendations have been disseminated to the responsible persons.

In the event of a serious accident, prompt oral reporting of the preliminary details is mandatory. See 9.4 under this section for required telephone reports.

In preparing written reports of an accident/unusual occurrence, statements and comments should be confined to objective finding of facts and determining the root cause. The Contractor's accident/unusual occurrence report, project records, progress, reports, and daily time reports may become important evidential material in any ensuing legal action. Accordingly, for the date on which a potential third party accident has occurred, it is important to be specific and accurate in describing work being performed, crew of equipment being utilized and their exact location.

9.2.2 Recordkeeping

Complete records are necessary accident prevention tools, but in addition, specific records are required by OSHA. Failure to maintain these records is a citable offense. Also, investigations, resultant reports and cumulative records are necessary for the protection of all concerned parties.

9.3 Procedures

9.3.1 Investigations and Reports

- a. Exhibits 8-1 through 8-5 contain administrative instruction and report forms to be used by Contractors and Subcontractors for the following required reports
 1. Construction Safety Surveys
 2. Report of Accident of Damage to Equipment or Property (Exhibit 8-2)
 3. Supervisors' Report of Accidents/Unusual Occurrences (Exhibit 8-3)

4. Accident Experience Summary Report (Exhibit 8-4)
5. Recordkeeping Requirements under the Occupational Safety and Health Act, Reprint 1985 (Exhibit 8-5)

9.3.2 Photographs

Photographs should be taken in conjunction with investigations of accidents involving serious personal injury, all non-project personnel injuries, substantial property damage (including motor vehicle), equipment or material failure, and all accidents that may, even remotely, involve third party action.

Photographs should be sufficient in number to adequately reflect the general area as well as pertinent details from a variety of angles. It is better to take too many than not enough. Photographs should be taken as soon as possible following the accident. Identify each print on its reverse as follows: name of injured (if equipment damage, type; if property damage, location); date of accident; photographer's initial, and time photographs taken (date if different from occurrence); direction facing, and brief description of photo.

9.4 Telephone Reports

Should a serious accident occur resulting in damage to public or MBTA property; or bodily injury to the public or employees of the MBTA, its Consultants, Contractors, or their Subcontractors, a telephone report shall be made as soon as practicable to the Resident Engineer.

**SAMPLE OF
CONTRACTOR RIGHT-OF-WAY SAFETY CERTIFICATION
CARD AND HARD HAT STICKER**

Number _____



THIS IS TO CERTIFY THAT

HAS COMPLETED THE ROW CONTRACTOR
SAFETY AWARENESS CERTIFICATION PROGRAM

DATE: _____ INSTRUCTOR: _____



**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
SAFETY POLICY/PROCEDURE**

<u>SUBJECT:</u> CONTRACTOR SAFETY VIOLATION PROGRAM	<u>ORIGINAL ISSUE</u> <u>DATE:</u> July 1, 1996	<u>SAFETY/POLICY</u> <u>PROCEDURE #:</u> 7.3 REV 2
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I. POLICY

The Authority is committed to overseeing that all projects are completed in a safe manner, without injury or losses resulting from accidents. The Safety Department is authorized to conduct workplace safety inspections to ensure contractor compliance with all applicable safety rules, regulations, and Authority requirements.

II. PURPOSE

To establish procedures for notification of and conducting safety inspections and the issuance of safety violation assessments by the MBTA Safety Department to Contractors who compromise the safety and health of the workforce and to enforce contractor compliance with applicable safety and health regulations and job safety requirements.

III. SCOPE

These procedures will apply to the Safety Department, Design and Construction Department, and all MBTA Contractors and Subcontractors. Authority-issued safety violation assessments do not relieve the contractor from any responsibility or obligation for fines or penalties levied upon the Contractor by other local, State or Federal agencies.

Definitions and Abbreviations (see MBTA Standard Specifications-Bidding and Contract Requirements and Division 1-General Requirements, dated November, 1983, and the following:)

Accident/Incident: An **accident** is an unplanned and undesirable event resulting in injury and/or loss. An **incident** is an unplanned and undesirable event that nearly results in injury or loss.

Assessment: Assessment is the monetary amount determined by the Safety Department to be paid by the Contractor for the safety violations cited.

Construction Inspector: The Construction inspector is the Authority's field representative who reports to the Resident Engineer, the Authority's representative at the Project site.

Deputy Director of Design & Construction: The Deputy or Assistant Director of Design and Construction, reports to the Director of Design and Construction, and plans, directs and oversees construction activities, methods and procedures relating to the Authority Design and Construction Projects

<u>SUBJECT:</u> CONTRACTOR SAFETY VIOLATION PROGRAM	<u>ORIGINAL ISSUE</u> <u>DATE:</u> July 1, 1996	<u>SAFETY/POLICY</u> <u>PROCEDURE #:</u> 7.3 REV 2
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**Director of Design
and Construction:**

The Director of Design and Construction oversees and implements all MBTA Design and Construction Projects.

Director of Safety:

The Director of safety is charged with overseeing Authority Safety Programs, Policies and Procedures and reports directly to the General Manager's Office.

Engineer:

The General Manager of the Authority or designee acting within the scope of the particular duties entrusted to this person.

OSHA:

The Occupational Safety and Health Administration under the United States Department of Labor. The OSHA Standards are used as minimum safety guidelines for Authority projects.

Project Manager:

The MBTA Project Manager reports to the Deputy or Assistant Director of Design and Construction. The Project Manager has responsibility for the project's design and construction budget, cost and quality control, schedules, claims and safety compliance.

Resident Engineer:

The Resident Engineer provides onsite supervision of assigned MBTA Construction Inspectors who are responsible for overseeing the Contractor's compliance with the Authority's contract plans and specifications, including Article 5.15 - Safety and First Aid Requirements, as amended.

Safety Official:

The Safety Official is the MBTA's Safety Department representative who has knowledge and experience in the safety field. The Safety Official is trained in OSHA standards and in the recognition of safety and health hazards as well as the Authority's Safety Policies and Procedures. The Safety Official is authorized to issue safety violations and assessments (as approved by the MBTA Safety Director) and co-signed by the MBTA's Project Manager and/or Resident Engineer.

<p align="center"><u>SUBJECT:</u> CONTRACTOR SAFETY VIOLATION PROGRAM</p>	<p align="center"><u>ORIGINAL ISSUE</u> <u>DATE:</u> July 1, 1996</p>	<p align="center"><u>SAFETY/POLICY</u> <u>PROCEDURE #:</u> 7.3 REV 2</p>
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IV. PROCEDURES

The representatives of the MBTA Safety Department, upon presenting proper identification are authorized to:

- X Enter without delay, with reasonable prior notice to the Authority's Resident Engineer, any construction site, workplace, or other areas where work is being performed for the Authority.
- X Inspect and investigate, any such place of employment and all pertinent conditions, structures, machines, apparatus, devices, and to question, in confidence, any project employer, owner, operator, agent or employee.
- X Issue the General Contractor the Authority's safety violation(s) notice, if applicable.

Under special circumstances, advanced notice will be given to the Authority's Project representatives. Such notice will not be less than 24 hours. The special circumstances include the following:

- X Inspections that take place after regular business hours, or that require special preparation.
- X Situations in which the Safety Department determines that advance notice would produce a more thorough or effective inspection.

The MBTA Safety Official conducting the site safety inspection will notify the MBTA Resident Engineer and the General Contractor's Safety Supervisor/Representative of any safety violations found before leaving the job site or within the 24 hour period of the inspection, depending on severity of the hazard.

After the Safety Official reports the finding, the MBTA Safety Director will determine whether assessments will be issued. The assessment amounts will be determined based on the violation. The Safety Official shall issue four copies of the safety violations (see Exhibit 1)

One copy will be issued to the MBTA Resident Engineer to ensure the Contractor's corrective action and safety compliance. The second copy will be issued to the General Contractor's on-site representative. The third copy will be sent by certified mail to the General Contractor's Senior Officer and/or the Contractor's Safety Director. A copy will be retained by the MBTA Safety Department, and the information will be entered into the Safety Department's database for follow-up and record keeping purposes.

A follow-up inspection may be conducted to determine whether previously cited safety violations have been corrected. If the Contractor has failed to abate the safety violation, the Safety Official will inform that Contractor that he/she may face additional daily assessments while such failure continues or the safety violation remains unresolved. The Contractor's Senior Office and/or Safety Director will be notified by certified mail.

SUBJECT: CONTRACTOR SAFETY VIOLATION PROGRAM	<u>ORIGINAL ISSUE</u> <u>DATE:</u> July 1, 1996	<u>SAFETY/POLICY</u> <u>PROCEDURE #:</u> 7.3 REV 2
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V. OSHA Violation Categories and Violation Assessment Table (see Exhibit II):

All violations to be determined by the sue of OSHA Regulations CFR 29 including Part 1926 and Part 1910 as amended. These Regulations will be considered as the safety guidelines, unless other more stringent safety requirements are noted in the Contract.

A. OSHA Violation Categories by Types:

- X Other-than-Serious Violation--"A violation that has a direct relationship to job safety and health, but would not cause death or physical harm".
- X Serious Violation--"A violation where there is a substantial probability that death or serious harm could result".
- X Willful Violation---"A violation that the employer intentionally and knowingly commits. The employer is aware that a hazardous condition exists, knows that the condition violates an (OSHA) standard or other obligation of the OSHA Act, and makes no reasonable effort to eliminate it."
- X Repeated Violation--"A violation of any standard, regulation, rule or order where, upon reinspection, a similar violation is found and the original citation (violation notice) has become a final order"
- X Failure to Abate--"Failure to correct a prior violation may bring a civil penalty (assessment) for each day that the violation continues".

B. MBTA Assessment Ranges based on OSHA Category:

1. Other-than Serious: (\$100.-\$900.)
2. Serious Violation: (\$1000.-\$3000.)
3. Willful Violation: (\$3000.-\$7500.)
4. Repeated Violation: (\$5000.-\$9500.)

The **First** violation, shall be a written warning or, depending on the severity of the incident, could include assessment up to \$3,000. The safety violation will be corrected immediately or within a time frame as noted on the Notice of Violation.

The **Second Repeat** violation, depending on the severity of the violation, will have assessments of \$3,000. Up to \$7500. Levied upon the General Contractor. The safety violation will be corrected immediately or within a time frame noted on the Notice of Violation.

SUBJECT: CONTRACTOR SAFETY VIOLATION PROGRAM	<u>ORIGINAL ISSUE</u> DATE: July 1, 1996	<u>SAFETY/POLICY</u> <u>PROCEDURE #:</u> 7.3 REV 2
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The **Third Repeat** violation will result in an additional assessment of \$5000.-\$9500. Being levied upon the General Contractor and may require a formal review of the on site safety program with the

Contractor's insurer and at the Contractor's expense. That review may also require additional safety training for the General Contractor(s) personnel.

V1. DISPUTE RESOLUTION PROCESS (See Exhibit III)

The General Contractor will be held accountable for all safety violations on the Project, including those of any subcontractors on the same project. Upon receipt, by certified mail, of a violation notice with assessments, the Contractor will have a **15 calendar day period** to dispute the assessment violation which written notification must be forwarded along with the "Contractor Safety Violation Dispute Resolution Form" (Exhibit III), to the MBTA Director of Safety (State Transportation Building, 10 Park Plaza Rm. #8350, Boston, MA 02116), and a copy forwarded to the MBTA Project Office.

The MBTA Dispute Resolution Committee shall consist of the Director of Safety or designee, the Director of Design and Construction or designee, and the MBTA Project Manager. The purpose of the committee will be to determine whether the safety violation assessments will be upheld, reduced or dismissed. The dispute resolution meeting will include the General Contractor's Project Manager/Superintendent, the General Contractor's designated site safety supervisor/representative and/or the General Contractor's Corporate Safety Director.

The assessment values determined for the various safety violations will be withheld from subsequent General Contractor's monthly pay estimate request. The Final Payment for work performed will be reduced by those amounts previously assessed. Assessment funds will be used to further promote and reinforce safety and health on the job through continuous site safety reviews and training.

II. EXHIBITS:

1. Violation Notice Form
2. Violations and Assessment Values
3. Dispute Resolution Form

“EXHIBIT P”

MBTA Safety Department

Safety Violation No. _____

NOTICE OF SAFETY VIOLATION

Warning First Notice Second Repeat Notice Third Repeat Notice

Project Name: _____ Date: _____

Project Location: _____ Time: _____

Contract Number: _____ Weather Conditions: _____

TO: (Name of General Contractor) _____

ATTENTION OF: (Contractor Safety Supervisor/Representative: _____

General Contractor’s Address: _____

THE FOLLOWING VIOLATION(S) OF SAFETY CONDITIONS(S) HAS/HAVE BEEN NOTED AND SHOULD BE CORRECTED:

STOP WORK until the violation is corrected: Immediately By _____
Description of Safety Violation(s):

Notice Issued by MBTA Safety Official: _____

Notice Received By: _____ Employer/Title: _____

MBTA SAFETY VIOLATION ASSESSMENT

FIRST Violation

SECOND Repeat Violation

Date: _____

Date: _____

Amount: _____

Amount: _____

THIRD Repeat Violation

Date: _____

Amount: _____

A COPY OF THIS VIOLATION NOTICE MUST ACCOMPANY THE DISPUTE RESOLUTION FORM

SAFETY VIOLATION ASSESSMENT TABLE

EXHIBIT II

OSHA CATEGORY (CFR 29 PART 1926)	SAFETY VIOLATION OCCURRENCE		
	First	2 nd /Repeat	3 rd /Repeat
GENERAL SAFETY AND HEALTH PROVISIONS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROLS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
PERSONAL PROTECTIVE & LIFE SAVING EQUIPMENT	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
FIRE PROTECTION AND PREVENTION	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
SIGNS, SIGNALS OR BARRICADES	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
MATERIALS HANDLING, STORAGE, USE AND DISPOSAL	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
TOOLS - HAND AND POWER	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
WELDING AND CUTTING	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
ELECTRICAL	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
SCAFFOLDING	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
FLOOR AND WALL OPENINGS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
CRANES, DERRICKS, HOISTS, ELEVATORS AND CONVEYORS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
MOTOR VEHICLES, MECHANIZED EQUIPMENT AND MARINE OPERATIONS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
EXCAVATIONS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
CONCRETE AND MASONRY CONSTRUCTION	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
STEEL ERECTION	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
UNDERGROUND CONSTRUCTION, CAISSONS, COFFERDAMS, AND COMPRESSED AIR	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
DEMOLITION	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
BLASTING AND USE OF EXPLOSIVES	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
POWER TRANSMISSION AND DISTRIBUTION	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
ROLLOVER PROTECTIVE STRUCTURES OVERHEAD PROTECTION	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
STAIRWAYS AND LADDERS	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500
TOXIC AND HAZARDOUS SUBSTANCES	Warning Up To \$3000	\$3000 - \$7,500	\$5,000 - \$9,500

“EXHIBIT III”

G67CN01
2012

CONSTRUCTION SAFETY
01568-88

CONTRACTOR SAFETY VIOLATION DISPUTE RESOLUTION FORM

1. Contractor _____

2. Description of Violation: _____

_____ Violation No. _____

3. MBTA Contract No. _____ Date of Violation: _____

4. Contract Description: _____ Date of Notice: _____

5. Amount of Assessment(s): _____

6. Contractor Action Taken:

7. Dispute Issues: _____

FOR DISPUTE RESOLUTION COMMITTEE COMMENTS (ONLY)

Committee Findings: _____

Committee Action Taken: _____

Director of Safety/Representative Date _____

Director of Design and Construction/Representative Date _____

MBTA Project Manager Date _____

Contractor Project Manager/Superintendent Date _____

Contractor Site Safety Supervisor/Representative Date _____

THIS FORM MUST HAVE THE ABOVE ITEMS 1-7 FILLED IN AND ACCOMPANY THE DISPUTE MEETING REQUEST

END OF SECTION

SECTION 01569

SYSTEM SAFETY CERTIFICATION

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section specifies requirements to produce a Safety Certification Report which shall certify that at the time of inspection, all Safety Critical Elements of this Contract are safe for passengers, MBTA employees, emergency responders, and the general public. The formal document also ensures that all Safety Critical Elements are in compliance with regulatory codes and agencies.
- B. Final acceptance of the Safety Certification Report shall require written approval of the MBTA Chief of Safety.
- C. The **System Safety Certification Program Policy**, applies to operating systems (e.g., fire alarms, operation control centers, vent/fans, signal/power systems, vehicles, and operation plans) and construction projects (i.e., stations, facilities, rails, and bridges). Collection of all certification reports, verification of the safety and acceptance by the MBTA of all Safety Critical Elements, and the Safety Certification Report shall be the responsibility of the Contractor.

1.2 SAFETY CRITICAL ELEMENTS

- A. The safety certification work covers operational safety under system safety, operational safety, and occupational safety. The project elements which are safety critical and a list of specification with inspection, report, and training requirements will be developed by the System Safety Engineer, the Construction Project Manager, and the design consultant.

1.3 PROGRAM TASKS

- A. The MBTA System Safety Engineer shall identify all Safety Critical Elements. The Contractor shall compile and document the safety requirements as described under Part IV, A, Task 1 of the attached System Safety Certification Policy.
- B. The Contractor shall verify equipment and system elements; verify procedural system elements; verify personnel training; verify system integration; and perform safety certification for the Safety Critical Elements of this Contract as described under Part IV B through F of the attached System Safety Certification Policy.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment will be made for work required under this Section. All costs in connection therewith shall be considered incidental to the item or items of work to which they pertain.

MBTA
SYSTEM SAFETY CERTIFICATION PROGRAM

I. INTRODUCTION

The goal of this Safety Certification Program is to certify that all practical steps have been taken to optimize the operational safety of the MBTA during and after construction, **before** the start of revenue service.

The program will be conducted by the MBTA as a self-certifying agency. The Safety Certification Program is administered by the MBTA Safety Department which reports directly to the General Manager's Office.

The program requires the support of all affected departments. The Safety Department is responsible for coordinating the documentation of all tasks that address safety critical elements. Safety Critical elements are defined as those items assessed as needed to eliminate, minimize, or control hazards, which could result in death, severe injury, or major system or public property damage. Safety certifiable elements exist in system equipment, facilities, procedures, and personnel, both individually, and as an integrated whole. (See Pages 4 & 5 for examples of certifiable elements).

Specific activities of the Certification Process include:

- (a) Identification of safety requirements
- (b) Verification of compliance with safety requirements
- (c) Identification and resolution of non-compliances (open items).

II. PROGRAM OBJECTIVES:

The objective of the Safety Certification Program is to produce a formal document that ensures at the time of operation, a particular system is safe for passengers, employees, emergency responders, and the general public. Safety Certification verifies that the project is in compliance with regulatory codes and agencies. For example, when a train station is modernized, the Safety Certification Program will ensure that the Fire Alarm System meets the applicable state and city codes, and the MBTA will receive an occupancy permit stating the station is acceptable to the fire department. The Safety Certification Program will identify which items require certification and will verify that the contract documents incorporate safety requirements from the design stage. This program will also verify procedures/results and identify open items or work arounds.

The ultimate objective for this program is to provide overall risk reduction by systematically addressing hazards before opening for revenue service. This Safety Certification Program has already proved its importance with the opening of the Blue Line on June 24, 1995, and the New Old Colony Railroad, on September 26, 1997. The Safety Department was able to identify safety critical elements to ensure that they were addressed prior to the start of revenue service.

With this proactive program in place, we can expect positive results: a safer railroad.

III. **PROGRAM SCOPE:**

The Safety Certification Program covers Operational Safety only, under three different, but overlapping functional areas:

- (a) **System Safety** - the application of operating, technical, and management techniques and principals to the safety aspects of a system throughout its life to reduce hazards to the lowest practical level through the most effective use of available recourses.
- (b) **Fire/Life Safety** - elimination, minimization, or control of potential hazards to patrons, employees, emergency response personnel, and the general public caused by fire, smoke, explosion, or resulting in panic; and the protection of MBTA property from fire or explosion.
- (c) **Occupational Safety** - elimination, minimization, or control of potential hazards to employees and emergency response personnel. (The certification process itself is concerned with the end product, the operational system elements (equipment and facilities, personnel, procedures), and the integration of these elements into one integrated and independent operation).

The following are typical Certifiable Elements:

(a) **Systemwide Elements**

- 1. Safe Braking
- 2. Automatic Train Control
- 3. Communications Equipment
- 4. Passenger Vehicles/Locomotives
- 5. Train Clearance
- 6. Running Rail/Field Welds
- 7. Signals
- 8. Grade Crossings
- 9. Bridges/Structures

(b) **Facility**

- 1. Passenger Stations
- 2. Layover Facilities
- 3. Site Security
- 4. Central Control
- 5. Maintenance Facilities

(c) **Procedural Elements**

- 1. Operations Rules and Procedures
- 2. Maintenance Rules and Procedures
- 3. Emergency Response Rules and Procedures
- 4. Personnel Training and Qualification Procedures

(d) **Personnel Elements**

- 1. Operations Personnel
- 2. Maintenance Personnel
- 3. Emergency Response Personnel

(e) **Integration Elements**

1. Integrated Test Procedures
2. Integrated Test Reports
3. Pre-Revenue Operations Test Procedures, including Emergency Response Scenarios
4. Pre-Revenue Operations Test Reports (e.g., grade crossing tests)

IV. PROGRAM TASKS

The program tasks described in this section comprise the overall certification process. Procedures, methodologies, checklists, work flow charts, schedules and other documentation necessary for the conduct, review and completion of tasks will be prepared under the appropriate task.

A. TASK 1 - IDENTIFICATION AND DOCUMENTATION OF SAFETY REQUIREMENTS

This task will involve the identification, compilation and documentation of safety requirements applicable to the equipment/facility and system elements shown under Section III of this plan.

Source documentation for the identification of safety requirements will include:

1. The technical specification for MBTA contract(s).
2. MBTA design and performance criteria.
3. Safety studies and analyses conducted by MBTA or consultants.
4. Pertinent Safety criteria and studies from other rail transit systems.
5. Applicable codes, standards, and regulations.

All safety requirements extracted from the technical specifications for equipment/facility element contracts and procurements will be documented on Safety Certification documents. Safety requirements extracted from source documentation, other than contract or procurement technical specifications, will be identified for resolution as open-items.

Primary emphasis will be given to identifying those safety elements that are "safety critical". Safety critical elements, as defined earlier, are those items assessed as needed to eliminate, minimize, or control hazards, which under consideration of the potentially worst critical mishap could result in death, severe injury, or major system or public property damage. However, safety codes and standards not falling within the above "safety critical" category will be included in the program so that non-critical safety elements can be verified. Safety Critical elements will be shown in "**Bold Type**" when producing a list of certifiable elements.

B. TASK 2 - VERIFICATION OF EQUIPMENT/FACILITY AND SYSTEM ELEMENTS

This task will be applicable to construction, installation, and procurement contracts appropriate to the equipment/facility element being considered. It will involve the completion of the Safety Certification elements listed in Task 1, to verify that contractors have complied with safety requirements. If non-compliance with a safety requirement is identified, it will be logged as an "open item" and tracked for resolution as described under Task 6.

C. TASK 3 -VERIFICATION OF PROCEDURAL SYSTEM ELEMENTS

Safety review and verification of MBTA operational rules and procedures and personnel training documentation will be conducted to ensure that procedural documents display contributions to certifiable levels of safety for the operational system. This task will be verified by the Safety Department.

A Safety Certification Procedures Review Log will be prepared and used to document the results. Where non-compliance with established safety requirements are found, or where new requirements are identified during reviews, they will be logged as an "open item" and tracked for resolution. (See Sample - Table 1).

D. TASK 4 -VERIFICATION OF PERSONNEL TRAINING AND QUALIFICATIONS

Verification of personnel training and qualification for operations, maintenance, and emergency response personnel will be conducted by review of personnel certification documentation provided and approved by the Operations Manager and the Chief Engineer. Verification under this task will be conditional, pending final verification under Task 5 - System Integration.

E. TASK 5 -VERIFICATION OF SYSTEM INTEGRATION

1. This task will consist of safety review and verification of:
 - (1) Integrated Test Procedures
 - (2) Integrated Test Reports
 - (3) Pre-Revenue Operations Test Procedures, including Emergency Response Scenarios
 - (4) Pre-Revenue Test Reports

2. Integrated Tests are conducted to verify the physical and/or the functional operations of equipment/facility elements that are integrated with other equipment/facility elements, subsequent to or as part of Acceptance Tests for individual equipment/facility elements. For example, when testing an elevator in a station, you must also test the emergency call system inside the elevator and at the platform at lobby levels. Integrated Test Procedures identified as required to verify the safety of operations, or the integrity of emergency response communications will be reviewed to:
 - (1) Verify the incorporation of safety requirements, and
 - (2) Verify that the procedural content, including test pre-requisites, is sufficiently consistent with the stated purpose(s) or objective(s) of the test.

Safety requirements will be extracted from pertinent source documentation listed in Task 1. Integrated Test Reports and any separate quality surveillance reports will be reviewed to verify that the safety requirements and parameters established by the approved test procedure have been met, and that any test non-compliances have been resolved.

3. Pre-Revenue Operations Tests are conducted subsequent to the completion of integrated tests, to verify the operational readiness of conditionally qualified operational personnel, emergency response personnel, and/or procedures, through simulated revenue service. Normal and abnormal operations are conducted, including emergency

response scenarios. Pre-revenue operation test procedures will be reviewed to verify that the stated purpose(s) of the simulated revenue service, and the overall procedural content, are of sufficient scope and depth to display the overall operational safety status. Along with others, Safety personnel will monitor and report on the conduct of pre-revenue operations tests to:

- a. Assess the effectiveness and the need for additions to, or revisions of, operational rules and procedures, or retraining of personnel.
- b. Assess the effectiveness of emergency response scenarios and response activities.

Pre-revenue operations test reports, safety assessment reports and any other reports will be reviewed to verify that a certifiable level of operational safety has been demonstrated during the conduct of pre-revenue operations. Where such reports display deficiencies in operational rules or procedures, or in compliance with rules and procedures, or in the effectiveness of the conduct of emergency response procedures, each deficiency will be logged as an "open item" and tracked for resolution as described under Section IV, Task 6.

4. Pre-revenue operations tests must be completed at least 2 weeks prior to opening revenue service.

F. TASK 6 - SAFETY CERTIFICATION

This task will be conducted to verify and display, by documentation, that a certifiable level of operational safety has been achieved for the MBTA System, and will include:

1. Preparation of a chronological summary report to display and discuss the safety certification activities that have been conducted.
2. Preparation of a comprehensive list of certification documentation.
3. Preparation of an Open Item Status Report, to display the status of all open items identified during the conduct of the certification program. This report will be based on open items documented on Form SC-2. Form SC-2 will be generated by the System Safety Engineer or designee as needed.

Open items will be resolved by:

1. Corrective Action
 - (1) Contract Change Order or Contract Procurement.
 - (2) Resolution
 - (3) Temporary Resolution - deferral or corrective action with or without a work around.
 - (4) Final Resolution.

All open items will be entered on a Safety Certification Open Item Status Log which will be used to track, report on and document the resolution of each item until closed out (see sample Table 1).

4. A Safety Certification Report will be submitted to the General Manager. This report will be prepared by the Safety Department showing all initial finding(s), conclusion(s), and recommendation(s).

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the general requirements for traffic regulation and load restrictions.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 01020 - ALLOWANCES.

1.2 BARRICADES, WARNING SIGNS AND OTHER PROTECTIVE DEVICES

- A. Barricades, barrier fences, traffic signs, drums with flashers, or other traffic devices will be provided at locations within and around the construction area which present a hazard to motorists or pedestrians. The type, amount, locations, and duration of such devices will be as directed by the Engineer. No additional compensation will be made for protective devices. This work will be considered incidental to the item of work to which it pertains.
- B. The Contractor must supply signage controls to keep the existing facility operational.

1.3 TRAFFIC OFFICER SERVICES

- A. Provide such police officers as the Engineer deems necessary for the direction and control of pedestrian and vehicular traffic within the site or sites. Police officers shall wear regulation uniforms.
- B. All requests for police details shall be referred to the MBTA Transit Police Detail Officer (Tel. 617-222-1270). The MBTA Transit Police Detail Officer will arrange for an appropriate and sufficient number of details. The request shall be forwarded to the MBTA Transit Police Detail Office, with a copy to the Engineer, well in advance to enable him to make the required arrangements. It is the policy of the Authority to use the services of the MBTA Transit Police for details when they are required.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Except as specified in Part 1 “Traffic Officer Services” Article, no separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item or items of work to which they pertain.

- B. Measurement: Work specified in this Section for Traffic Officer Services will not be measured but will be paid for under an allowance for Item 0130.429. The allowance will be adjusted to the actual amount paid for all such work. The Contractor shall furnish itemized statements of the work performed and give the Engineer access to accounts, bills, and vouchers relating thereto, and unless the Contractor does furnish such itemized statements, bills, and vouchers, he shall not be entitled to payment for the related work. The allowance will be made to reimburse the Contractor for all services required for the work specified herein.

4.2 PAYMENT

- A. Payment: Payment for the work of this Section will be used on itemized statements furnished by the Contractor to the Authority without any mark-up for overhead or profit. No other costs will be paid for work of this Section.

4.3 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.429	TRAFFIC OFFICERS SERVICES	AN

END OF SECTION

SECTION 01571

MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies the furnishing of labor for the Maintenance and Protection of Railroad Traffic, and for inspection, review, coordination, and other interfaces with the Contractor's work as required by the Authority, Massachusetts Bay Commuter Rail Company (MBCR), and Pan Am Railways.
- B. Work under this section shall include coordinating with the representatives of the Authority, MBCR, and Pan Am Railways to maintain service over the existing tracks.
- C. Existing train operations include, but are not limited to, the following:
 - 1. Regularly scheduled MBTA Commuter Rail trains.
 - 2. Unscheduled MBTA Commuter Rail Trains.
 - 3. Freight trains operated by Pan Am Railways.
 - 4. Other unscheduled equipment moves by the Railroads.
- D. When, in the opinion of the Engineer and the Chief Engineering Officers of the Railroads, the construction work would cause hazard to the safe operation of trains and other facilities of the Railroads, including signal and communication lines, the Railroads will furnish the necessary qualified employees to protect their trains and other facilities.
- E. The Contractor shall be governed by MBTA Railroad Operations Directorate "Guidelines and Procedures for Construction on MBTA Railroad Property" included as an Appendix to these Contract Specifications, for all work adjacent to, above and below the Railroad Right-of-Way. Additional Authority requirements are contained in "Maintenance and Protection for Railroad Traffic", (Massachusetts Bay Commuter Rail Company operated MBTA lines, dated July, 1988 attached to this specification section as pages 01571-5 thru 01571-7).
- F. Protection services will be required whenever the Contractor is performing work over, under, or adjacent to the railroad tracks or right-of-way, such as excavating, sheeting, shoring, erection and removal of forms, handling material, using equipment which by swinging or by failure, could foul the track, and when any other type of work being performed, in the opinion of the Railroad, requires such service.
- G. The Contractor is advised that although the cost for protective services will be paid under a separate force account agreement by the Authority, the Contractor shall be required to plan, coordinate, and organize the work effort in a way that shall absolutely minimize the use and number of Railroad Protection personnel. The Authority and MBCR representative will review and approve all Contractor work schedules prior to the commencement of work and prior to the assignment of protective personnel. Misuse of these protective services by the Contractor due to inadequate work procedures shall not be tolerated and shall be sufficient cause for the Authority to require the Contractor to bear all costs related to the inadequate work procedures.
- H. Railroad train crews necessary for the operation of Contractor scheduled work trains or Contractor owned or leased locomotive equipment shall not be paid by the Authority under this Section and all such costs will be considered incidental to the Contractor's work and therefore, shall be entirely borne by the Contractor.
- I. Related Documents: The following MBTA Railroad Operations documents are attached as part of the Appendix and hereby made part of this section:
 - 1. Part I: Guidelines and Procedures for Construction on MBTA Railroad Property, April 2001.
 - 2. Part II: Maintenance and Protection of Railroad Traffic, April 2001.
 - 3. Part III: Insurance Requirements

4. Part VI: Bridge Erection, Demolition and Hoisting Operations.
5. Part VII: Temporary Sheeting and Shoring.

1.2 GENERAL

- A. All existing signs, markers and other informational indicators associated with the operations of the Authority or the Railroads that are removed by the Contractor in the performance of this work shall be preserved and reinstalled as soon as possible, but in any event, reinstallation shall precede any train operation at the same locations as they are removed. Any sign, marker or other information indicator that is damaged by the Contractor's operations, shall be considered a charge against the Contractor and shall be paid for by him, or deducted from any monies due or that may become due him under this Contract.

1.3 RULES, REGULATIONS, ETC.

- A. Railroad traffic shall be maintained at all times with safety and continuity, and the Contractor shall conduct all of his operations on or over the Railroad right-of-way fully within the rules, regulations, and requirements of the Authority, MBCR and Pan Am Railways. The Contractor shall be responsible for acquainting himself with such requirements as the Railroad and Authority demands.
- B. The Contractor shall obtain verification of the time and schedule of track occupancy from the Railroad before proceeding with any construction or demolition work over, under, within, or adjacent to the Railroad right-of-way. The Contractor shall submit for the approval of the Engineer, plans and a detailed description of the procedure planned for work within these areas. The work in the field shall not proceed until the plans and method of procedure have been approved by the Authority.
- C. All work to be done under, upon or over the Railroad right-of-way shall be performed by the Contractor in a manner satisfactory to the Engineer and shall be performed at such times and in such manner, as to not interfere with the movement of trains or traffic upon the tracks. The Contractor shall use all necessary care and precaution to avoid accidents, delay or interference with the trains or other property.
- D. The Contractor shall give written notice to Pan Am Railways, at least 2 days prior to the commencement of any work, or any portion of the work, over or adjacent to the railroad right-of-way, so that necessary arrangements can be made promptly by the Railroad to protect their railroad traffic.
- E. If deemed necessary by the Railroad, it may furnish or assign an Inspector or Engineer who will be placed on the work during the time the Contractor or any subcontractor is performing work under the Contract on Authority, Pan Am Railways, or Massachusetts Bay Commuter Railroad Company property.
- F. The Contractor shall be required to participate in regular coordination meetings with the MBTA, MBCR, and other contractors who may be working on adjacent contracts.
- G. Before proceeding with any construction or demolition work, a preconstruction meeting shall be held at which time the Contractor shall submit for approval by the Authority, plans, computations, and a detailed description of his method of procedure for accomplishing the construction work required under this Contract, including methods of protecting Railroad traffic; however, such approval shall not serve in any way to relieve the Contractor of his complete responsibility for the adequacy and safety of his methods of procedure.
- H. During any demolition procedure, the Contractor must provide an approved shield to prohibit all debris from falling onto railroad right-of-way.
- I. The Contractor shall conduct his work and handle his equipment and materials so that no part of any equipment should foul an operated track or wire line without the written permission of the Authority and MBCR. When it is noted that the work will foul an operating track, the Contractor shall give the Authority and MBCR written notice two days in advance so that, if approved, arrangements can be made for proper protection of the railroad.
- J. Cranes, shovels, or any other equipment shall be considered to be fouling the track when located in such position that failure of same, with or without load, brings the equipment within the fouling limit. The Contractor's employees and equipment will not be permitted to work near overhead wires or apparatus.

- K. Equipment of the Contractor to be used adjacent to the tracks shall be in first-class condition so as to fully prevent failures of defective equipment that might cause delay in the operation of trains or damage to Railroad facilities. His equipment shall not be placed or put into operation adjacent to tracks without first obtaining permission from the Authority and MBCR. Under no circumstance shall any equipment or materials be placed or stored within 15 feet from the centerline of the outside track, unless otherwise directed.
- L. Materials and equipment belonging to the Contractor shall not be stored on the Authority or MBCR property without first obtaining permission; such permission will be on the condition that the Authority and MBCR will not be liable for damage to such materials and equipment from any cause. The Contractor shall keep the tracks adjacent to the site clear of all refuse and debris and shall leave the property in the condition existing before the start of his operations.
- M. The Contractor shall consult with MBCR and Pan Am Railways to determine the type of protection required to ensure safety and continuity of railroad traffic incidental to the particular methods of operation and equipment to be used on the work. Any Construction Inspectors, track foremen or track watchmen, signalmen, or other employees deemed necessary for protective services by the Railroad, or its duly authorized representative to ensure the safety of trains, contingent upon the Contractor's operations, shall be obtained from the railroad by the Contractor.
- N. The providing of such watchmen, and other precautionary measures, shall not, however, relieve the Contractor from liability for payment of damages caused by his operations.

1.4 FLAGGING AND PROTECTIVE SERVICES

- A. The Contractor will make all arrangements with the Authority, MBCR, and Pan Am Railways, as applicable, for railroad employees required for flagging and protective services. The Contractor shall notify MBCR a minimum of five days ahead of their need for flagman for the following week.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. The Authority will assume the costs for flagging and protective services charged by MBCR under a separate Force Account Agreement. These services will be provided as specified herein and as approved by the Authority to allow the Contractor to carry out their regular work activities. Costs for additional flagging required for the convenience of the Contractor, or to accelerate the Contractor's work will be borne by the Contractor. No reimbursement will be made by the Authority for the cost of maintenance and protection of railroad traffic and related payments, including additional flagging, which may be required by the Contractor to meet project milestone dates, beyond the date to which it may have been extended by authorized time extensions. The Force Account Agreement will be adjusted to the actual amount paid for such services.

MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC
(Massachusetts Bay Commuter Rail Company Operated MBTA Commuter Rail Lines)

General

- (1) The Contractor should note that the proposed work involves construction operations on, and over, property owned and operated by Massachusetts Bay Commuter Rail Company and Pan Am Railways. Requirements must be strictly observed whenever the tracks, structures, or properties of the Authority and Railroads are involved or affected.
- (2) Whenever in these Specifications and/or other Contract Documents the term "Railroad" is used without further qualification, it shall mean and be taken to mean Massachusetts Bay Commuter Rail Company and/or Pan Am Railways. The terms "Authority" and/or "MBTA" shall be used synonymously without further qualification to mean and be taken to mean The Massachusetts Bay Transportation Bay Authority.
- (3) If, during the carrying out of the work covered by this Contract, the tracks or other facilities of the Authority or other property owners or Railroads are endangered, the Contractor shall immediately do such work as directed by the Authority or Railroad to restore safety, and upon failure of the Contractor to carry out such orders immediately, the Authority or Railroad may take whatever steps are necessary to restore to safe conditions. The cost and expense to the Authority or Railroad of restoring safe conditions or of any damage to the trains, tracks, or other operations, shall be considered a charge against the Contractor and shall be paid for by them, or may be deducted from any monies due or that may become due them under this Contract.

Rules, Regulations, Etc.

- (1) Railroad traffic shall be maintained at all times with safety and continuity, and the Contractor shall conduct all of his operations on or over the Railroad right-of-way fully within the rules, regulations, and requirements of the Railroads and the Authority. The Contractor shall be responsible for acquainting himself with such requirements as the Railroad and/or Authority may demand.
- (2) The Contractor shall obtain verification of the time and schedule of track occupancy from the Railroad before proceeding with any construction or demolition work over, under, within, or adjacent to the Railroad right-of-way. The Contractor shall submit for the approval of the Chief Engineering Officer of the Authority, plans and a detailed description of the method of procedure which will be followed for work within these areas. The work in the field shall not proceed until the plans and method of procedure have been approved by the Chief Engineering Officer of the Authority.
- (3) All work to be done under, upon or over the Railroad right-of-way shall be performed by the Contractor in a manner satisfactory to the Chief Engineering Officer or his authorized representatives, and shall be performed at such times and in such manner, as not to interfere with the movement of trains or traffic upon the tracks of the Railroad. The Contractor shall use all necessary care and precaution in order to avoid accidents, delay or interference with the Authority's and Railroad's trains or other property.
- (4) The Contractor shall give written notice to the Senior Engineer - Massachusetts Bay Commuter Rail Company Commuter Division of the Railroad, or his fully authorized representative, at least 14 days prior to the commencement of any work, or any portion of the work, by the Contractor or his subcontractors on, over or adjacent to the railroad right-of-way, in order that necessary arrangements may be made promptly by the Railroad to protect railroad traffic.

- (5) If deemed necessary by the Railroad, it may furnish or assign an inspector and/or engineer who will be placed on the work during the time the Contractor or any subcontractor is performing work under the Contract on Railroad property.
- (6) Before proceeding with any construction or demolition work, on, over, or adjacent to the Railroad's property, a preconstruction meeting shall be held at which time the Contractor shall submit for approval of the Chief Engineering Officer, plans, computations, and a detailed description of his method of procedure for accomplishing the construction work required under this Contract, including methods of protecting Railroad traffic; however, such approval shall not serve in any way to relieve the Contractor of his complete responsibility for the adequacy and safety of his methods of procedure.
- (7) During the demolition procedure, the Contractor must provide an approved shield to prohibit all debris from falling onto railroad right-of-way. In addition, if any openings are left in the existing deck, a protective fence must be erected at both ends of the bridge to prohibit trespassers from entering over the unprotected area of the Railroad.
- (8) The Contractor shall conduct his work and handle his equipment and materials so that no part of any equipment should foul an operated track or wire line without the written permission of the Senior Engineer, Massachusetts Bay Commuter Rail Company Commuter Division. When the Contractor desires to foul an operated track, he must give the Senior Engineer, Massachusetts Bay Commuter Rail Company Commuter Division written notice of his intentions seven (7) days in advance, so that if approved, arrangements may be made for proper protection of the railroad.
- (9) Cranes, shovels, or any other equipment shall be considered to be fouling the track when located in such position that failure of same with or without load brings the equipment within the fouling limit. The Contractor's employees and equipment will not be permitted to work near overhead wires or apparatus.
- (10) Equipment of the Contractor to be used adjacent to the tracks shall be in first-class condition so as to fully prevent failures of defective equipment that might cause delay in the operation of trains or damage to Railroad facilities. His equipment shall not be placed or put into operation adjacent to tracks without first obtaining permission from the Senior Engineer - Massachusetts Bay Commuter Rail Company Commuter Division or his duly authorized representative. Under no circumstances shall any equipment or materials be placed or stored within fifteen (15) feet from the centerline of the outside track.
- (11) Materials and equipment belonging to the Contractor shall not be stored on Railroad property without first having obtaining permission from the Senior Engineer - Massachusetts Bay Commuter Rail Company Commuter Division, and such permission will be on the condition that the Authority and/or Railroad will not be liable for damage to such materials and equipment from any cause. The Contractor shall keep the tracks adjacent to the site clear of all refuse and debris that may accumulate from his operations, and shall leave the Railroad property in the condition existing before the start of his operations, except MBTA construction project elements.
- (12) The Contractor shall consult the Senior Engineer - Massachusetts Bay Commuter Rail Company Commuter Division, or his representative, in order to determine the type of protection required to insure safety and continuity of railroad traffic incident to the particular methods of operation and equipment to be used on the work. Any Construction Inspectors, track foreman or track watchmen, signalmen, or other employees deemed necessary for protective services by the Railroad, or its duly authorized representatives to insure the safety of trains, contingent upon the Contractor's operations, shall be obtained from the Railroad by the Contractor.

- (13) The providing of such watchmen, and other precautionary measures, shall not, however, relieve the Contractor from liability for payment of damages caused by his operations.
- (14) The Railroad will require protection during all periods when the Contractor is working on, or over, the railroad right-of-way, or as may be found necessary in the opinion of the Railroad Engineers. When protection is required, the Contractor shall make the requests in writing to the Senior Engineer, Massachusetts Bay Commuter Rail Company Commuter Division of the Railroad at least seven (7) days before such protection is required.
- (15) It shall be expressly understood that this Contract includes no work for which the Railroad is to be billed by the Contractor, and it shall be further understood that the Contractor is not to bill the Railroad for any work which he may perform, unless the Railroad gives a written request that such work be performed at its expense.
- (16) The Contractor, subcontractor and respective employees who will come within the limits of the railroad right-of-way, must first attend Massachusetts Bay Commuter Rail Company's Safety Orientation Class. They are required to comply with Massachusetts Bay Commuter Rail Company's Safety Requirements throughout the entire construction period. The Safety Orientation Class will be provided under the jurisdiction of Massachusetts Bay Commuter Rail Company's Area Safety Engineer who will be responsible to assure that the Contractor, subcontractor and respective employees have attended the Safety Orientation Class. The Safety Orientation Class will be given free of charge. All costs encountered due to complying with Massachusetts Bay Commuter Rail Company's Safety Requirements will be at the sole expense of the Contractor and subcontractors.
 - a. The Contractor for the Project must appoint a qualified person who will be designated as a Safety Representative for the Contractor. He must be approved by Massachusetts Bay Commuter Rail Company's Safety Representative and will be given special instructions on conducting the Safety Class. The Contractor's designee will be responsible to give Safety Orientation to the Contractor's/subcontractor's employees who will come onto Authority's right-of-way for short periods of time after the initial Safety Orientation Class has been given by Massachusetts Bay Commuter Rail Company. The Contractor's designee will keep Massachusetts Bay Commuter Rail Company's Safety Representative informed of the temporary employees, who received Safety Orientation. Since the Contractor's Safety Orientation is for a few employees, and on a limited basis, Massachusetts Bay Commuter Rail Company's Safety Orientation Class will be repeated when employee turnover or the groups of Contractors and subcontractors employees are such that another Massachusetts Bay Commuter Rail Company Safety Orientation Class is justified.
 - b. Contractors will follow established safety procedures and remain 15 feet from the centerline of the outside track. When it becomes necessary for Contractors to encroach on this 15 foot limitation, the proper fouling procedures will be set up.
 - c. Contractors will establish the 15 foot foul line by installing stakes and taping off the area prior to beginning work.
 - d. Stickers will be procured for Contractor's equipment to be placed in operating cab as a constant reminder of the 15 foot clearance envelope. (See sample copy of sticker at the end of the Specification Section).

- (17) Upon completion of the work, the Contractor shall remove from within the limits of the railroad right-of-way, all machinery, equipment, surplus materials, false work, rubbish and temporary buildings, and other property of the Contractor, or any subcontractor, and shall leave the right-of-way in a condition satisfactory to the Senior Engineer - Massachusetts Bay Commuter Rail Company Commuter Division, or his authorized representative.

Railroad Protective Services

Wages of the Railroad's Inspector and/or Engineers are deemed to be also included in the Railroad Protection Services. The services are performed to insure safe operation of trains when construction work would, in the Railroad's opinion, be a hazard to Railroad operations.

Definition of Hazard

Protection services will be required whenever the Contractor is performing work over, under or adjacent to the railroad tracks or right-of-way, such as excavating, sheeting, shoring, erection and removal of forms, handling material, using equipment which by swinging or by failure, could foul the track, and when any other type of work being performed, in the opinion of the Railroad, requires such service.

END OF SECTION

SECTION 01580

PROJECT IDENTIFICATION AND SIGNS - FTA

1.1 DESCRIPTION

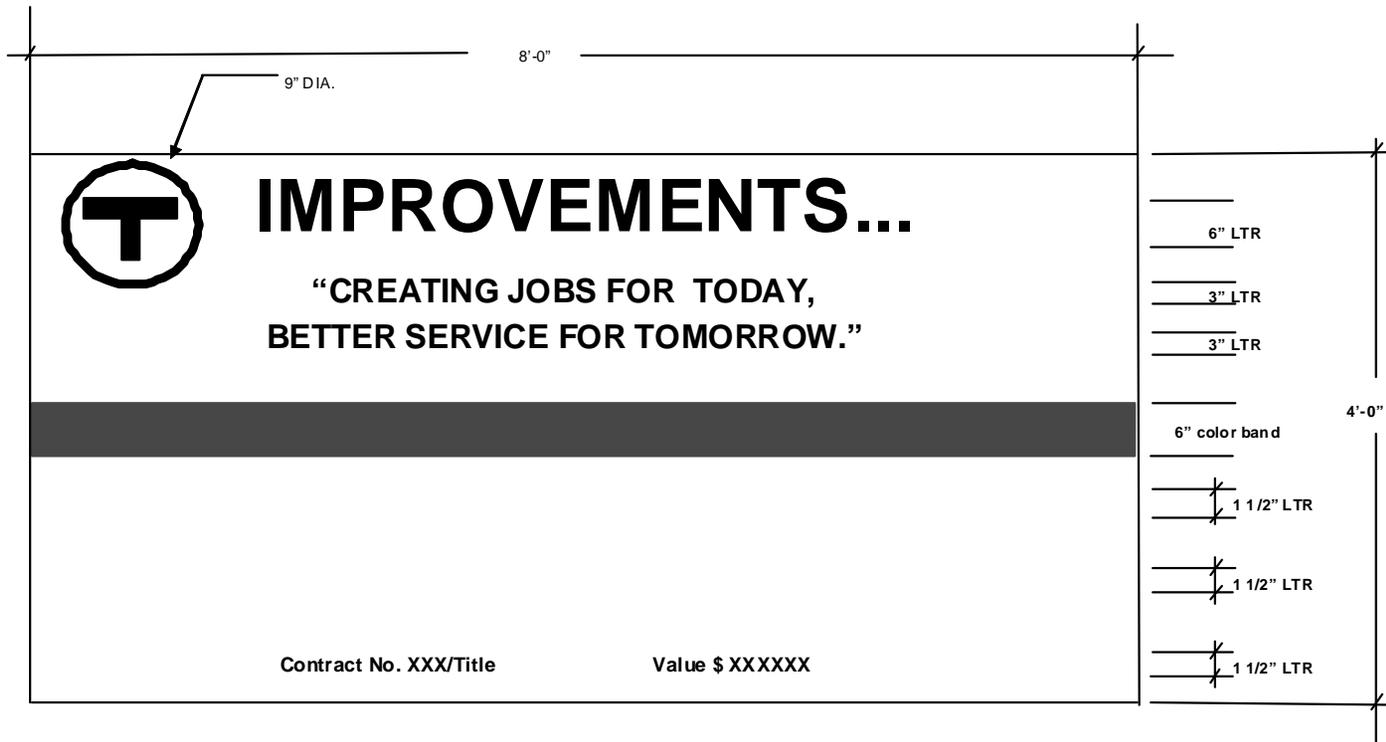
- A. This Section specifies Project Identification and Signs.

1.2 PROJECT SIGN

- A. Unless specified otherwise in the Contract Specifications, provide one general construction sign as specified herein. Construction sign shall be approximately 4 feet by 8 feet in size, mounted on two posts set in the ground where directed. Construction sign shall be constructed of 3-inch painted waterproof plywood for which the wording and colors will be determined by the Authority.
- B. Where and as approved by the Authority, the contractor shall erect and maintain signs identifying the Project and indicating State and Federal participation.
 - 1. One (1) sign of each type shall be erected at the project site where and as directed by the Engineer for maximum public identification of the work and shall be maintained in good condition until completion of the project. Upon completion, the signs shall be removed.
 - 2. Signs are to be cut from standard 4' by 8' waterproof plywood sheets, or other suitable material, and shall meet the design standards as shown in the attached figures (Sign Type A – State and Sign Type B – FTA).
 - 3. The size may be varied to meet special or local requirements, but proportions shall be maintained.
 - 4. Information and color of 6" horizontal color band to be included in Sign Type A shall be supplied to the Contractor by the Engineer.
 - 5. No information shall be included on the project signs, except that stipulated in the above paragraphs.
- C. Maintain signs in good condition until completion of the Project. Remove the signs upon completion when directed by the Engineer.

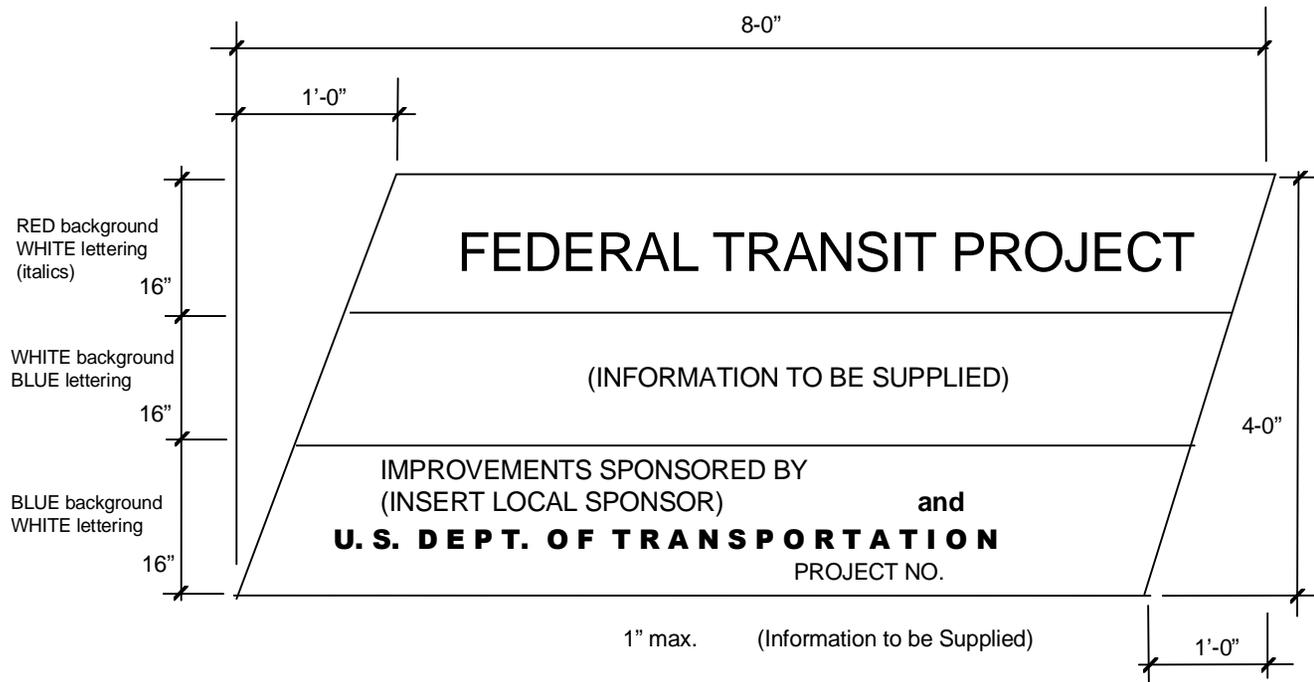
1.3 MEASUREMENT AND PAYMENT

- A. Neither separate measurement nor payment will be made for work required under this Section. All costs in connection therewith shall be considered incidental to the item or items of work to which they pertain.



- COLOR BAND TO DENOTE LINE
- TEXT TO BE HELVETICA MEDIUM
- CONTRACT NO. & VALUE TO REFLECT APPLICABLE CONTRACT

SIGN TYPE A



Lettering: Futura Bold Italic (top)
Futura Bold (center)
Futura Demi Bold (bottom)

Adopted July 1966

SIGN TYPE B

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the General requirements for materials and equipment, including the delivery, handling, transportation, and storage thereof.

1.2 QUALITY OF MATERIALS

- A. Materials provided shall be new, except as may be indicated otherwise in the Contract Documents. The materials shall be so manufactured, handled, and to provide completed work in accordance with the Contract.

1.3 DELIVERY, HANDLING AND TRANSPORTATION

- A. Delivery:
 - 1. Deliver materials and equipment to the site so that there will be neither delay in the progress of the Work nor an accumulation of material that is not scheduled to be used within a reasonable time.
- B. Handling:
 - 1. Avoid bending, scraping, or overstressing materials and equipment. Protect projecting parts by blocking with wood, by providing bracing, or by other approved methods.
 - 2. Materials and equipment shall be protected from soiling and moisture by wrapping or by other approved means.
 - 3. Small parts shall be packaged in containers such as boxes, crates or barrels to avoid dispersal and loss. Firmly secure an itemized list and description of contents to each such container.
- C. Transportation, Loading, transporting, unloading and storage of all materials and equipment shall be conducted such that they are kept clean and free from damage.

1.4 STORAGE AND PROTECTION

- A. Storage:
 - 1. Provide sheltered, weathertight or heated weathertight storage as required for materials and equipment subject to weather damage.
 - 2. Provide blocking, platforms or skids for materials and equipment subject to damage by contact with ground
- B. Store packaged materials in their original unbroken package or container.

- C. Protection. Protect materials and equipment from damage during warehousing operations
- D. The Contractor shall obtain approval of the Engineer for all material storage sites on the Authority's property and shall be solely responsible for the security of such storage sites at no additional expense to the Authority.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item of work to which they pertain.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the general requirements for protection and final clearing of floor coverings, the providing of operations and maintenance manuals, and the providing of As-Built Drawings.

1.2 PROTECTION AND FINAL CLEANING OF FLOOR COVERINGS

- A. Protect finished floors and floor coverings after completion of Work. Final cleaning of all floors and floor coverings shall be the responsibility of the Contractor.
- B. Immediately after acceptance by the Authority, clean floors and floor coverings and base. Clean floor finish material or covering as recommended by the manufacturer, and in accordance with the manufacturer's directions.

1.3 FINAL CLEANUP

- A. See Section 01560 - TEMPORARY CONTROLS.

1.4 OPERATIONS AND MAINTENANCE MANUALS

- A. At least one month prior to turning over the Project to the Authority for occupancy, deliver to the Engineer three complete indexed files containing approved data as follows:
 - 1. Operating manuals and operating instructions for the various systems.
 - 2. Catalog data sheets for each item of mechanical equipment actually installed, including performance curves, rating data and parts lists.
 - 3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical equipment controls and fixtures with all details clearly indicated, including size of lamps.
 - 4. Names, addresses and telephone numbers of repair and service companies for each of the major systems installed.

1.5 AS-BUILT DRAWINGS

- A. The Authority will provide one set of black or blue line on white drawings to the Contractor to maintain and submit as As-Built Drawings. Maintain these prints at the site and at all times, absolutely, clearly, and completely show the actual installations in accordance with the Contract requirements. Record all subcontractors' changes.

- B. Upon completion of the Work and after checking the subcontractors' As-Built Drawings, and all required drawings, submit a complete set of marked-up record drawings to the Engineer by registered mail in time to be used for the final inspection, and acceptance and for verification by the designer. Availability of as-built drawings shall be a prerequisite to scheduling a final inspection of the Contract and these drawings and the Contract Documents will be used in checking completion of the Work. Non-availability of As-Built Drawings or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the Authority until such time as the drawings are available or the discrepancy has been corrected. Upon completion of the work, the as-built drawings shall become the property of the Authority. If As-Built Drawings are not maintained as required herein to the satisfaction of the Engineer, the Authority will deduct from monthly partial payments, an amount representing the estimated monthly cost of maintaining the as-built drawings, and will continue deduction of the 5 percent retainage after 50 percent completion of the Contract, as provided in Section 01151 - MEASUREMENT AND PAYMENT.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith will be considered incidental to the item or items of work to which they pertain.

END OF SECTION

SECTION 02010

GEOTECHNICAL INSTRUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section specifies surveying, furnishing, installing, protecting, reading, reporting, maintaining and removing instrumentation as part of a Geotechnical Monitoring Program required for evaluation of ground movements during construction, and their effects on adjacent structures. The locations of all instruments and monitoring points are specified within the Contract Documents. The Work includes implementing required remedial and precautionary measures based on instrumentation data
- B. Geotechnical instrumentation shall be provided for monitoring of the following activities:
1. Excavation support systems for construction activities.
 2. Vibration-producing activity.
 3. Monitoring of existing tracks during drilled shaft and minipile installation should comply with sections 02365 Drilled Shafts and 02369 Drilled Minipiles, respectively.
 4. Monitoring of excavation and existing tracks during soldier pile and lagging wall installation should comply with Section 02356 Soldier Pile and Lagging Wall.
- C. The purpose of this program is to provide data which when used with other observations and measurements will be the basis of:
1. Pre-construction baseline data for comparison with construction and post-construction data.
 2. Evaluation of adequacy of ground support systems, compaction, or other vibration-producing construction activity and any required modifications of such systems or operations.
- D. Work in connection with the Geotechnical Monitoring Program shall include, but not necessarily be limited to the following:
1. Furnishing and installing geotechnical instrumentation and respective readouts.
 2. Surveying, monitoring, reporting and interpreting instrumentation data.
- E. Instrumentation Layout
1. Locations and type of instruments to be installed are specified within the Contract Documents.
 2. Engineer reserves the right to modify the instrument layout as is deemed necessary to monitor the impact of the Contractor's proposed method of construction.
- F. Related work specified elsewhere:
1. Section 02240 – DEWATERING
 2. Section 02300 – EARTHWORK
 3. Section 02356 – SOLDIER PILE AND LAGGING WALL

4. Section 02365 – DRILLED SHAFTS

5. Section 02369 – DRILLED MINIPILES

G. The MBTA is not responsible for the safety of the Work based on data from the Contractor's or the Engineer's monitoring program.

1.2 QUALITY ASSURANCE

A. All equipment shall be approved by the Engineer.

B. Materials, designs and construction shall be of highest quality to provide robust, corrosion and vibration resistant instruments. Accuracy and dependability of equipment shall be selected considering changes in temperature, humidity, stray currents or other adverse conditions that may be encountered.

C. Installation procedures acceptable to the Engineer shall be developed for each type of instrumentation. All instrumentation shall be installed in presence of the Engineer.

D. Qualifications

1. Manufacturer: Select a firm regularly engaged in the manufacture of monitoring instrumentation of the type specified herein.

2. Personnel:

a. Geotechnical Instrumentation Engineer: Employ a Professional Engineer, registered in the Commonwealth of Massachusetts, specializing in geotechnical engineering, who has experience in installation of instruments of the type specified in this Section in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer. The Contractor's Geotechnical Instrumentation Engineer shall supervise and direct instrument installation technicians and shall be responsible for instrument installation monitoring, reduction and interpretation of instrumentation monitoring data.

b. Qualified geotechnical instrumentation personnel must be available on call at all times during the work that would affect geotechnical instrumentation.

c. Provide a Land Surveyor, Registered in the Commonwealth of Massachusetts, responsible for layout and subsequent verification of all instrument locations and elevations.

E. Tolerances

1. Establish the initial coordinates of each instrument at the point of installation to 0.03 foot or less.

2. Establish the initial elevation of settlement reference points to 0.005 feet. Achieve level circuit closure with an error of closure of 0.01 foot, or less.

F. The Engineer may perform supplemental monitoring of instrumentation and will require Contractor support as follows:

1. Make probes, sensors, and read-out devices available as required.

2. Coordinate activities to minimize interference.

3. Remove obstruction from line of sight when requested by the Engineer.

4. Temporarily cease activities that create hazards to instrument monitoring or surveying personnel.

- G. A factory calibration shall be conducted on all instruments prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology.
- H. A final quality assurance inspection shall be made prior to shipment. During the inspection, a checklist shall be completed to indicate each inspection and test detail. A completed copy of the checklist shall be supplied with each instrument.
- I. Contractor shall provide the manufacturer's warranty for each portable readout unit furnished for the Engineer's monitoring program.

1.3 SUBMITTALS

- A. Qualifications:
 - 1. Submit qualifications of Geotechnical Instrumentation Engineer
- B. Working Drawings:
 - 1. Submit Working Drawings of instrumentation location layout and details in accordance with Section 01300 before installation. Indicate methods of installation and maintenance for instrumentation systems.
- C. Documentation:
 - 1. Submit manufacturer's catalogs and printed installation instructions for instruments furnished.
 - 2. Submit, within 24 hours of completion of equipment installation, three copies of installation notes, initial readings, and monitoring data taken immediately after installation.
- D. Certification:
 - 1. Submit certification of equipment manufacturers, supervision, installation crews, and monitoring personnel at least 21 calendar days prior to installation.
 - 2. Submit certificates of equipment calibration.
- E. Monitoring Documentation:
 - 1. Unless otherwise provided by the Engineer, submit proposed forms to be used for recording observations, monitoring and reporting data. Submit a sample showing proposed format for recording of readings, calculations and plots.
 - 2. Submit the following within 12 hours after monitoring any instrument:
 - a. A copy of the data sheet containing a cumulative history of all readings, including weather conditions at time of each reading.
 - b. A copy of the plot of measured value versus time, which also includes a time history of construction activity likely to influence such readings (e.g. depth of excavation, presence of heavy equipment).
 - 3. Each week the Contractor shall submit to the Engineer a weekly data report together with all new data on a CD or by e-mail, in Excel or other spreadsheet format approved by the Engineer.

1.4 RESPONSIBILITIES OF CONTRACTOR

- A. Furnish components of instrumentation that are to be installed during construction, portable readout units for the Contractor's use, portable readout units for the Engineer's use, and install instruments. The Contractor shall protect and maintain installed instruments and replace or repair damaged or inoperative instruments.
- B. Maintain and calibrate portable readout units. Maintain readout unit(s) at the Site for use by the Engineer
- C. Collect, reduce, process, plot, interpret, and report data from instrumentation; henceforth the monitoring program.
- D. Provide safe access to the Engineer for data collection. Coordinate with the Engineer to verify the consistency of collected data. Implement remedial measures based on interpretations of monitoring program data.
- E. Contractor is responsible for obtaining all necessary permits for installation of all specified instruments.

1.5 JOB CONDITIONS

- A. Disclosure of Instrumentation Data:
 - 1. Do not disclose instrumentation monitoring data to third parties and do not publish instrument monitoring data without the prior approval of the Engineer. The data from the instrumentation program shall be the property of the MBTA.
 - 2. Be responsible for interpretation of instrumentation data as input to evaluating excavation performance and controlling settlements to prevent damage to structures, facilities and utilities.
 - 3. The Engineer will also interpret the instrument monitoring data and will make the interpretation available to the Contractor.
- B. Determine exact location of the instruments to be installed in the field with approval of the Engineer.
- C. Access to Instruments: Provide and facilitate safe access to each instrument for the Engineer at all times. Access includes ladders, working platforms and other necessary facilities, and the removal thereof.

1.6 MONITORING SCHEDULE

- A. All equipment and installation accessories required for operation of instrumentation system and recording of measurements shall be furnished by Contractor and shall be available at least four (4) weeks in advance of construction in the area where they are to be installed and shall be securely stored where they will not suffer physical damage or damage arising from excessive moisture, extremes of temperature or other adverse conditions.
- B. Contractor shall provide and maintain adequate lighting and provide a safe means of access to all instruments to allow installation, repair, and reading of instruments at times selected by Engineer.
- C. Surface settlement points, and structural settlement points shall be installed and initial surveys complete a minimum of two (2) weeks prior to any construction activity related to excavation or installation of earth support system.
- D. The instruments shall be monitored in accordance with the requirements of Table 1 specified herein.

- E. If, in the opinion of Engineer, there appears to be excessive movement, the monitoring points shall be surveyed as often as deemed necessary by Engineer, at no additional cost to the MBTA.

PART 2 - PRODUCTS

2.1 MATERIALS FOR INSTRUMENTATION

- A. All instrumentation hardware, protective covers, read-out equipment, and equipment and materials necessary to conduct the monitoring program shall be purchased or rented by the Contractor. Prior to installation, all materials and equipment shall be available for inspection by the Engineer to ensure compliance with these specifications.
- B. Surface protection shall be flush with the ground surface in paved or other areas.
- C. For each instrument type, provide an instruction manual that shall include the following:
 - 1. A description of the purpose of the instrument.
 - 2. Theory of operation.
 - 3. Step-by-step procedures for:
 - a. Pre-installation acceptance test when instruments are received on site, to ensure the instruments are functioning correctly prior to installation.
 - b. Calibration of readout units.
 - 4. A list of calibration equipment required, and recommended frequency of calibration.
 - 5. Step-by-step instrument installation procedure including materials, tools, spare parts and any borehole requirements, and post-installation acceptance tests.
 - 6. Maintenance procedure.
 - 7. Step-by-step data collection procedure.
 - 8. Data reduction, processing, and plotting procedures.
- D. All graduations shall be in U.S. Customary Units, for example feet, inches, pounds.

2.2 DEFORMATION MONITORING POINTS

- A. Deformation monitoring points (DMPs) shall be used to monitor vertical and horizontal deformation of various facilities at selected locations specified within the Contract Documents.
- B. The following types of DMPs shall be used to monitor deformation:
 - 1. Surface Settlement Points (SSP) shall consist of a 2-in.-long masonry nail with an identification tag. The nail shall be manufactured from hardened, zinc-plated steel. The nail shall have ribbed threads along its shank and a conical point. It shall also have an indent in the center of its head to receive a surveyor's plumb bob. The identification tag shall be 1-1/2-in. dia. x 3/32-in. thick with a punched number for identification. The masonry nail shall be placed through the central hole in the identification tag and driven into an asphalt-covered surface such that the identification tag lies directly between the asphalt covered surface and the head of the masonry nail.

2. Vertical Monitoring Points (VMP) shall be used to monitor movements of structures, and shall consist of a 5/16 in. dia. x 4-1/2 in. long (or longer) hex bolt, ASTM A307-UNC Thread, screwed into a 1 in. long x 5/16 in. dia. tamp in screw anchor. The anchor and the casing shall meet the requirements of Federal Specification FF-S-325 Group 1, Type 1, Class 1. A 5/16 in. dia. x 3/4 in. long carriage bolt shall replace the 4-1/2 in. long (or longer) hex bolt when readings are not being taken. These tamp in screw anchors shall typically be installed into vertical surfaces of building foundations.
3. Survey Pins (SP) along the side of existing tracks to identify locations of track monitoring.

2.3 CRACK MONITORS

- A. Provide portable comparator/reticule crack monitor system, with linear scale 0.75 in. long, graduated every 0.005 in., and a triplet lens to create a flat optical field over the entire reticule area.

2.4 SEISMOGRAPHS

- A. Provide portable seismographs for monitoring the velocities of ground vibrations and air overpressure levels resulting from construction activities. Provide model MR2002 manufactured by Syscom Instruments and provided by Geocomp Corporation, 1145 Massachusetts Avenue, Boxborough, MA 01719; model SSU 2000DK as manufactured by Geosonics Inc., Warrandale, PA; model Blastmate II as manufactured by InstanTel Inc., Ottawa, Ontario, Canada; model VMS-200 as manufactured by Thomas Instruments, Inc., Spofford, NH, or acceptable equivalent. The seismograph shall have the following minimum features:
 1. Seismic range: 0.01 to 8 inches per second with an accuracy of 5% and no more than a 3 db roll off at the low frequency end.
 2. Flat frequency response: 2 to 200 Hertz.
 3. Three component sensor.
 4. Two power sources: Internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
 5. Capable of internal dynamic calibration.
 6. Direct writing to printer and to 3-1/2 magnetic disk. Instruments must be capable of producing strip chart recordings of readings on site within one hour of obtaining the readings. Provide computer software to perform frequency analyses of data obtained on magnetic disks.
 7. Continuous monitoring mode must be capable of recording peak velocities.
 8. Sound level frequency response: flat within ± 3 db from 2 to 200 Hz."

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All instruments shall be installed in the presence of the Engineer. Cooperate with the Engineer to allow safe access to the work area at all times for the purpose of observing instrumentation installation.
- B. Contractor's Geotechnical Instrumentation Engineer shall be fully responsible for the installation, testing, calibration, reading, and maintenance of the instrumentation, interpretation of the field readings and implementation of appropriate corrective measures. Verify the reliability of all installed instruments a minimum of 2 weeks prior to construction.

- C. Location and arrangement of the instrumentation shall be planned so that monitoring can continue until completion. Adequate access for maintenance and reading of the instrumentation shall be provided.
- D. All instruments shall be securely fixed such that they are capable of resisting movement and pressure changes underground, or vandalism and adverse climatic conditions at surface locations.
- E. The Contractor shall install, monitor, and interpret data from instrumentation, in addition to that specified herein, that the Contractor deems necessary to ensure the safety of personnel and the Work, at no additional cost to the MBTA. Data shall be reported to the Engineer as specified herein.
- F. Maintain records relating to problems encountered, delays, unusual aspects of the installation, and details of any events that may have a bearing on instrument behavior. These records should be submitted along with monitoring data.

3.2 INSTALLATION OF INSTRUMENTS

- A. Install the equipment according to the manufacturers' recommendations.
- B. Testing shall be undertaken as necessary to ensure satisfactory functioning of the equipment at each stage of the installation. In particular, adequate precautions shall be taken to protect the instruments from harmful effects of groundwater.
- C. Instruments found to be malfunctioning at any time shall be replaced within one week.

3.3 INSTALLATION OF DEFORMATION MONITORING POINTS

- A. Deformation monitoring points (DMPs) including survey pins (SP) shall be installed as defined in Sections 02300, 02356, 02365, and 02369, or as directed by the Engineer.
- B. After installation of a DMP, determine as-built location in horizontal position to an accuracy of +/- 0.03 ft, and in elevation to an accuracy of +/- 0.005 ft.

3.4 INSTALLATION OF CRACK MONITORS

- A. Cracks to be monitored on structures shall be identified and marked clearly for identification purposes at locations determined by the pre-construction survey performed by the Contractor and as approved by the Engineer.
- B. The initial reading of crack monitors where installed shall be documented and photographed with date stamped.

3.5 INSTALLATION OF SEISMOGRAPHS

- A. Monitoring of vibrations by seismographs shall be performed as a minimum at all locations specified within the Contract Documents, and also on other facilities that may be affected by construction activities where the Contractor deems necessary to monitor vibration levels. At each facility, geophones shall be placed as appropriate on the ground at points between three and six feet from the faces of buildings, on the structure of buildings and on the floor slab near the closest exterior face of the buildings.

- B. Geophones shall be firmly mounted on the surface slab of concrete or asphalt, firmly set in undisturbed soil, or rigidly attached to the structure of buildings and shall be left in place for a time adequate to achieve the monitoring schedule specified herein.

3.6 MAINTENANCE OF INSTRUMENTATION

- A. Prevent damage to the instruments and ancillary equipment during handling, installation and subsequent operation. Maintain all the instruments required for long term monitoring in a satisfactory working order for the duration of the monitoring program. Should an instrument become damaged or become non-functional, it shall be the Contractor's responsibility to replace, within one week, the damaged instrument to the satisfaction of the Engineer at no additional cost to the MBTA.
- B. Ensure that all the instrumentation in use has been correctly calibrated. Carry out periodic checks to confirm the validity of calibration of equipment in accordance with the manufacturer's instructions and carry out any adjustments that are found necessary. Suspect readings shall be repeated.
- C. Keep records of all calibration certificates and, when necessary, send equipment off site for re-calibration by an independent accredited testing laboratory.
- D. Record the location of all instrumentation on as-installed Working Drawings. As-installed drawings shall include the routing of all cabling. Hidden electrical instrumentation shall be identifiable by color codes and/or tagged cables. The reference coding shall also be recorded on the as-installed drawings.
- E. Ensure that electrical instrumentation is not adversely affected by other temporary or permanent electrical services.

3.7 INSTRUMENT READING AND RECORDS

- A. Instruments shall be read as soon as possible after installation to establish datum readings that shall be established from a minimum of two independent reading operations giving consistent results. The method of reading shall be as recommended by the manufacturer.
- B. Monitoring Schedule
 - 1. Monitor instrumentation in accordance with the schedule shown in Table 1.
 - 2. Monitor instrumentation more frequently, if instrumentation detects significant anomalous or suddenly changing readings.
- C. In the event of any change in circumstances, for example the influence of the construction of other structures nearby, the program of readings shall recommence.
- D. The same recording devices shall be used at any given location through the monitoring program. If for any reason this becomes impracticable, due to instrument breakage for example, new datum readings shall be taken immediately with a replacement instrument, and the new instrument used for the future readings. Similarly, should a monitoring location become unavailable, the instrument previously read from this point shall, within one week, be read from an alternative point, the latter then being used for subsequent readings.
- E. Readings shall, wherever possible, be taken by the same personnel. Should the personnel be replaced for any reason, a series of duplicate readings shall be carried out by the out-going person and the replacement.

3.8 TRACK MONITORING PROGRAM

- A. Provide continuous monitoring of all tracks within 100 feet of construction activities to assure that movements do not exceed the tolerances specified herein at any time during construction. Provide all survey data in reduced form to the Owner in order that any required track adjustments can be made by MBTA field crews. All costs associated with monitoring and any track adjustments shall be borne by the Contractor with no compensation by the Owner.
- B. Track Tolerances
 - 1. Horizontal Track Alignment ± 0.25 -inch
 - 2. Vertical Track Profile ± 0.25 -inch

3.9 LIMITING INSTRUMENTATION READINGS

- A. The Contractor shall perform all work in a manner to prevent instrumentation readings from exceeding limiting values specified in Table 2. Where the Contractor's operations result in instrumentation readings approaching the limiting values in Table 2, the Contractor shall modify his means and methods so that the work may be accomplished without exceeding the limiting values. Any delays or modifications to the Contractor's means and methods shall be at no additional cost to the MBTA.

3.10 DATA REDUCTION, PROCESSING, PLOTTING AND REPORTING

- A. The Contractor's instrumentation personnel and surveyors shall reduce, process, plot, and report data from the Contractor's monitoring program.
- B. Each week the Contractor shall submit to the Engineer a weekly data report together with all new data on magnetic disk, as specified herein. The weekly data report shall be bound and indexed and shall include:
 - 1. A section for each type of instrument. This section shall include: a brief description of the cumulative changes in instrument readings, a brief description of the changes in readings from the previous weekly data report, a table summarizing instruments, actual readings, and if any limiting readings have been reached. Raw and reduced data collected during the week, on summary tables (8-1/2in. x 11in. sheets of paper). Plots of data versus time and including key construction activities and other events that could influence changes in the data shall be shown. Plots of like instruments shall be done at the same scale to facilitate graphical comparison.
 - 2. A description of work being performed during the week by the Contractor and any possible activity in the area that may have an effect on instrument readings. Describe groundwater control and temporary relief operations, including pump locations, times of operation, and estimated quantity of flow.
- C. Plots of seismograph data shall be in the form of strip charts. Strip charts shall be used to monitor continuously and record peak particle velocities produced each minute of continuous vibration producing activity as defined in Table 1. Contractor shall provide the following data:
 - 1. A permanent record of peak particle velocity for each minute from the specific start to finish time specified in Table 1. This permanent record shall be in the form of a scaled histogram strip chart printed or photocopied onto 8-1/2 in. x 11 in. non-fading paper. The strip chart should also indicate the time and magnitude of maximum peak particle velocity measured during each one-hour interval of the monitoring period.
 - 2. A tabular summary report printed on 8-1/2 in. x 11 in. paper summarizing the maximum peak particle velocity measured during each hour of monitoring.

3. A CD containing all maximum peak particle velocity data, and compatible manufacturer's software required to read and analyze the data."

3.11 DAMAGE TO INSTRUMENTATION

- A. The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, weather, traffic, and vandalism.
- B. If an instrument is damaged or inoperative, including an existing instrument installed by others, the Contractor's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours, at no additional cost to the MBTA. The Engineer will be the sole judge of whether repair or replacement is required. The Engineer may impose a work stoppage in the vicinity of the damaged or inoperative instrument until it is again operational, at no additional cost to the MBTA.
- C. Contractor shall repair or replace at its own cost any of the readout devices used for the Contractor's monitoring program that become damaged, inoperative, or, in the judgment of the Engineer, unreliable.

3.12 REMOVAL OF INSTRUMENTS

- A. Prior to completion of the Contract, remove all instrumentation installed under this Contract. Protect and maintain all instrumentation until such time as written approval authorizing removal of instrumentation has been received from the Engineer.
- B. Removal of instruments shall include removing and disposing of protective covers, recovery of salvageable portions of instrumentation and grouting of casings.
- C. All instruments or portions thereof removed by the Contractor shall remain the property of the Contractor.
- D. Instrumentation readout and calibration equipment purchased under this Contract shall become the property of the MBTA.
- E. Remove the instrumentation specified herein as directed by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

TABLE 1: MONITORING SCHEDULE

INSTRUMENT	SCHEDULE
All Instruments	(1) One reading immediately after installation. (2) One reading each workday until, as determined by the Engineer, repeatability indicates that any data changes resulting from the installation process have ceased. (3) Formal initial reading. (4) One reading immediately prior to any construction of the associated facility. Thereafter, reading frequency shall follow the schedule given below.
Railroad Track Monitoring Points	Perform two baseline readings. Within one hundred feet of excavation or other vibration-producing construction activity, one reading daily or every three (3) feet of completed excavation, whichever is more frequent. Readings shall be taken more frequently if limiting values are exceeded. After backfilling to finished grade, readings shall be taken weekly for two weeks, and one final reading shall be taken prior to the end of the Contract.
Crack Monitor	One reading every five (5) feet of completed excavation or every week, whichever is more frequent, until excavation has reached full depth. Readings shall be taken once daily if limiting values are exceeded and until the readings have equilibrated to the satisfaction of the Engineer. Readings will continue to be taken weekly until the end of any support of excavation installation within 100 feet of the instrument and backfilling of the excavation. Thereafter, monthly readings shall be taken until completion of the construction contract.
Structural Deformation Monitoring Points	One reading every five (5) feet of completed excavation or every week, whichever is more frequent, until excavation has reached full depth. Readings shall be taken once daily if limiting values are exceeded and until the readings have equilibrated to the satisfaction of the Engineer. Readings will continue to be taken weekly until the end of any support of excavation installation within 100 feet of the instrument and backfilling of the excavation. Thereafter, monthly readings shall be taken until completion of the construction contract.
Seismographs	Formal initial background seismograph readings shall be taken prior to the beginning of excavation, installation of excavation support, compaction, or other vibration-producing construction activity. Initial readings on facilities shall consist of a minimum of 24 hours of continuous monitoring of peak particle velocities, which shall be printed to a strip chart. During this period, particle velocities shall be read with a minimum sensitivity of 0.002 in./sec. (continued)

INSTRUMENT	SCHEDULE
Seismographs (cont.)	<p>Prior to the beginning of a vibration-producing construction activity within 100 feet of a vibration monitoring location, determine peak particle velocity and corresponding frequencies, (i.e. full wave form data, produced by individual or discrete events caused by vibration-producing activities) to establish the maximum energy which can be used without surpassing acceptable vibration levels as specified in Table 2.</p> <p>During vibration-producing construction activity, record vibrations continuously with the threshold trigger level of the seismograph set at 50% of the limit specified in Table 2. Monitoring shall continue until completion of the construction activity or until the Contractor has demonstrated to the satisfaction of the Engineer, that the construction activity will not exceed the limits specified in Table 2. Monitoring and full wave form data shall be recorded and submitted.</p>

TABLE 2: LIMITING INSTRUMENTATION READINGS

INSTRUMENT	LIMITING VALUE
Railroad monitoring points	Horizontal \pm 0.25 inches; Vertical \pm 0.25 inch
Structural Deformation Monitoring Points	0.5 inch
Crack Monitor	None (1)
Seismograph	See Table 02010- Table 3

TABLE 2 NOTES:

1. Crack monitor data shall be evaluated by the Contractor in conjunction with DMP data.

**TABLE 3: RESPONSE VALUES
VIBRATION ACCEPTANCE CRITERIA WITH SEISMOGRAPHS**

RESPONSE VALUES FOR ALL SEISMOGRAPHS

STRUCTURAL CATEGORY	f(Hz)	PEAK PARTICLE VELOCITY (ppv)	
		Limiting Value (in/sec)	
I	1-30	0.5	
	30-60	0.5-0.7*	
II	1-30	0.3	
	30-60	0.3-0.5*	
III	1-30	0.2	
	30-60	0.2-0.3*	
IV	1-30	0.12	
	30-60	0.12-0.2*	

TABLE 3 NOTES:

1. Limiting Value: (*) the lower value applies to 30 Hz, the upper to 60 Hz, with interpolation in between.
2. Vibration acceptance criteria for building based on Swiss Standard SN640312. This standard allows acceptance criteria according to building type and the frequency and type of expected construction related vibrations. For the purpose of this Project, the acceptance criteria of the Swiss Standard were converted to English units (inches per second), and are incorporated in this table.
3. f(Hz) = frequency in hertz.
4. Strict vibration thresholds and limits have been established for buildings in the vicinity of the construction. The Contractor is advised that due to the close proximity of the construction to some of these buildings, construction means and methods may need to be altered or restricted to operate within the range of vibration established.
5. Response values for airblast overpressure are based on peak airblast levels with a 2-Hz descriptor, as recommended by the U.S. Bureau of Mines.
6. Structural Category Definitions:

<u>Location</u>	<u>Structural Category</u>
Adjacent Buildings	I

END OF SECTION

SECTION 02100
SITE PREPARATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
- 1 Protection: Protection from harm or defacement of trees and other vegetation or objects indicated or designated by the Engineer to be preserved.
 - 2 Clearing and Grubbing: Clearing, grubbing, and disposing of all natural materials within the limits of the work including vegetation, bushes, brush, trees, stumps, fallen timber, logs, roots, overhanging branches, and other similar materials. The limits of the work shall be the property lines extending along either side of the railroad trackway from Station 1326+50 to Station 1341+00 as shown on the Site Plans.
 - 3 Removal and Salvage: Removal, disposal, salvage, or other disposition of man made materials within the limits of the work including precast concrete barriers, slabs and footings, pavements, curbs and gutters, sidewalks, headwalls, wood edging along the existing platform, walls, and steps, utility service facilities, guardrail and posts, highway and street signs, fences, other miscellaneous structures and site improvements which interfere with construction as indicated by the Engineer, and refuse, trash, and debris. The limits of the work shall be the property lines extending along either side of the railroad trackway from Station 1326+50 to Station 1341+00. The property lines encompass both the existing right-of-way and property recently acquired by the MBTA adjacent to the right-of-way.
 - 4 Erosion Control System: Placing of siltation fence and straw bales for erosion and sediment control in areas shown on the drawings or as indicated by the Engineer.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 02221 – DEMOLITION: Covers the material that must be broken apart before removal.
 2. Section 02300 – EARTHWORK: Covers the removal of items completely buried below grade.
 3. Section 02650 – EXISTING SITE UTILITIES: Covers the maintenance, support, protection, relocation, reconstruction, adjusting-to-grade, restoration, and abandonment of existing utilities.

1.2 SUBMITTALS

- A. Submit copies of requests for and certificates of severance of utility services to the Engineer prior to start of site preparation work.

PART 2 - PRODUCTS

2.1 SILT FENCE

- A. Wood posts for silt fence shall be hardwood stakes a minimum two inches square and five feet long.
- B. Silt fence shall be a woven, polypropylene, ultraviolet resistant material that is inert to biological degradation and naturally encountered chemical, alkalis, and acids and with a mesh size sufficient to trap suspended soil particles but allow for the passage of water flow. Materials shall be Beltech 940 Silt Fence, Mirafi 100X Silt Fence, Perma 2130 Silt Fence, or equal.
- C. Tie wires for securing silt fence fabric to stakes shall be light gauge metal clips (hog rings) or one-thirty second inch diameter soft aluminum wire.
- D. Prefabricated commercial silt fence - such as Mirafi Envirofence, Celanese Corp Envirofence, AMXCO Silt Stop, or equal. - may be substituted for a built-in-field fence.

2.2 STRAW BALES

- A. Straw bales shall consist of straw for outdoor use with a minimum weight of forty pounds per bale, shall be banded with a minimum of two bands of string or nylon cord of sufficient strength to maintain bale integrity, and shall be staked into the ground with a minimum of two stakes per bale.
- B. Wood stakes for straw bales shall be hardwood stakes a minimum of two inches square by four feet long.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect indicated or designated trees with fencing to the approximate diameter of foliage to prevent damage to the trunk, foliage, and root system by construction equipment or procedures.
- B. Protect other plants, monuments, existing improvements, adjacent property, and facilities from damage.
- C. Maintain protected vegetation in a healthy growing condition during construction.
- D. The Contractor shall not damage, remove, or destroy any tree unless designated by the Engineer as a tree to be removed. In the event that the Contractor severely damages, removes, or destroys an existing tree designated to be saved, the Contractor shall promptly replace any such damaged, removed, or destroyed tree 12 inches in caliper or smaller with a tree of the same size and variety at no cost to the Authority.
- E. The Contractor shall promptly replace any such damaged, removed, or destroyed tree greater than 12 inches in caliper with a 12 inch caliper tree of the same variety.
- F. The Contractor shall monitor and guarantee the survival of any such replacement tree for a period of two years from the date of replacement.

- G. The Contractor shall use all necessary precautions to prevent damage to Authority or private property and to avoid hazardous exposure and personal injury to workers.
- H. The use of herbicides is strictly prohibited.
- I. Protect existing stone or concrete bounds and monumentation along property lines. Any disturbed bound or monumentation shall be reset by a Registered Land Surveyor at no additional cost to the Authority.

3.2 CLEARING AND GRUBBING

- A. Clear materials specified herein within the limits described and remove from the site. Remove stumps and roots completely in excavation areas and under embankments where the original ground level is within 3.5 feet of the sub-grade or slope of embankments. In embankment areas where the original ground level is more than 3.5 feet below the sub-grade or slope of embankment, cut off trees, stumps, and brush to within six inches of the ground.
- B. Do not start earthwork operations in areas where clearing and grubbing is not complete, except that stumps and large roots may be removed concurrently with excavation.
- C. Remove all material generated by clearing and grubbing and tree trimming and other related operations off the site and dispose of in compliance with all applicable laws and regulations.
- D. Where the work includes the removal of elm trees or the branches or stumps of elm trees, dispose of such material immediately after cutting or removal, by covering with earth to a depth of at least six inches in areas off the jobsite where such disposal has been arranged.
- E. Material from clearing and grubbing activities found acceptable by the Engineer may be used to produce wood chips for use on the site. Material obtained from elm trees will not be acceptable for such use.

3.3 TREE BRANCH TRIMMING

- A. Remove tree branches overhanging trackways, roadways, and other designated areas of the site to within 20 feet above the finished grade. Cut off branches neatly close to the tree trunks. Remove other branches as necessary to present a balanced appearance of the tree.

3.4 REMOVAL

- A. Remove entirely existing miscellaneous structures and site improvements that interfere with construction within the limits described or as designated by the Engineer. Remove walls and masonry construction to a minimum depth of two feet below existing ground level in areas where such items do not interfere with construction.
- B. Remove all material generated by removal operations and other related operations off the site and dispose of in compliance with all applicable laws and regulations.
- C. The Contractor shall coordinate with MBCR with regard to ownership, removal, and disposal of abandoned rail and other track material located within the MBTA property lines on either side of the trackway.

- D. All removal and disposal must be done in accordance with applicable state and federal laws.
- E. Any element to be removed that performs a safety function – such as fencing and signage – shall not be removed until its safety function is no longer necessary or has been replaced.

3.5 SALVAGE

- A. Salvage indicated material or material determined by the Engineer to be suitable for reuse, including: grates, frames, other metal castings and miscellaneous parts of inlets and manholes; hydrants, fire alarm posts and boxes; metal light poles; sound pipe and valves; metal fencing; guard rail; highway and street signs and posts shall be delivered to the MBTA.
- B. Protect metallic coatings on salvaged items. Remove adhering concrete from salvaged items where required for disposal or directed by the Engineer.
- C. Repair, or replace with new material, salvaged material damaged or destroyed due to the Contractor's negligence.
- D. All items designated as "remove" and not relocated as part of this project, and determined to be in salvageable condition by the engineer, shall be delivered to the MBTA Railroad Operations material yard in Charlestown, MA, unless otherwise directed by the Engineer. No delivery will be greater than 60 miles, one way. Such delivery of materials must be coordinated with the Engineer prior to delivery.

3.6 BACKFILL

- A. Backfill and compact trenches and excavations resulting from work under this Section in accordance with Section 02300 - EARTHWORK.

3.7 SILT FENCE AND STRAW BALE INSTALLATION

- A. Silt fence and straw bales shall be positioned as indicated on the Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the Engineer and as shown on the Drawings.
- B. Dig trench approximately six inches wide and six inches deep along the proposed silt fence lines. The trenches are to be used for the anchorage of the fabric.
- C. Drive stakes at the back edge of trenches at a spacing as indicated on the drawings. Stakes shall be a minimum of eighteen inches into undisturbed ground.
- D. Hang four by four woven wire mesh on posts, setting the bottom of the wire in the bottom of the trench. Secure the wire to the posts.
- E. Hang filter fabric on wire carrying to bottom of trench with a minimum of four (4) inches of fabric laid across the bottom of the trench. Stretch fabric taut along the fence length and secure with tie wires eighteen inches on center both ways.
- F. Backfill trench with excavated material and tamp.
- G. Install a single row of straw bales, as indicated on the Drawings, against the siltation fence and stake with a minimum of two hardwood stakes per bale. Place straw bales around existing down-stream catch basins in the vicinity of the project as indicated by the Engineer.

- H. Furnish, place, and maintain silt fence and straw bales as shown on the Drawings and in areas where a need is indicated by the Engineer. Remove upon completion of all work. The removal shall include the entire assembly including stakes, silt fence, wire, straw bales, and all other elements of the system. All material will be disposed of off site in accordance with all applicable laws and regulations. Restore the disturbed area to its previous grades and condition.

3.8 MAINTENANCE AND INSPECTIONS

- A. Inspections: Contractor shall make a visual inspection of all sedimentation control devices at least once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to off site areas, the Contractor shall promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly. Maintain stockpiles on site of siltation fence, straw bales, stakes, and repair kits so that repairs can be made without any delay in obtaining the necessary materials.
- B. Maintenance:
 - 1. Silt Fences and Straw Bales
 - a. Remove accumulated sediment in the vicinity of the silt fence once it builds up to one-half inch of height. Dispose of the sediment off site in compliance with all applicable laws and regulations.
 - b. Replace damaged fabric with new fabric or patch it with section of new fabric with a two foot minimum overlap. Anchor the new fabric in place.
 - c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed towards it.
 - d. Replace straw bales when they are saturated with silt or otherwise damaged or ineffective. Dispose of used straw bales off site in compliance with all applicable laws and regulations.
- C. Existing Trackside steel guard rail currently running along the north side the track and adjacent to the Grimes Lane parking lot will be removed and reset at the location shown on the drawings. Use new hardware where required to reassemble the guard rail.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02221

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work specified under this Section includes demolition work identified on the Contract Documents and identified as follows:
 - 1. Demolition, selective demolition and removal of structures.
 - 2. Demolition, selective demolition and removal of site improvements.
 - 3. Removing below-grade construction.
 - 4. Disconnecting, capping or sealing, and removing site utilities.
 - 5. Salvaging items for reuse by the Authority.

- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 01300 SUBMITTALS.
 - 2. Section 01571 MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC.
 - 3. Section 02100 SITE PREPARATION.
 - 4. Section 02300 EARTHWORK.

1.2 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.

- B. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Authority ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

- C. Hazardous Material: include but is not limited to asbestos and materials regulated under TSCA, RCRA (310CMR 30.00) and the Massachusetts Contingency Plan (MCP) (310 CMR 40.00) and building construction material defined by OSHA. Where applicable, consideration should be given to MSDS in determining if a material could be potentially hazardous.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Authority that may be uncovered during demolition remain the property of Authority.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Authority.

1.4 SUBMITTALS

- A. Proposed Protection Measures: Submit informational report in accordance with OSHA Part 1926 procedures, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
 - 1. Adjacent Buildings and Structures: Detail special measures proposed to protect adjacent buildings and structures to remain.
- B. Schedule of Station or Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.\
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping or re-routing of utility services.
- C. Station or Building Demolition Plans: Drawings indicating the following:
 - 1. Locations of temporary protection and means of egress for adjacent occupied buildings.
- D. Inventory: Submit a list of items to be removed and salvaged and deliver to Authority prior to start of demolition.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by building demolition operations. Comply with Division 1. Submit before the Work begins.
- F. Hazardous material remediation plan. Included in the plan are landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- H. Results of Professional Engineer's survey required by Article 3.1D.
- I. All submissions shall be approved before work may proceed

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Prepare a hazardous material remediation plan and submit to Authority for approval.
- D. Predemolition Conference: Conduct conference at Project site to review methods and procedures related to station or building demolition including, but not limited to, the following:

1. Review of hazardous material remediation plan.
2. Inspect and discuss condition of construction to be demolished.
3. Review structural load limitations of existing structures.
4. Review and finalize station or building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
5. Review and finalize protection requirements.
6. Review procedures for noise control and dust control.
7. Review procedures for protection of adjacent buildings.
8. Review items to be salvaged and returned to Authority.

1.6 PROJECT CONDITIONS

- A. Station or buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area may be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 1. Provide not less than 72 hours notice of activities that will affect operations of adjacent occupied buildings.
 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. The Authority assumes no responsibility for buildings and structures to be demolished.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by Authority as far as practical.
- D. Hazardous Materials: Hazardous materials may be present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file at the Authority for review and use. Examine report to become aware of locations where asbestos, lead paint or other hazardous materials are present. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified or required by a licensed professional and/or agency having jurisdiction.
- E. On-site storage or sale of removed items or materials is not permitted.
- F. Construction Access and Staging
 1. Special attention shall be given to sequence demolition staging work so the MBTA Commuter Rail operations are not affected with respect to safety, operation and schedule.

2. All materials removed as part of this demolition shall become the property of the Contractor and are to be disposed of properly according to applicable local, State and Federal regulations, unless otherwise specified by the Engineer.

1.7 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Authority's operations and operations of adjacent occupied buildings.
- B. Demolition shall proceed in sections. The demolition work must be performed in conjunction with the approved sequence of construction plans.
- C. A minimum of one track must be in operation at all times. This track will be active during all demolition activities. The contractor must take steps to ensure that his operations will not impact rail service.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Authority. Authority does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
- D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- E. Verify that hazardous materials have been remediated before proceeding with station or building demolition operations.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving station or buildings and structures to be demolished.
 1. Arrange to shut off indicated utilities with utility companies.
 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.

3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Existing Utilities: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
 - C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of demolition.
 - D. Salvaged Items: Comply with the following:
 1. Clean salvaged items of dirt and demolition debris.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Authority.
 4. Transport items to storage area designated by Authority.
 5. Protect items from damage during transport and storage.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, station or building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Authority and authorities having jurisdiction.
 2. Provide temporary services during interruptions to existing utilities, as acceptable to Authority and authorities having jurisdiction.
 - a. Provide at least 72 hours notice to occupants of affected station or buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1.
 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

5. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to station or building demolition operations.
 6. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing station or buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least four hours after flame cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 5. In general, demolish buildings top down.
- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Site Access and Temporary Controls: Conduct station or building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- D. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete station or building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the station or building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be salvaged are indicated on the Site Plans.
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet outside footprint indicated for new construction. Abandon below-grade construction outside this area.
1. Remove below-grade construction, including basements, foundation walls, and footings, to at least depths indicated.
- E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade unless indicated otherwise.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings, utilities, fences, or other structures caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by station or building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02240

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies dewatering to facilitate subsurface construction. The section also specifies the proper handling of water from the dewatering operation and control procedures related to a dewatering operation.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02260 - EXCAVATION SUPORT AND PROTECTION.
 - 2. Section 02300 - EARTHWORK.
 - 3. Appendix A - Guidelines and Procedures for Construction on MBTA Railroad Property

1.2 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control groundwater flow into excavations and permit construction to proceed on dry, stable sub-grades.
 - 1. Maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to sub-grades and permanent structures is prevented.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Accomplish dewatering without damaging existing buildings adjacent to excavation.
 - 4. Remove dewatering system if no longer needed.
 - 5. Provide for legal and suitable disposal of groundwater.
 - 6. Evaluate existing soil conditions and propose equipment and techniques to dewater both non-cohesive and cohesive soils.

1.3 SUBMITTALS

- A. Shop Drawings for Information: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water.
 - 1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 - 2. Include a written report outlining control procedures to be adopted if dewatering problems arise.

3. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Qualification Data: For installer and professional engineer.
 - C. Photographs or videotape, sufficiently detailed, of existing conditions of adjacent structures and site work that might be misconstrued as damage caused by dewatering operations.
 - D. Record drawings at Project Closeout identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions performed during dewatering.
 1. Note locations and capping depth of wells and well points.
 - E. Field Test Reports: Before starting excavation, submit test results and computations demonstrating that dewatering system is capable of meeting performance requirements.
 - F. Adjacent Foundations Report and Analysis: Record subsurface foundation systems of adjacent structures and evaluate impacts of groundwater removal; i.e. wood foundations and similar items.
 - G. The Contractor shall dewater for the length of time necessary to complete the specified sub-surface improvements. Dewatering operations shall be stopped based on a mutual decision between the Contractor and the engineering consultant. Any requirements to remove portions of the dewatering system will be noted on the Drawings.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.
- B. Professional Engineer: Engage a professional engineer to design and certify dewatering systems. Engineer shall have a minimum of 5 years experience with type of dewatering systems similar to those proposed for use.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Authority or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for review as information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. The Authority will not be responsible for interpretations or conclusions drawn by the Contractor from this data.
 1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
 2. The geotechnical report is available for review from the Authority.
- C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify the Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent structures.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 1. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared sub-grades, and from flooding site and surrounding area.
 2. Protect sub-grades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system 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 Authority and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.
- C. Provide an adequate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry sub-grades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, sub-grade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below sub-grade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.
- E. Dispose of water removed by dewatering in a manner that avoids negative impacts on abutters, endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Authority.
1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 OBSERVATION WELLS

(Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02250

STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The work specified in this Section includes requirements for 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.
- B. Pursuant to the Federal Clean Water Act, effective June 30, 2008 construction activities which disturb one acre or more are required to apply to the U.S. Environmental Protection Agency (EPA) for coverage under the NPDES General Permit for Storm Water Discharges From Construction Activities. On February 16, 2012 (Federal Register/Vol. 77, No. 40/ pp. 12286 - 12293), EPA published the final NPDES General Permit for Stormwater Discharges From Construction Activity.
- C. Related work described elsewhere:
 - 1. Section 01500 - CONSTRUCTION TEMPORARY FACILITIES AND TEMPORARY CONTROLS
 - 2. Section 02100 - SITE PREPARATION
 - 3. Section 02240 - DEWATERING
 - 4. Section 02282 - HANDLING TRANSPORTATION & DISPOSAL OF EXCAVATED MATERIALS
 - 5. Section 02300 - EARTHWORK
 - 6. Section 02920 - LAWNS

1.2 SUBMITTALS

- A. Contractor shall refer to Section 01300 for submittal procedures.
- B. Submit Storm Water Pollution Prevention Plan in accordance with the requirements of Article 1.4 of this Section. Resubmit as appropriate during the progress of the Work to reflect proposed revisions and changed conditions; Appendices need not be included with these resubmittals. However, the Contractor is advised that submittal of selected items contained therein, or copies of same, are required to be submitted by other provisions of this Section or other Sections of these Contract Documents. At completion of the Work, and before final payment is made, Contractor shall submit one copy of final Storm Water Pollution Prevention Plan, including all Appendices.

1.3 NPDES NOTICE OF INTENT

- A. The NPDES General Permit requires the submission of a Notice of Intent (NOI) to the U.S. 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 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.

- B. The operator of the construction site, the Contractor, must submit the NOI. In cases where the municipality or other party has control over the plans and specifications or day-to-day site operations, said party must also submit a NOI. The Contractor is responsible to ensure that all required parties have submitted a NOI and shall provide proof of same to the Engineer. The Contractor may file a Notice of Intent form using EPA's eNOI system at: www.epa.gov/npdes/eNOI.
- C. 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. If required, said notification shall be made in accordance with DEP BRP WM09, Approval of NPDES Stormwater Pollution Prevention Plans for Construction or Industrial General Permits Discharging to Outstanding Resource Waters. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification and, if required, the SWPPP filing to DEP shall be paid by the Contractor. Any additional time required by DEP for review of submittals, SWPPP approval and issuance of BRP WM09 shall not constitute a basis for claim of delay.

1.4 STORM WATER POLLUTION PREVENTION PLAN

- A. The General Permit also requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the afore-mentioned statutes and regulations. The Plan will include the General Permit 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, including but not limited to the requirements of the U.S. EPA's Developing Your Pollution Prevention Plan A Guide for Construction Sites (Office of Water/EPA 833-R-06-004/May 2007), and the requirements of this Section. The EPA's template for a Construction SWPPP is available at: <http://cfpub.epa.gov/npdes/stormwater/swppp.cfm>. The Contractor shall submit the Plan to the Engineer for approval at least four weeks prior to any site activities. It is the responsibility of the Contractor to be familiar with the General Permit 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 this project and to include in the Stormwater Pollution Prevention Plan the methods and means necessary to comply with applicable conditions of said permits.
- B. It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA Construction General Permit, provide all information required, and obtain any and all certifications as required by the Construction General Permit. 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.
- C. Included in the General Permit 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 0.5 inches in twenty-four hours. The Contractor shall choose a qualified individual who will be on-site during construction to perform these inspections. The name and qualifications of the inspector shall be submitted to the Engineer for approval in accordance with subcontractor approval requirements. 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 inspector qualifications, inspection reports and monthly reports shall also conform to the requirements of the Wetlands Order of Conditions issued by any Conservation Commissions with jurisdiction over the Work.

- D. 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 General Permit. This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, inspection reports 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.

1.5 NPDES NOTICE OF TERMINATION

- A. The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved. Approval of final stabilization by the Engineer and confirmation of submission of the NOT by the Contractor will be required prior to submission of the Resident Engineer's Final Estimate.

1.6 PENALTIES

- A. Failure to comply with provisions of the NPDES permitting program and the Storm Water Pollution Prevention Plan may result in penalties assessed by the U.S. Environmental Protection Agency, the costs of which would be borne by the Contractor.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 IMPLEMENTATION OF THE STORM WATER POLLUTION PREVENTION PLAN

- A. The Storm Water Pollution Prevention Plan, developed in accordance with Paragraphs 1.2 B. and 1.3 of this Section, shall be implemented and adhered to during all phases of construction at the South Acton Station site. The Contractor shall retain an up-to-date copy of his Storm Water Pollution Prevention Plan and all Appendices at an on-site construction project office. Such Plan, including all Appendices, shall be available for inspection during normal working hours by the Engineer, the Authority, and all duly-authorized Federal, State, and local officials from the date of initial Plan submittal until the final copy is submitted upon completion of the Work in accordance with the requirements of Paragraph 1.2 B.
- B. The Contractor shall develop appropriate plans, figures, related sketches, etc. as necessary to illustrate the Storm Water Pollution Prevention Plan. Such items shall be maintained in an Appendix to the Storm Water Pollution Prevention Plan as they are developed by the Contractor. At a minimum such drawings shall address the following three elements for the site - (1) Existing Site Conditions; (2) Site Plans (illustrating slopes after grading, areas of disturbance, drainage pattern, etc.); and (3) Site

Controls (illustrating erosion and sediment measures, project construction waters management, OHM management, etc.) - with each element separately addressed on its own drawing or series of drawings.

- C. The following inspection and maintenance practices shall be used to maintain erosion and sediment controls:
1. All control measures identified in the Storm Water Pollution Prevention Plan shall be inspected by a Contractor-designated individual at least once each week and following any storm event of 0.5 inches or greater.
 2. All measures shall be maintained in good working order; if a repair is necessary, it shall be initiated within 48 hours of deficiency identification.
 3. An Inspection and Maintenance Report shall be completed for each inspection by the individual who performed the inspection. Completed Inspection and Maintenance Reports shall be maintained in an Appendix to the Storm Water Pollution Prevention Plan. The Contractor-developed report form to be completed by the Contractor's inspector shall be submitted to the Engineer for approval, and shall address the control measures identified in the Storm Water Pollution Prevention Plan. A sample Inspection and Maintenance Report form is presented as Attachment 2 to this Section. Contractor shall further develop this form as necessary to list the specific control measures to be inspected and to provide additional detail based on his proposed work. Inspection activities performed by the Contractor shall in no way limit the Authority or Engineer from conducting their own inspections and identifying deficiencies to the Contractor for correction.
- D. The Contractor shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) to achieve compliance with the conditions of the NPDES General Permit and with the requirements of the Storm Water Pollution Prevention Plan.
- E. The Contractor shall maintain records of dates when major grading activities occur, dates of temporary or permanent cessation of construction, and dates of initiation of stabilization measures in an Appendix to the Storm Water Pollution Prevention Plan.
- F. Oil and Hazardous Materials Management and Spill Control
1. For practices not more specifically addressed by federal, state, and local laws and implementing regulations or these Specifications, all oil and hazardous materials and all spills shall be managed in accordance with the Oil and Hazardous Materials Management and Spill Control Program presented in the Storm Water Pollution Prevention Plan.
 2. Spills
 - a. The NPDES General Permit does not relieve the Contractor of the reporting requirements of the Massachusetts Contingency Plan, 40 CFR Part 117, or 40 CFR Part 302. Where a release containing a hazardous substance in an amount equal to or in excess of a reporting quantity established under the Massachusetts Contingency Plan, 40 CFR Part 117, or 40 CFR Part 302, the Contractor is required to comply with the requirements of the aforementioned regulations. Spills of oil or hazardous material shall be reported to the Massachusetts Department of Environmental Protection and/or the National Response Center as appropriate, if the reportable quantity is exceeded. All spills of OHM, in any quantity shall be reported to the Authority.

- b. A spill report shall be prepared by the Contractor following each occurrence. Spill report shall present a description of the release, including quantity and type of material, date of spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications, and corrective measures implemented to prevent reoccurrence. Such reports shall be maintained in an Appendix to the Storm Water Pollution Prevention Plan.
 - c. The Contractor shall identify an appropriately trained site employee involved with day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of responsible spill personnel shall be posted in the material storage area and in the office trailer on site. Each employee shall be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.
- G. The Contractor shall be required to amend the Plan whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to waters, including the addition of or change in location of storm water discharge points, or if the Plan proves to be ineffective in eliminating or significantly minimizing pollutants in storm water discharges or in otherwise achieving the general objectives of the Plan. Also, where warranted based on the results of an inspection by the Contractor or others, the site description, procedures, or other elements of the Plan shall be revised as appropriate; modifications called for by the inspection and resultant changes to the Plan shall be implemented within 7 calendar days following the inspection. In addition, the Plan shall be amended to identify any new subcontractor that will implement a measure of the Plan. Finally, the Plan shall be amended to incorporate specific revisions if so directed by the Engineer, the Authority, or any duly-authorized Federal, State, or local official at any time during the performance of the Work under this Contract.
- H. The Work specified in this Section for preparing, implementing, monitoring and maintaining the Storm Water Pollution Prevention Plan shall include development and implementation of activities and measures to properly handle OHM and to prevent storm water pollution; as such the Work shall also include installation, operation, maintenance, and removal of all facilities for the collection, containment, diversion, and disposal of surface and ground water as required for compliance with the Storm Water Pollution Prevention Plan, including all supervision, labor, materials, and equipment not specifically included but necessary for proper completion of the Work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02260

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies temporary soils excavation support and protection systems.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02240 – DEWATERING
 - 2. Section 02300 – EARTHWORK
 - 3. Appendix A – Guidelines And Procedures For Construction On MBTA Railroad Property

1.2 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed construction loads.
 - 1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements or facilities adjacent to excavation.
 - 4. Prevent impacts on adjacent structures and utilities.

1.3 DESIGN CRITERIA

- A. The Contractor is responsible for the design of all excavation support and protection.
- B. Design the excavation support system in accordance with the earth pressures, and other detailed criteria indicated. Excavation support shall allow the safe and expeditious construction of the permanent structures without excessive movement or settlement of the ground, to prevent damage to, or movement or settlement of adjacent buildings, roadways, tracks, structures, or utilities, as shown on the Contract Drawings and as specified herein.
- C. Design the excavation support system to support; earth pressures, unrelieved hydrostatic pressures, Railroad loads (E-80), HS20-44 traffic loads and any adjacent structure surcharge loads, utility loads, equipment and construction loads. HS20-44 load shall be as set forth by the latest edition of AASHTO Standard Specification for Highway Bridges. The Contractor shall verify that the latest editions of AREMA Manual and AASHTO manuals are being used for design.

- D. Consult official records of existing utilities, both surface and subsurface, and their connections to be fully informed on all existing conditions and limitations as they apply to this work and its relation to other construction work. Proceed with caution in areas of utility facilities. Expose them by hand excavation or by other methods acceptable to the utility owner. Protect existing utilities to remain within and adjacent to the work area in accordance with the requirements of authorities having jurisdiction over same. The Contractor is responsible for any damage to utilities caused by the Contractor's operations and shall restore them to equal or better operation at no cost to the utility owner or Authority.

1.4 SUBMITTALS

- A. Shop Drawings and Design Submittals: Prepared by or under the supervision of a qualified Professional Engineer for excavation support and protection systems.
 - 1. Include Shop Drawings and design calculations signed and sealed by a qualified Professional Engineer, registered in the Commonwealth of Massachusetts, responsible for their preparation.
 - 2. Written requests for use of temporary tie backs subject to review and approval by the Engineer.
- B. Qualification Data: For Installer and Professional Engineer.
 - 1. Work under this Section shall be performed by a qualified Contractor having a minimum of 5 years experience with support of excavation design and construction. The Contractor shall demonstrate that the Contractor's key personnel or Subcontractor has installed, constructed, and completed work involving the installation of excavation support walls, including projects involving tiebacks on a minimum of five projects; and has competently managed and supervised the manpower, materials, equipment, and tools necessary to complete such work as required by the size and complexity of this contract; and that the work was successfully completed within the time frame allotted; and that the work was done to the satisfaction of the owner.
 - 2. Furnish a project list of satisfactorily completed wall installations. The project list shall include the name of the owner for whom the Work was performed, the scope and value of the wall installations, and the names of the Contractor's or Subcontractor's Project Superintendent(s) and Assistant Superintendent(s) and their experience with the installation of excavation support walls. The list shall also include at least three projects of similar height and size where the design and installation of temporary bracing was required.
- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Authority or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for review as information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by

geotechnical engineer. The Authority will not be responsible for interpretations or conclusions drawn by the Contractor from this data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
 2. The geotechnical report is available for review from the Authority.
 3. Borings and site history indicate below ground obstructions may be encountered. Such obstructions may include, but are not necessarily limited to, boulders, concrete from past structures, stone retaining walls, and various other demolition and construction debris.
- C. The Contractor shall monitor adjacent structures and improvements for vertical and lateral movement using survey techniques, employing a qualified Professional Engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations prior to start of construction.
1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

1.6 QUALITY ASSURANCE

- A. The Contractor shall engage a licensed Professional Engineer, registered in the Commonwealth of Massachusetts, to design, approve and inspect all excavation support areas on a periodic basis.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
- D. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- F. Timber Piling: ASTM D 25, species listed in AWPA C3, pressure-treated in accordance with AWPA C3.
- G. Seven Wire Strand: ASTM A 416, Grade 250 or 270, uncoated seven-wire, low-relaxation strand.
- H. Grout: Suitable for service, minimum 4,000 psi.

2.2 TIEBACKS

- A. The Contractor may use temporary tie backs to optimize the design in areas approved by the Engineer.
- B. Tieback tendons shall be fabricated from single or multiple elements of the following:
 - 1. Steel bars conforming to ASTM Designation A 722, "Uncoated High Strength Steel Bars for Prestressed Concrete."
 - 2. Seven wire strand conforming to ASTM Designation A416, "Uncoated Seven Wire Stress Relieved Strand for Prestressed Concrete."
 - 3. Wires conforming to ASTM Designation A 421, "Uncoated Stress Relieved Wire for Prestressed Concrete."
 - 4. Compact seven wire strands conforming to ASTM Designation A 799 80, "Uncoated Seven Wire Compacted, Stress Relieved Steel Strand for Prestressed Concrete."
- C. Anchorages shall be capable of developing 95 percent of the guaranteed minimum ultimate tensile strength of the prestressing steel elements. All anchor head assemblies shall be restressable.
- D. The bearing plate shall be fabricated from structural steel and it shall be capable of developing 95 percent of the guaranteed minimum ultimate tensile strength of the tendon steel elements.
- E. Centralizers shall be fabricated from any material, except wood, which is non detrimental to the prestressing steel elements. The centralizer shall position the tendon in the drill hole so a minimum of 0.5 inch of grout cover is provided around each anchor strand. Centralizers shall be spaced at maximum 10 ft. intervals in the stressing length and maximum 5 ft. intervals in the bonded length.
- F. Cement Grout
 - 1. Cement grout used for encapsulating tiebacks shall be a neat cement grout conforming to the shop drawing submittal for the tiebacks.
 - 2. Non shrink grout made with TYPE I, II, or III Portland Cement conforming to ASTM C 150 specifications shall be used. Cement should be fresh and should not contain any lumps or other indications of hydration.
 - 3. Appropriate measures shall be taken to preclude freezing of the grout prior to its reaching design strength.
 - 4. Water for mixing grout shall be potable.
 - 5. Cement grout utilized for tiebacks shall have sufficient strength to achieve an effective bond between grout and the anchor tendon.
 - 6. Redesign of the cement grout mix shall be conducted by the Contractor if performance and/or proof tested tiebacks do not meet the specified criteria for acceptance as determined by the Engineer or Authority.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install excavation support systems in accordance with the accepted working drawings. Install, maintain, and remove excavation support system in such a manner as to prevent movement,

settlement, or loss of ground, removal of fines from the adjacent ground, or damage to or movement of adjacent structures. Excavation supports within the “zone of Influence “ of train live load surcharge shall not be removed at the completion of work, but shall be cut off 4 ‘ below top of rails and left in-place.

- B. Borings and site history indicate below-ground obstructions may be encountered. Such obstructions may include, but are not necessarily limited to, boulders, granite blocks, and retaining walls from past structures, granite block walls, and various other demolition and construction debris. The Contractor is responsible for removal of obstructions by pre-trenching/pre excavation or other means and backfilling with a suitable material.
- C. Protection of Existing Adjacent Structures
 - 1. The Contractor shall repair all damage to adjacent properties and restore the surfaces and finishes to the original state.
 - 2. If in the opinion of the Engineer the integrity of the adjacent railroad tracks, buildings, structures, or paved areas are jeopardized due to movement, the Contractor shall immediately discontinue further excavation in the affected area and implement a Plan of Action to mitigate further movement. Mitigating measures shall remain in effect until such time that the Engineer evaluates the impact on the structure and may direct the Contractor to perform any remedial work. The Contractor shall submit proposed remedial measures to the Geotechnical Engineer for review and approval. Submittals shall include methods and names of subcontractors. The Contractor shall proceed with remedial work upon acceptance by the Engineer. Mitigating measures shall be at no additional cost to the MBTA.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems 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 Engineer and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces is not impeded.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.3 SOLDIER BEAMS AND LAGGING

- A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wales horizontally at spacings indicated on the approved shop drawings and secure to soldier beams.

3.4 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.5 TIEBACKS

- A. Tiebacks shall be designed and installed by the Contractor in accordance with the current edition of the "Recommendations for Prestressed Rock and Soil Anchors", by the Post Tensioning Institute.
- B. Excavation support wall, and other support system members incorporated in a system using tiebacks, shall be designed to resist the vertical components of the tieback loads without settlement during any stage of the excavation and construction.
- C. Coordinate locations of all bracing and components thereof for temporary lateral excavation support with locations of permanent steel and foundation wall elements.
- D. Install tiebacks in accordance with reviewed shop drawings as specified herein and as indicated on the Drawings.
- E. Tiebacks shall be installed through sleeves or holes provided in the earth support system. Prevent loss of ground and water seepage at the tieback locations. Implement remedial measures immediately if loss of ground or seepage occurs at these locations.
- F. Tiebacks shall be installed by duplex drilling methods only, using internal flushing methods only which provide return of wash fluid and cuttings through the inside of the outer casing. Outer casing shall be extended for the entire tieback length. Methods of installation shall be used which prevent the loss of ground, e.g. collapsing hole.
- G. Tiebacks shall be installed with pressure grouted anchor zones of the regrowable type. Regrowable type tiebacks shall have the capability, following initial low pressure grouting, for regrowing in successive stages, using higher grouting pressures to increase load capacity. Each tieback must be capable of being retensioned, if necessary.
- H. Each tieback installed for support of earth excavations shall be tested to verify and establish the tieback capacity. All testing shall be performed in the presence of the Engineer or Authority. Performance tests shall be performed on a minimum of 10 percent of tiebacks for each design, as selected by the Engineer or Authority, to verify the tieback design. Tiebacks grouted into differing strata will be considered a different design. All other tiebacks shall be proof tested.

- I. Performance Tests shall be conducted in accordance with procedures described in the current edition of the "Recommendations for Prestressed Rock and Soil Anchors", by the Post Tensioning Institute.
- J. Proof Tests shall be conducted in accordance with procedures described in the current edition of the "Recommendations for Prestressed Rock and Soil Anchors", by the Post-Tensioning Institute.
- K. Tiebacks shall be locked-off at a load equal to 75% of the tieback design load.
- L. Acceptance of Performance tests and proof tests shall be determined by the Engineer in accordance with the current edition of the "Recommendations for Prestressed Rock and Soil Anchors", by the Post Tensioning Institute.
- M. Any tieback which cannot meet the criteria for acceptance for its design capacity can only be incorporated in the bracing system using 67 percent of the load that can be maintained and meets the criteria for acceptance. Regroutable anchors will be accepted at full capacity after regrouting and acceptable proof testing.
- N. Additional tests shall be performed when any changes are made in the tieback assembly or installation procedures at no additional cost to the Authority.
- O. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- P. Inspect tiebacks periodically to confirm anchors exhibit no movement.
- Q. Detension temporary tiebacks in accordance with the proposed construction sequence as accepted by the Authority.

3.6 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Engineer.
 - 2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.7 REMOVAL AND REPAIRS

- A. Remove excavation support (if not within- railroad live load "zone of influence") and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
 - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

3.8 MONITORING OF EXCAVATION

- A. The Contractor shall monitor the performance of components of the excavation support system, both for vertical and horizontal movement, at intervals specified below. If the Response Values as specified in Table 02260-1 attached are reached at any time during the work, the Contractor shall immediately stop work and implement approved contingency plans.
- B. Possible effects of the excavation on the lateral support system:
 - 1. Deflection of the wall into the excavation due to soil, groundwater, and surcharge loads.
 - 2. Settlement adjacent to the lateral support wall due to inward deflection of the wall.
 - 3. Settlement adjacent to the lateral support wall due to ground loss into the excavation through gaps and voids in the wall.
- C. Monitoring Deflection of Wall
 - 1. Once the wall is installed to final elevation but before excavation begins, establish deformation-monitoring points on the top of the wall, spaced approximately every 20 feet along the wall or at every other soldier pile, whichever is lesser. The monitoring points shall consist of markings which are clearly identifiable, and will produce a repeatable accuracy of within 1/8 inch in any direction.
 - 2. Perform a baseline survey of each deformation monitoring point before excavation begins. Survey both vertical and lateral (into proposed excavation) position.
 - 3. Perform daily survey of each top-of-wall deformation monitoring point from when excavation begins until full excavation depth is reached adjacent to the wall. Thereafter, perform weekly survey of monitoring points until the wall is backfilled.
 - 4. When excavation reaches mid-depth, establish monitoring points on the face of the wall for lateral deflection monitoring. Perform a baseline survey of each point prior to additional excavation. Perform daily survey of each mid-wall deformation monitoring point until full excavation depth is reached adjacent to the wall. Thereafter, perform weekly survey of monitoring points until the wall is backfilled and concrete facing is constructed.
- D. Monitoring Track Movement
 - 1. Before the start of excavation and wall installation, establish elevations along Top of Rail of outbound track spaced approximately every 20 feet along the walls.
 - 2. Perform two baseline elevation surveys of the Top of Rail before the start of excavation/wall installation. Survey both vertical and lateral (into excavation) positions.
 - 3. Perform daily survey of settlement monitoring points from the beginning of excavation work until the track support structure is completed.
 - 4. Perform weekly survey following completion of the track support structure until all work for the access structure completed including all concrete work, backfill and compaction. Landscaping work shall not be considered an outstanding work item.
 - 5. Any existing structures supporting tracks or embankments adjacent to tracks in the vicinity of work, such as bridges, abutments, retaining walls, or other structures where settlement, deflection, or failure could affect the tracks shall be included in any monitoring program.
- E. Survey instruments used for vertical deformation monitoring shall have a minimum accuracy of ± 0.05 in and a minimum setting accuracy of ± 1.0 arc seconds. Leveling staffs shall be non-telescopic in

design (i.e. 'Chicago' style leveling staff). A bull's eye bubble shall be used to plumb the leveling rod.

- F. Survey instruments used for horizontal deformation monitoring shall have a minimum accuracy of ± 3.0 arc seconds and a minimum display reading less than or equal to the accuracy. Distances less than 30 feet shall be measured with a standardized steel tape used in conjunction with a tension handle. Distances greater than 30 feet shall be measured with an Electro-Optical Distance Measuring Instrument (EDM). Distances between 30 and 100 feet shall be verified with a standardized steel tape in conjunction with a tension handle. Electronic pointing shall be used to minimize error due to possible misalignment of the EDM axis and telescope. Centering shall be accomplished using high precision optical plummets or mechanical centering devices.
- G. EDM equipment used for lateral deformation monitoring shall, after calibration, have a minimum accuracy of ± 0.2 in plus 5 parts per million
- H. Make adjustments to survey schedule and monitoring point locations (including the addition of monitoring points) as requested by the Engineer if additional monitoring of wall performance is desired. Extra monitoring points and increases in survey frequency shall be considered incidental to the costs associated with this Section.
- I. The Contractor shall submit the results of the settlement point readings to the Engineer in draft form at the end of each working day. All monitoring data shall be reported to the Authority and Engineer within twenty-four (24) hours of measurement in tabular format, allowing comparison of current data to previous data, including baseline, and showing a complete history of movement versus time.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

Attachment: Table 02260-1

**TABLE 02260-1
RESPONSE VALUES**

Monitoring Type	Value
<u>Lateral Deflection of Earth Support Wall</u>	
Top of wall	2.0 inches
Mid-point of wall	0.75 inches
<u>Vertical Deflection of Earth Support Wall</u>	
Top of wall	0.5 inches
<u>Ground Surface Settlement</u>	
Top of Rail	1/4 inch

END OF SECTION

SECTION 02270

SLOPE PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section specifies the following types of slope protection:
 - 1. Type 1, Dumped Riprap: angular shaped stones dumped in place to form a well-graded mass with a minimum of voids, placed directly over a layer of filter fabric on subgrade soils.
 - 2. Provision of an Erosion Control Mat over slopes steeper than 2H:1V as shown on the Contract Drawings or as directed by the Engineer. Prior to placement of erosion control mats, the slopes shall be covered with topsoil and seeded with Crown Vetch as specified within.
- B. Related work described elsewhere:
 - 1. Section 02100 - SITE PREPARATION
 - 2. Section 02300 - EARTHWORK
 - 3. Section 02920 - LAWNS

1.2 QUALITY CONTROL

- A. Control of gradation of stone for Type 1 slope protection shall be by visual inspection. Provide at the construction site and at the quarry a mass of rock of at least five tons meeting the specified gradation. The sample at the construction site may be a part of the finished riprap covering. These samples will be used as a reference for judging the gradation of riprap supplied.
- B. Each roll of fabric or erosion control mat shall be labeled or tagged to provide product identification sufficient for field identification, as well as inventory and quality control purposes. Each roll of fabric shall be stored in a manner that will protect them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.
- C. Erosion control mats shall be installed in accordance with the manufacturer's recommendations. Where manufacturer's recommendations conflict with details shown on the Contract Drawings, the more stringent, in the opinion of the Engineer, shall apply.

PART 2 - PRODUCTS

2.1 TYPE 1, DUMPED RIPRAP

- A. Stone: hard, durable, angular in shape; resistant to weathering; free from overburden, spoil, shale, and organic materials; neither breadth nor thickness of a stone shall be less than one third its length.

B. Gradation:

- | 1. Weight of Stone
Smaller than Given Size | Maximum Percent
of Total Weight |
|---|------------------------------------|
| 400 pounds | 100 |
| 300 pounds | 80 |
| 200 pounds | 50 |
2. Maximum percent passing a two-inch sieve: 5 percent.

C. Filter Fabric (Geotextile) below riprap:

Shall meet the physical requirements set for MassDOT Standard Specifications M9.50.0 Type I geotextile fabric.

2.2 EROSION CONTROL MAT

- A. Fibers used in the manufacture of the erosion control mat, and the threads used in joining the erosion control mat by sewing, shall consist of long-chain synthetic polymers, composed of at least 85% by weight polyolefins, polyesters, or polyamides. They shall be formed into a network such that the filaments or yarns retain dimensioned stability relative to each other, including selvages. These materials shall conform to the following physical requirements:

<u>Property</u>	<u>Method</u>	<u>Value</u>
Thickness	ASTM D-1777	0.40 in. (min)
Resiliency	ASTM D-1777	80% (min)
Flexibility	ASTM D-1388	450 lb/in (maximum)
Porosity	Calculated	95%
Ground Cover Factor	Light Protection Test	65% (min)
Tensile Strength	ASTM D-1682	130 x 105 lb/ft (min)
Moisture Absorption	ASTM D-570	.01% (max)
Elongation	ASTM D-1682	-90 x 90 lb/ft
Ultraviolet Stability	ASTM D-4355	80% (min)

- B. Erosion control mat rolls shall be furnished with suitable wrapping for protection against moisture, and extended ultraviolet exposure prior to placement. Each roll shall be labeled or tagged to provide product identification sufficient for inventory and quality control purposes. Rolls shall be stored in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.

PART 3 - EXECUTION

3.1 TYPE 1, RIPRAP SLOPE PROTECTION

- A. Prior to riprap placement, the subgrade soil that receives the geotextile is required to be prepared to a relatively smooth condition that is free of obstructions, depressions, or debris.
- B. Geotextiles used for 2 to 1 slopes or greater are required to be placed with the machine direction of the geotextile sheets perpendicular to the toe of the slope. The geotextile sheets are overlapped in the direction of the anticipated movement of the water. For example, on a foreslope the movement of the water is from the pavement and the geotextile sheets start at the bottom of the slope and proceed upslope.
- C. Adjacent pieces of geotextile may be joined by sewing or by overlapping. When geotextile sheets are overlapped they are required to be pinned. The pins are driven until the washer bears against the geotextile so that the geotextile is secured firmly to the ground. Additional pins are installed as necessary to prevent any slippage of the fabric.
- D. Place riprap on the prepared filter fabric covered slope or area in such a manner as to produce a well-graded mass of stone with the minimum practicable percentage of voids and a minimum thickness of eighteen inches. Place stone to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing of stone in layers or by dumping into chutes or by similar methods likely to cause segregation will not be permitted. Place and arrange stones by hand or by mechanical equipment as necessary to produce a compact riprap protection in which all sizes of stones are placed in their proper proportions.
- E. Place riprap in conjunction with the construction of the embankment with only sufficient lag in construction of the riprap protection to allow for proper construction of the embankment and to prevent mixture of embankment and riprap material. Maintain the elevation of the riprap within five feet of the elevation of the embankment during construction.
- F. A minimum 2-foot deep riprap key should be installed to a depth below the final grade at the toe of the riprap. Filter fabric should be wrapped around the riprap stone above at the toe of slope.

3.2 EROSION CONTROL MAT

- A. Slope surfaces shall be final graded, stable firm and free of rock or other obstructions which would prevent the mat from lying in direct contact with the soil.
- B. Spread 6 inches of topsoil over final grade and seed with Crown Vetch before installing erosion control mat. Low Maintenance Ground Cover, Crown Vetch Seed Mix: K-31 Tall Fescue at 40 pounds for each acre and Crown Vetch at 20 pounds for each acre. Inoculate seed with fresh inoculant as directed on package insuring that Crown Vetch inoculant contains sticker supplement. Maintain temperature of between 50 and 75 degrees F during inoculation. When hydroseeding, use 4 times inoculant rate.
- C. Install the upslope folded mat end by burying in a 6 inch wide by 24 inch deep trench as shown on the Drawings. Staple the mat along the bottom of the trench at 1.5 foot intervals. Backfill the trench and firmly compact. Install a row of staples 1 foot downslope of the trench along the width of the fabric at 1.5 foot intervals.

- D. Place 18-inch long anchoring pins over the slope area at 4 foot centers
- E. Anchor the downslope end of the mat in a similar manner as specified for the upslope.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02282

HANDLING, TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the procedures used for field screening; soil sampling, stockpile management, reuse, transportation and disposal of excavated materials.
- B. This section includes furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with the handling, testing, treating, stockpiling, transporting and disposal and/or re-use of soil (defined hereinafter as including sediments for the purposes of this Section) and associated fill and waste material resulting from the construction operations as specified.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 01567 - HEALTH AND SAFETY
 - 2. Section 02300 – EARTHWORK
 - 3. Section 01151 – MEASUREMENT AND PAYMENT (Lump Sum)
- D. The Authority will be the generator and will sign all disposal facility waste profiles, Hazardous Waste Manifests (manifest), Material Shipping Records (MSR) and 21E Bills of Lading (BOL) as the Generator. The Contractor's License Site Professional (LSP) will sign all BOL as the LSP. Except for soil that requires transport under a manifest, all soil shall be transported under BOL or MSR whichever is applicable, based on the results of the laboratory chemical analysis of soils. All paperwork required for work under this Section shall be prepared by the Contractor. BOL shall be utilized for \geq Reportable Concentration Soil (RCS-1) soils; MSR shall be utilized for all \leq RCS-1 soils.
- E. Furnish all labor, materials, equipment, and incidentals necessary to properly, sample, segregate, handle/manage, load, transport and dispose of excavated materials located from within the Limit of Work. Work covered by this Section shall include furnishing, operating, and maintaining equipment decontamination stations for the duration of excavation activities and dismantling, disposing of decontamination stations at project completion. Decontamination stations shall be capable of eliminating the dispersion of dust and mud caused by vehicles exiting the site.
- F. The objective of the soil management practices is to handle all soil and fill excavated during this contract in accordance with applicable state, federal and local regulations and bylaws and to implement off-site soil management in a cost effective manner. To the extent possible, the Contractor shall reuse structurally suitable excavated material prior to using imported backfill to reduce the volume of material to be disposed off-site.

1.2 RESPONSIBILITIES

- A. The Contractor shall employ the services of an Environmental Consultant to assist in the activities listed below. Contractor's Responsibilities:

1. The Contractor shall employ the services of an Environmental Consultant to perform the soil screening, soil sampling, dust control measures, management coordination and support compliance efforts associated with all references listed in this Section. The Environmental Consultant shall include at least one professional experienced in soil sampling and dust control measures and a Licensed Site Professional (LSP) registered with the Massachusetts LSP Board. Proof of current licensure and professional experience on projects of similar nature and complexity shall be provided to the Engineer with the EMMP.
2. The Contractor shall field-screen excavated material for the presence of volatile organic compounds (VOCs) with a photo ionization detector (PID). As directed by the Engineer, samples representative of each 20 cubic yards of material excavated shall be screened.
3. The Contractor shall be responsible for the submitting the daily logs summarizing field screening and excavating activities to the Authority's Representative and Engineer.
4. The Contractor shall identify and propose locations for construction staging of temporary soil stockpiles and miscellaneous materials, soil/waste treatment technologies and areas, disposal, recycling and treatment facilities, facilities for the beneficial re-use of excavated materials including but not limited to soil, debris, or other miscellaneous materials, temporary storage facilities, landfills, soil recycling and hazardous waste treatment, storage and disposal facilities for all excavated material.
5. The Contractor shall be responsible for transporting excavated material to the approved construction storage location/stockpile area and, disposal, recycling, treatment facilities and facilities for beneficial re-use.
6. The Contractor shall furnish, operate and maintain equipment decontamination stations for the duration of excavation and soil disposal work.
7. The Contractor shall develop and implement site-specific emergency response and health and safety protocols and procedures.
8. For each shipment of material transported to a disposal facility, the Contractor shall demonstrate to the Authority's Representative and Engineer that the least costly means of disposal has been selected. This demonstration shall be made prior to shipment.
9. The Contractor shall be responsible for submitting completed Bills of Lading, MSR, manifests and other shipping documents to the Authority's Representative and Engineer within two weeks of shipment to a storage or disposal/recycling facility. The Contractor is responsible for uploading these BOLs onto the MassDEP electronic filing system (eDEP). The Contractor's LSP will sign and stamp Bills of Lading. The receiving facility shall provide electronic attestation of receipt of soils within 5-days of receiving notification from the LSP of the availability of the BOL for that purpose on eDEP.
10. The Contractor shall advise the Engineer and Consultant at least three working days in advance of the schedule for off-site disposal of excavated material. No off site shipments or on-site re-use will occur without the approval of the Authority's Representative and Engineer and Environmental Department.
11. The Contractor shall advise the Authority's Representative and Engineer at least three working days in advance of the collection of soil samples and any other environmental sampling. The Contractor shall collect, analyze and characterize samples of excavated material prior to off-site recycling and/or disposal.
12. The Contractor shall prepare the necessary documents to transport and dispose of excavated material. These documents include, but are not limited to waste profiles, Bills of Lading, MSR and manifests.

13. The Contractor shall submit the executed transportation and disposal documents to the appropriate local, state and federal agencies as well as the Authority's Representative and Engineer.
14. The Contractor will provide an environmental field technician to oversee the loading of excavated material into transport vehicles for off-site disposal/recycling.
15. The Contractor shall develop an excavated soil tracking/management system and keep records, including daily logs and photographs, of all waste streams, stockpiles, and excavated materials for the purposes of tracking points of origin and final disposition.
16. The Contractor will develop and implement dust control measures.

B. Authority's Responsibilities:

1. The Authority Representative will review and approve the proposed facilities selection of off-site recycling, reuse or disposal facilities.
2. The Authority shall be the designated Generator for all excavated material identified for off-site reuse, recycling and/or disposal.
3. The Authority Representative shall review and approve all paperwork, manifests, and Bills of Lading.

1.3 QUALITY ASSURANCE QUALITY CONTROL

A.

1. The Contractor shall be responsible for the collection and analysis of soil samples from all areas of the site. Sampling frequency shall be conducted as to meet the requirements of the disposal facility. For the purpose of disposal, TPH data is acceptable. However, MCP notification will be based upon VPH and/or EPH MADEP Method 1.0 analysis. The analysis and analytical documentation shall meet the MassDEP Compendium of Analytical Methods requirements. The contractor will include the result of all soil testing in the Excavated Materials Management Plan in accordance with Section 1.4 Submittals.

1.4 SUBMITTALS

- A.** The Contractor shall prepare an Excavated Materials Management Plan (EMMP) that describes the work to be performed under this Specification. The EMMP shall be submitted to the Authority within 14-days after the issuance of the Notice to Proceed. At a minimum the EMMP shall include the following:

1. A schedule detailing the proposed sequence of work.
2. Procedures that will be used for field screening of the excavated soils.
3. Procedures for the collection of soil samples for laboratory chemical analysis. The plan will list the proposed laboratory analytical parameters.
4. A description of the tracking methodology that will be implemented to identify the source excavation area(s) and the final disposition of the excavated soil from each area of excavation.
5. A detailed site plan indicating the construction staging/stockpile area as it relates to the active construction area. The plan shall show the proposed layout of the staging area as it relates to the stockpile soil, debris and/or miscellaneous materials and construction materials. For off -

- site staging areas, the plan shall include the location name, address and any other pertinent information.
6. Plan and procedure for Tracking of Excavated Material - The Contractor shall provide a plan and procedure for tracking of all excavated materials from generation through final disposition. The plan shall include:
 - a. The location (i.e. station, offset) depth, date of excavation, stockpile location and stockpile identification system.
 - b. Drawings showing the limits of work and shall document the origins of each soil stockpile and its location within temporary storage area.
 - c. The plan shall be maintained and updated to show the location of all excavated material that has been stockpiled on a daily basis.
 - d. Furnish a duplicate copy of the master stockpile plan to be located in the MBTA and Contractor field office and update on a daily basis.
 - e. Submit to the Authority for review the excavated material tracking plan. This plan shall provide for the tracking of the excavated materials from the "point of excavation" to the location of the stockpile material in the storage area to the final disposition of the stockpiled material. This plan shall include all proposed daily log sheets.
 - f. Provide to the Authority, on a daily basis, copies of field records documenting the location of stockpiled material in the system and stockpile identification data.
 - g. Each stockpile shall be identified with a suitable weatherproof sign attached to a stake driven into each pile.
 7. Procedures for Temporary Stockpiling Of Excavated Materials -The Contractor shall provide a plan and procedure for Temporary Stockpiling Of Excavated Materialsto include:
 - a. All excavated material shall be stored in a secure manner to prevent exposure to humans and the environment.
 - b. The stockpiling or consolidating of excavated material near sensitive human health receptors such as public and private water supply wells or sensitive environmental receptors such as wetlands, surface water bodies, or marine environments shall be prohibited.
 - c. All excavated material stored at the site of generation or at a temporary storage location shall be placed entirely on a polyethylene liner, and shall be covered at the end of each day's work and at all times when earthwork is not taking place on site, with the same material or so as to minimize the infiltration of precipitation, volatilization of contaminants and erosion of the stockpile. Any cover material used shall be properly secured and possess the necessary physical strength to resist tearing by the wind and other elements.
 - d. The stockpiles shall be bermed around the edges to minimize infiltration of storm water or exfiltration of leachate.
 - e. Any failure of materials or procedures used in employing the base layer or cover layer shall be immediately repaired, replaced or re-secured so as to minimize precipitation infiltration, volatilization and erosion/runoff of the excavated material.
 - f. Movement and/or aeration of excavated material shall be limited to those activities that are necessary to manage such stockpiles. Land farming of material stockpiles is prohibited.

- g. Stockpiles are to be segregated based on a review of pre-characterization data and visual and olfactory conditions and field screening results obtained during excavation. Similar material may be stockpiled together. Each stockpile must be clearly marked from adjacent stockpiles.
 - h. Excavated material not previously classified in accordance with the field screening classification, final characterization, or as otherwise directed by the Authority shall be stockpiled separately based on classification. Transfer suspected waste material from the excavation to a stockpile area in a manner to prevent the spread of contaminated material with other materials.
 - i. Disposal of material that is contaminated as a result of careless handling or use of unauthorized procedures shall be at the Contractors expense. Delays of Work resulting from temporary storage of excavated material, regardless of the classification, shall be at no additional cost to the Authority.
 - j. Unless otherwise directed by the Authority's Engineer, excavated material shall be reused on site or disposed of off-site within 45 days of excavation.
 - k. The Contractor shall segregate excavated material into stockpiles no greater than 500 cubic yards. Effort will be made to keep each stockpile separate. The Contractor shall collect the necessary samples of the stockpile at that time for classification.
 - l. The stockpiles shall be clearly labeled and securely barricaded from contact with workers and the general public.
8. The means and methods for decontaminating all equipment and personnel, including provisions for installing equipment decontamination pad within the work zone.
9. All pertinent information relating to the transport of excavated material. The information, at a minimum, shall include:
- a. Name and address of all transporters.
 - b. Transporter identification number (USEPA or Massachusetts Department of Transportation Transporter) and expiration date.
 - c. Proof of permit, license, or authorization to transport excavated material in all affected states.
 - d. Details of methods, vehicle and containers (as applicable) to be used for transporting excavated material. Refer to Part 2 of this Section.
 - e. Dust control measures
 - f. On-site pre-treatment of excavated soil unsuitable for re-use.
10. The Contractor shall identify each waste stream and propose an appropriate disposal facility that will accept the excavated material as classified. The Contractor shall submit approvals or letters of intent and facility information for each facility proposed. For each facility, the Contractor shall submit the following information:
- a. General Information
 - 1) Facility Name
 - 2) Facility Address
 - 3) Name of Contract Person
 - 4) Title of Contact Person
 - 5) Telephone Number of Contact Person

- 6) Permit Number
 - b. The facility shall specify the volume of material that can be accepted from the site on a weekly and a total basis.
 - c. The facility shall provide written confirmation that they are permitted to accept and will accept the classified material of the general quality and quantity described by these Specifications.
 - d. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils or materials specified in this contract.
 - e. The Contractor shall submit a complete list of the disposal facility's permitted allowable contaminant levels and physical characteristic requirements for excavated material, and list any required regulatory approvals for individual waste streams.
- 11. The Plan shall include the current licensure of the Contractor's LSP and proof of relevant experience of the field personnel.
- 12. The plan shall include an Equipment Vehicle Decontamination Plan.
- B. Laboratory results for all samples collected and/or analyzed by the Contractor shall be tabulated and compared to applicable MCP standards by the Contractor's Environmental Consultant and subsequently submitted to the Engineer within two days of receipt. The results shall include all Chain-of-Custody forms and all documentation provided by the laboratory.
- C. The EMMP shall be approved in its entirety before any excavated soil is disposed of off-site or reused on-site.

1.5 REFERENCES

- A. All regulations cited and those of other governing agencies in their most recent version are applicable. This Section refers to many requirements found in these references, but in no way is intended to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations and common practices. Other provisions contained in these references may from time to time during the execution of this Contract be enforced by the Authority's Representative or the Engineer. In the event of a conflict, the most stringent regulations shall govern. The following documents and/or publications are made part of this Section by reference herein:
 - 1. Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.
 - 2. Massachusetts Hazardous Waste Regulations, 310 CMR 30.00.
 - 3. Solid Waste Management Facility Regulations, 310 CMR 19.00.
 - 4. Site Assignment Regulation for Solid Waste Facilities, 310 CMR 16.000.
 - 5. Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, DEP Bureau of Waste Site Cleanup Policy No. WSC-94-400.
 - 6. "Hazardous Waste Operations and Emergency Response", Federal Occupational Safety and Health Act (OSHA), 29 CFR 1910.120.
 - 7. "General Regulations for Hazardous Waste Management", EPA, 40 CFR 260.
 - 8. "Regulations for Identifying Hazardous Waste, Hazardous Waste Generators and Hazardous Waste Transporters", EPA, 40 CFR 261, 262 and 263.

9. “Standards for Management of Specific Hazardous Wastes and Facilities”, EPA, 40 CFR 266.
10. “Construction of Buildings in Contaminated Areas,” DEP, Bureau of Waste Site Cleanup Policy #WSC-00-425, dated January 2000.
11. Massachusetts DEP Policy #COMM-97-001.
12. Local regulations governing dust control, soil handling, and health & safety (see Section 01567 – HEALTH AND SAFETY).
13. Compendium of Quality Assurance and Quality Control Requirements and Performance Standards (CAM) DEP WSC #02320.
14. MassDEP Technical Update Background Levels of Polycyclic Aromatic Hydrocarbons and metals in soils.
15. All other applicable Federal, State. Or local requirements.
16. Interim Remediation Waste management Poly for Petroleum Contaminated Soils Attachment II, Jar headspace analytical Screening Procedure. MassDEP Policy no. WSC-94-900.

1.6 DEFINITIONS

- A. Natural soils: Is defined as unconsolidated sand gravel silt clay and organic materials which has become a part of the unconsolidated soil matrix.
- B. Excavated Material: All soil, sediment and/or debris excavated from within the Limit of Excavation.
- C. Limit of Excavation: For the purpose of reusing soil/fill on site the *limit of excavation* is considered to be the approximate area in which the soil/fill was removed provided that area is consistent in soil strata, color, texture, geotechnical properties and has substantially similar visual and olfactory characteristic as accepted by the Authority’s Engineer. Soil/fill returned to the *limit of excavation* shall be placed approximately in the same location from which it originated.
- D. Contaminated Material/Soil: Any excavated material found to contain oil or hazardous material (OHM) at concentrations in excess of applicable MCP Method 1 standards (310 CMR 40.0300), Reportable concentrations (310 CMR 40.1600) or regulated background levels (as defined in the MADEP Technical Update Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil and 310 CMR 40.00006) or other applicable State or Federal Regulations.
- E. Generator: The Authority.
- F. Hazardous Material/Waste: A waste/material or combination of waste/material, that because of its quantity, concentration, physical chemical or infectious characteristics may cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness, or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. This definition also includes but is not limited to materials regulated under TSCA, M.G.L., chapter 21E, RCRA (310CMR 30.00) and the MCP (310 CMR 40.00) and any applicable Federal regulations Where applicable consideration should be given to MSDS in determining if a material could be potentially hazardous
- G. Historic Fill: Also referred to as “urban fill.” Generally acknowledged as fill material from non-specific sources. Historic fill typically are observed to contain mixtures of ash, coal, glass, brick, wood and/or miscellaneous building debris. OHM attributable to a source or sources or which are attributable to a specific industrial process is excluded from this definition regardless of the physical soil constituents. Historic fill typically contain elevated concentrations of polycyclic aromatic

hydrocarbons, lead and/or petroleum hydrocarbons. Historic fill shall not include boulders, ledge, consolidated rock, asphalt, concrete, railroad timbers, rail, cobblestones or any other abandoned building materials which would preclude the disposal of the material as daily cover at a landfill.

- H. Construction and Demolition Waste: Also referred to as “debris” includes but is not limited to waste building materials and rubble resulting from construction, remodeling, repair or demolition of buildings, pavement, roads, or other structures. Construction and demolition waste includes but is not limited to concrete, bricks, lumber, masonry, road paving materials, rebar, plaster, granite, steel, concrete and wooden ties miscellaneous metal trees and other vegetative waste material.
- I. Asphalt pavement, Brick and Concrete (ABC): rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar used in construction or concrete that may contain rebar. The rubble shall not be painted, coated or impregnated with any substances.
- J. Stockpiled Materials: Any soil/fill and/or debris (which include ABC material or other construction/demolition waste) which are stored prior to re-use, disposal, recycling or treatment.
- K. Background: Any excavated soil or fill material which meets the regulatory definition of “background” as defined in 310 CMR 40.0006 may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified herein and as specified in Section 02210 – Earth Excavation, Backfill and Grading. Excess soil that meets the definition of background shall be transported under a Material Shipping Record (MSR) of BOL.
- L. Special Waste: Any solid waste that is determined not to be hazardous waste and that exist in such quantities or in such chemical or physical state or any combination thereof so that a particular management controls are required to prevent an adverse impact from the collection, transport, transfer storage processing, treatment or disposal of the solid waste. Asbestos and PCB contaminated soils/fill are examples of special waste.

1.7 PERMIT REQUIREMENTS

- A. The Contractor shall obtain all Federal, State, and local permits required for the transport and disposal of excavated material. The Contractor shall adhere to all permit requirements.
- B. The Contractor shall document that the disposal facilities, recycling/treatment facilities proposed have all certifications and permits as required by Federal, State, and local regulatory agencies to receive and dispose of the excavated material.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this Work as indicated in Section 01567 – HEALTH AND SAFETY.
- B. Containers used for hauling the excavated material shall be constructed of steel, in good condition and designed for the intended purpose of safe, secure storage of hazardous material during loading and transport to an approved facility. The containers shall have a secure cover which will prevent a release of material from truck during transportation. The container and covers shall be approved by the Engineer prior to mobilization of trucks/containers. The containers must be approved by and labeled in

accordance with the US Department of Transportation (DOT). The containers shall be rust proof and water resistant in accordance with the DOT regulations.

2.2 STORAGE LABELS

- A. Provide signage to label all stockpiles. Labels shall be of 6-inch by 12-inch weatherproof material, such as plastic, affixed to 1" x 3" wood straps, 3 feet long. The labels shall be clearly marked with indelible ink marker. Markings shall be as agreed upon between Authority and Contractor.

2.3 STOCKPILE SHEETING

- A. Stockpile Sheeting: Provide Nylon-reinforced polyethylene (NRPE) sheeting as follows:
 - 1. The membrane shall be manufactured of new, first quality product designed and manufactured specifically for the intended use.
 - 2. The material shall be 10-mil polyethylene reinforced with a non-woven grid of high strength nylon cord.
 - 3. The material shall be ultra-violet resistant and cold crack resistant to -40 degrees F.
 - 4. The materials shall be manufactured in a minimum 12 foot seamless width. Labels on the roll shall identify the thickness, length width and manufacturer's mark number.

2.4 DUST MONITORING

- A. Air monitoring shall include total dust testing using MIE, INC. Miniram PDM-3 Dust Monitors or like instrument.

2.5 EQUIPMENT AND VEHICLE DECONTAMINATION PAD

- A. A decontamination pad shall be constructed of reinforced concrete or bituminous concrete to withstand an H-20 loading. The decontamination pad shall be of minimum length to accommodate one 18-wheel dump truck, and a minimum area to accommodate the largest piece of equipment to be used in the excavation. The pad shall have a six inch containment berm and provisions for collection, storage and disposal of decontamination water.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall handle and convey all materials to perform site work described in this Contract.
- B. The Contractor shall perform any additional disposal characterization sampling and analytical testing of the excavated material as required by the permitted disposal facility at no additional cost to the Authority.
- C. Based upon all analytical results, transport and dispose of the excavated material as specified herein.

- D. An LSP Opinion shall be required for all material shipped using a Massachusetts Bill of Lading or for off-site re-use of excavated materials.
- E. Utilization of a Hazardous Waste Manifest shall require the use of a licensed hazardous material transporter in conformance with the Massachusetts Hazardous Material Regulations as required by 310 CMR 30.0000. An LSP Opinion is not required when using a Hazardous Waste Manifest for transporting excavated materials.
- F. The Authority shall have final approval over all disposal options.
- G. Immediately notify the Authority of visible stains or unnatural odor of any excavated material, or if potentially contaminated and/or hazardous material is encountered.

3.2 FIELD SCREENING EXCAVATED MATERIAL

- A. Screen excavated materials for the presence of oil and hazardous materials as excavation proceeds using visual, olfactory and jar headspace analysis.
- B. Perform field screening evaluation in accordance with Department of Environmental Protection Policy No. WSC-94-900, "Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, Attachment II, Jar Headspace Analytical Screening Procedure."
- C. Provide services of one or more individuals to field screen excavated materials in accordance with the MassDEP Policy No. WSC- 94-900. The individual(s) shall have been adequately trained in the use of the PID. Jar headspace results shall be recorded on the Contractors daily excavation log.
- D. Field screening equipment shall be provided by the Contractor and maintained and calibrated according to the manufacturer's recommendations.
- E. Maintenance and calibration data shall be recorded on the Contractor's daily excavation log and submitted to the Authority's Engineer.
- F. The Contractor shall perform field screening of excavated material at a frequency no less than every 20 cubic yards of material or fraction thereof.
- G. The Contractor shall conduct TCLP testing for soil contamination that is 20 times the Hazardous Waste Threshold concentration (310 CMR 30.125B).
- H. The Contractor shall use the following field screening classification system in order to segregate excavated material:

FIELD SCREENING CLASSIFICATION SYSTEM

MEDIA	VISUAL/ODOR	JAR HEADSPACE ANALYSIS	SCREENING CLASSIFICATION
Material	Light or No Staining	<10 ppm	Presumed Reusable/Surplus
Material	Staining/Odor or Unnatural Colors	>10 ppm	Presumed Waste

3.3 DISPOSAL CHARACTERIZATION SAMPLING

- A. The Contractor shall be responsible for sampling and characterizing the excavated material to determine appropriate off-site disposal and/or re-use opportunities. The contractor is responsible for final waste characterization and shall determine if any additional waste characterization is required at no additional cost to the Authority. The Contractor shall provide the Engineer with a minimum of 2 days’ notice prior to sampling and shall not sample unless Engineer’s approval is received.
- B. Stockpiled soils: Soil stockpiles shall be limited in size to a maximum of 500 cubic yard. A minimum of one grab sample (for VOC analysis) and on composite sample (generated by collection of at least eight (8) random grab samples from across the stockpile) shall be collected from each stockpile. 1. The sample will be collected at a minimum depth of one foot from the stockpile surface. For in-situ soils: Soil samples shall be collected The sample will be collected at a frequency of a minimum of one five-point composite sample (except for VOC’s) per 500 cubic yard of material. Test pit sampling: Test pit samples shall be collected from the excavation pit or if infeasible, from the excavator bucket. Samples shall be composited from the excavation bottom and the sidewalls so as to form a sample representative of the test pit soils. If samples are collected from the excavator bucket or from a stockpile generated from the excavation, the collection method described in Section 3.3(B) shall apply.)
- C. Should the Disposal Facility require additional samples the Contractor shall collect a sufficient number of samples that will satisfy the requirements of the disposal facility. No separate payment will be made for sampling conducted by the Contractor, the Contractor’s LSP or any agent/personnel acting on behalf of the Contractor or the Contractor’s LSP.
- D. Samples shall be collected in such a manner as not to result in cross-contamination. All sampling equipment shall be decontaminated between uses. Disposable sampling equipment shall not be used for collection of more than one sample.
- E. The collected samples shall be submitted, at a minimum, for the following chemical analyses: total petroleum hydrocarbons (TPH) using modified EPA method 8100, acid/base/neutrals (A/B/Ns) using EPA method 8270, volatile organic compounds (VOCs) using EPA method 8260, polychlorinated biphenyls using EPA Method 8081, RCRA 8 metals (arsenic, barium, cadmium, mercury, selenium and silver) using Method 6010/7471, reactive cyanide and sulfide using EPA method sw-846, Ignitability using modified EPA method 1010, Corrosivity using EPA Method 9045, and Conductivity using EPA method 120.1. Any sample found to contain contaminant concentration equal to or greater than “20 times” their hazardous waste toxicity threshold (i.e. the 20-times rule) shall be analyzed for toxicity characteristic leachate procedure (TCLP).
- F. A copy of the laboratory report on the disposal characterization including the chain of custody and all laboratory quality assurance/quality control documentation and a tabulated summary of the data shall be submitted by the Contractor to the Engineer within 2 days of receipt of the laboratory report(s) by the Contractor.

- G. All analyses shall be performed by a laboratory certified for such analyses by the Commonwealth of Massachusetts.
- H. The Engineer reserves the right to stop the Contractor's work any particular location at any time in order to collect samples taken for analysis. If requested, the Contractor shall assist the Engineer in collecting samples. The work shall not resume in that area until directed by the Engineer. Stoppage of work for this reason, or until laboratory results are delivered to the Engineer, shall not be a cause for the Contractor to request additional compensation or an extension of time to the Contract or to other intermediate Contract deadlines. Unless directed otherwise by the Authority's Engineer or LSP, the laboratory turn-around time for these samples shall be 24 or 48 hours as obtainable from the laboratory.
- I. The Contractor shall not backfill an excavation area from which samples have been collected, until the laboratory results have been received and reviewed and the Authority' Engineer gives approval.

3.4 DEBRIS MANAGEMENT

- A. As required by designated disposal facilities, the Contractor shall be responsible for decontaminating any debris shown by sampling to be contaminated at no additional cost to the Authority. The decontamination means and methods shall be included in the EMMP.

3.5 ON-SITE AND OFF-SITE SOIL REUSE AND DISPOSAL

- A. Excavated material found to be suitable for on-site or off-site reuse or disposal shall conform to the following:
 - 1. Soils not exhibiting visual or olfactory evidence of OHM may be reused within the area of excavation without first performing laboratory analysis. Soil/fill material that is not re-used within the area of excavation must be characterized prior to re-use.
 - 2. Any soil which exhibits a petroleum odor or has a chemical odor or visual indications of OHM shall be handled as potentially contaminated soils. Soils exhibiting visual or olfactory evidence of OHM shall not be reused on-site without prior confirmation that the OHM concentration shall not pose a significant risk under current or future use scenarios.
 - 3. Excavated material which has been characterized may be re-used within the area of excavation at similar depths from which it was excavated or otherwise within the limits of work provided the proposed re-use has been characterized and determined to meet MassDEP anti-degradation requirements. Soil reuse shall also comply with MassDEP Policy #WSC-00-425, "Construction of Buildings in Contaminated Areas"
 - 4. Excavated material that has been sampled and found to contain OHM concentrations less than MCP RCS-1 limits or regulated background (as defined in the Technical Update Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soils) as applicable and subject to geotechnical requirements shall be considered suitable for on-site reuse
 - 5. Background soils may be re-used without restriction provided that the soil is re-used in an area where the excavated soil concentrations is equal to or less than the site specific background determined at the off-site reuse location. The contractor is responsible for determining the background levels in the area of excavation; the Contractor shall identify one or more disposal facilities/locations with background levels appropriate to receive the excavated material. It is the Contractors responsibility to determine these background levels in advance so as to comply with 310 CMR 40.0032(3)(b) and so as not to delay or adversely affect construction operations.

6. If re-used off site, the Contractor shall be responsible for documenting that excavated material that is designated for off-site reuse shall contain OHM concentrations equal to or less than OHM concentrations at the designated reuse location (in accordance with the MCP's "anti-degradation" policy) or in accordance with the facility permitted acceptance limits. The Authority shall have final approval over all proposed reuse locations.
7. Excavated materials that has been sampled and determined to contain OHM in concentrations at or exceeding RCS-1 Reportable Concentrations or regulated background levels (as defined in the Technical Update Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soils) whichever applicable, maybe suitable for on-site re-use if a risk assessment determines that these soil do not pose a significant risk to human health and the environment at the proposed location(s) with associated current and anticipated future uses(s).

3.8 MCP NOTIFICATION REQUIREMENTS

- A. The Contractor shall be familiar with the MCP definitions of "two hour", "72 hour" and "120 day" reportable conditions
- B. The contractor shall immediately notify the Authority of any 2-hour and 72-hour reporting condition. Notification to the MassDEP shall be the sole responsibility of the Authority.
- C. MCP notification for petroleum shall be based upon VPH/EPH MassDEP Method 1.0 analysis. Notification shall not be based upon Total Petroleum Hydrocarbon concentrations.
- D. Depending upon the nature of the reportable conditions, the MCP may require the cessation of work, implementing a Limited Removal Action (prior to notification), developing/implementing an "Immediate Response Action Plan" or a "Release Abatement Measure Plan" prior to continuing work or other actions which could delay certain aspects the site work.

3.9 ENVIRONMENTAL FIELD MONITORING/DUST CONTROL

- A. The contractor shall hire an Environmental professional to keep accurate documentation of all air monitoring which will be made available to the Engineer upon request
- B. During excavation and construction the Contractor shall monitor the air quality where construction activities involve soil handling such as excavation, relocation, staging, loading or grading of soil/waste materials. Air monitoring shall involve appropriate techniques capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. If there are indications of contamination, the frequency of air monitoring shall be determined by the Contractor's Industrial Hygienist or competent health professional. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for assuring that monitoring is conducted in an appropriate manner and that work practices, engineering controls and/or personal protective equipment are proper for the conditions.
- C. The air monitoring program is to be designed to protect public health and the environment from the potential generation of dust and contaminant release during work. At a minimum, the air monitoring shall include daily monitoring and documentation of one upwind and two downwind conditions during periods of activity on the site and when there is a potential for dust being generated on the site. The air monitoring information including air monitoring in the vicinity of the site activities shall also be utilized for establishing levels of personal protection measures in the Contractor's Site Specific Health

and Safety Plan. The Contractor shall submit his/her air quality monitoring program for review prior to commencement of site activities.

- D. Air monitoring shall be performed by the Contractor during all soil handling operations. All personnel shall be made aware of potential hazards and be informed of air monitoring information.
- E. Dust shall be controlled during excavation of soil/fill material to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.
- F. Nuisance dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor and Odor Control Plan shall describe the procedures and materials to minimize dust. At a minimum the Contractor shall provide clean water, free from salt, oil and other deleterious materials.
- G. Prior to excavation areas of exposed earth shall be lightly sprayed with water before excavation if there is potential for nuisance dust generation. Additional water may be sprayed only when an indication of excessive dust is observed. To the extent feasible, the Contractor shall minimize the use of water within the limits of excavation.
- H. When feasible, access roads shall be sprayed with water on a regular basis to minimize the generation of dust.
- I. All containers and stockpiles shall be covered at all times except as necessary to place or remove materials from the containers or stockpiles, The Contractor shall monitor the covers daily to ensure the covers are in place and effectively eliminating the generation of dust.

3.10 VAPOR and ODOR CONTROL

- A. The Contractor shall provide the materials and labor to control objectionable vapors and odor in accordance with the Contractor's Dust, Vapor and Odor Control Plan. The Contractor shall limit the exposure area and shall cover the exposure area with synthetic reusable covers, lime, foam suppressants or other methods to reduce off-site odors to acceptable levels. The contractor shall not use soil suitable for on-site re-use as a cover to control vapor and odors.

3.11 DISPOSAL FACILITY CLASSIFICATION /CATEGORIES

- A. The Contractor shall transport the material for off-site reuse, recycling, or disposal at a permitted facility based on the following categories:
 - 1. Less than RCS-1 Facility: Accepts excavated material which contains oil or hazardous materials (OHM) at concentrations greater than background levels but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Less than RCS-1 may be reused in the area of excavation or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein. Surplus soils so classified shall be disposed of or reused at a property licensed to accept less than RCS-1 soils or at an In-State Unlined Landfill, whichever results in the least amount of cost.
 - 2. In-State Unlined Landfill Facility: Accepts excavated material that meets MassDEP criteria for reuse at in-state unlined landfills, to be used as daily cover, intermediate cover, and pre-cap contouring material. The material must not exceed the contaminant levels listed in DEP Policy #COMM-97-001. This category also includes excavated material and solid waste that meets Massachusetts DEP Solid Waste criteria and regulations and the facility's operating permit for

reuse or disposal in the Massachusetts landfill per COMM 97-001. Sediments shall not be reused at an in-state unlined landfill.

3. In-State Lined Landfill Facility: Accepts excavated material that meets MassDEP criteria for reuse at in-state lined landfills, to be used as daily cover, intermediate cover, and pre-cap contouring material. The material must not exceed the contaminant levels listed in DEP Policy #COMM-97-001. This category also includes excavated material and solid waste that meets Massachusetts DEP Solid Waste criteria and regulations and the facility's operating permit for reuse or disposal in the Massachusetts landfill.
4. In-State Asphalt Batch Recycling Facility: Accepts excavated materials that meet the criteria set forth in MassDEP policy WSC-94-400 and the receiving facility's operating permit(s) for recycling at a licensed in-state facility.
5. Regional Thermal Treatment Facility: Accepts soil and fill that contains contaminants that exceed in-state lined and unlined landfill reuse criteria as well as in-state recycling acceptance criteria but meets the criteria for regional thermal treatment facilities or out-of-state recycling facilities and are not classified as a RCRA Hazardous Waste.
6. NON-RCRA Out-of-State Lined Landfill: Accepts excavated material that contains concentrations of OHM that require removal to a regional disposal facility (ies), are not classified as a RCRA Hazardous Waste and meets the destination state's solid and hazardous waste regulations and the receiving facility's operating permit(s). This includes material designated as a "special waste".
7. Treatment of soil Prior to Disposal/Re-use: Materials determined through testing to be characteristically hazardous waste due to TCLP testing shall be treated on-site to render the material characteristically non-hazardous.

- B. Material shall be transported using a Bill of Lading; except RCRA Landfill Material shall be transported under a Uniform Hazardous Waste Manifest.
- C. Material shipped to any recycling/disposal facility must meet the selected facility's chemical and physical acceptance criteria. Selected facilities must be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, state, and federal regulations.

3.12 WEIGHT AND MEASUREMENT

- A. The Contractor shall provide certified tare and gross weight slips for each load received at the accepted Facility and these shall be attached to each returned manifest or Bill of Lading.

3.13 WASTE PROFILES AND MANIFESTS

- A. The Contractor shall prepare and submit to the Engineer for review all waste profile applications and questionnaires, and coordinate with disposal facilities and all Federal and State Environmental Agencies.
- B. The Contractor shall prepare all Hazardous Waste Manifests, Bills of Lading, and material shipping records with all applicable analytical backup, notification, and control forms. Final copies of Bills of Lading shall be signed by the Authority as generator and by the Contractor's LSP following submissions and approvals of draft Bills of Lading.

- C. The Contractor shall furnish all copies of the Hazardous Waste Manifest to the Authority as generator for submittal to the appropriate regulatory agencies and to retain for the Authority's records.
- D. The Contractor shall submit to the Engineer, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility. The documentation shall include the following, as a minimum.
 - 1. Documentation shall be provided for each load from the site to the disposal facility, including all manifests and any other transfer documentation as applicable.
 - 2. All documentation for each load shall be tracked by the original manifest document number that was assigned by the Engineer at the site.
 - 3. Attestations of shipment and receipt of soils under a Bill of lading. Original signatures on Material Shipping Records including signatures of Authority and disposal facility's representative(s).

3.14 TRANSPORT OF EXCAVATED MATERIAL

- A. The Contractor shall not be permitted to transport materials off-site until all storage, disposal, or recycling facility documentation has been received, reviewed, and approved by the Engineer.
- B. The Contractor shall transport materials from the site to the storage, disposal, reuse or recycling facility in accordance with all United State Department of Transportation (DOT), USEPA, MADEP, and applicable state and local regulations.
- C. The Hauler(s) shall be licensed in all states affected by transport.
- D. The Contractor shall be responsible for ensuring that free liquid is properly transported. "Wet soils" shall not be loaded for transport. The Contractor shall dewater "wet soils", and properly dispose of free liquid in accordance with local, state, and federal regulations. The Contractor shall dispose of any free liquids that may result during transportation at no additional cost to the Authority.
- E. All excavated material transported upon public roadways shall be covered to minimize fugitive dust, and where necessary truck tire and undercarriage decontamination shall be employed to minimize tracking of soils onto public roadways.

3.15 DISPOSAL

- A. Dispose of excavated materials at an approved facility in accordance with all federal, state and local regulations.
- B. The Contractor shall perform analyses on the material as necessary to fulfill any disposal testing requirements of the approved Facility.
 - 1. The Contractor shall bear all costs incurred in sampling and analyses for those tests required by the facility in excess of those performed by the Engineer.
 - 2. The Contractor shall submit a copy of all sampling analyses to the Engineer within two days of receipt of the laboratory report. Analytical data shall be kept confidential, distributed to the Engineer only.
- C. The Contractor shall provide to the Engineer copies of all weight slips; both tare and gross, for every load weighed and disposed of at the approved facility. The slips shall be tracked by the original

manifest document number that was assigned by the Engineer at the site. The Engineer shall make progress payments after receipt of these weight slips.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. Separate measurement or payment shall not be made for the on-site or off-site reuse or disposal of non-contaminated or non-hazardous excavated material as described or defined herein including all loading, transporting, unloading and other activities related hereto. All costs in connection therewith including temporary stockpiling maintaining the stockpile area, material handling, stockpile sheeting, dewatering, erosion control, straw bales, drums, fencing, signage, sweeping and all other costs associated with the reuse of material shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- B. Measurement for disposal of contaminated, hazardous or other materials described in Part 1.6 Definitions D, F, and L shall be by the ton as accepted by the facility. The Contract Allowance shall cover only the costs associated with transporting of contaminated or hazardous soils from the site of excavation to the approved disposal facility and the cost of acceptance by the facility. Payment for Item 0221.330 DISPOSE OF CONTAMINATED SOIL will be made in accordance with the requirements of Section 01020 Allowances.
- C. Separate measurement and payment will not be made for services related to characterization, sampling and testing of soils and cost related to the Licensed Site Professional required under this contract and described herein and in other specification sections, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- D. No separate measurement or payment will be made for construction, operation, or demolition of the decontamination station, including disposal of accumulated solids and water. This work will be considered included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

4.2 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0221.330	DISPOSE OF CONTAMINATED SOIL	AN
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02298

TEMPORARY PEDESTRIAN FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section specifies requirements for furnishing, installing, operating and maintaining temporary pedestrian facilities.
- B. All materials provided by the Contract under this section shall be removed by the Contractor when no longer required.

1.2 SUBMITTALS

- A. Submit plans of temporary pedestrian facilities for each phase of construction at least 30 days prior to implementation of that portion of the Work.
 - 1. Indicate construction zones, laydown areas, storage areas, location of construction field offices, and locations of temporary fence. Indicate access locations for each zone.
 - 2. Indicate pedestrian routes and detours through and around each construction zone.
 - 3. Indicate all existing and temporary crosswalks.
 - 4. Indicate the extent and type of all proposed temporary pedestrian facilities including temporary lighting.
 - 5. Indicate all directional signage and directional arrows.
 - 6. Indicate the proposed surface improvements in the areas of temporary pedestrian facilities.
 - 7. Indicate details of temporary shuttle bus arrangements provided by the Contractor when required for temporary removal of parking spaces during construction staging or for any other reasons.

1.3 QUALITY ASSURANCE

- A. Structural loads shall be calculated according to the Massachusetts Building Code.
- B. Electrical components shall conform to the Massachusetts Electrical Code.
- C. Temporary pedestrian facilities shall conform with:
 - 1. Americans With Disabilities Act, Accessibility Guidelines for Buildings and Facilities
 - 2. Rules and Regulations of the Massachusetts Architectural Access Board
 - 3. Massachusetts Building Code
 - 4. Manual on Uniform Traffic Control Devices
 - 5. Occupational Health and Safety, Code 1926

6. Town of Acton Traffic Department Guidelines or other Town statutes that may apply to the work.
7. Appendix B - Temporary Pedestrian Access Route Work Procedure
8. Temporary Pedestrian Access Route Checklist

1.4 PROJECT CONDITIONS

- A. Coordination will be required with the work requirements to install permanent paved walkways and curbs.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Precast concrete barriers meeting the Massachusetts Highway Department Standard Specification 629. Precast barriers are the only acceptable barrier where pedestrians are being protected from vehicular traffic.

2.2 METALS

- A. Chain-link fence meeting the Specification 02444 except that vinyl coated fabric is not required for temporary fencing.
- B. Hot galvanized pipe, ASTM A53 Type E, Grade B coated with zinc inside and outside. Brackets, plates, anchoring elements, and miscellaneous components shall be hot-dip galvanized.
- C. Welding shall conform with AWS D1.1 Structural Welding Code-Steel and AWS D1.3 Structural Welding Code-Sheet Metal.

2.3 WOOD

- A. Wood and Timber Members: Suitable for service, sized to limit deflection under full AASHTO H-20 and construction loading of 1/2 inch.
- B. Lumber shall be seasoned and have a maximum moisture of 19%.
- C. Dimensioned lumber shall be straight grained, sound S4S dressed lumber, grade Select Structural. Allowable species are Douglas Fir and Spruce-Pine-Fir.
- D. Plywood shall be 3/4 inch, exterior Medium Density Overlay.
- E. Plywood flooring shall be Sturdifloor Exposure-1, exterior adhesive type, 3/4 inch thick with non-skid epoxy resin and aggregate coat on exposed surfaces.

2.4 ELECTRICAL

- A. Fluorescent light fixtures shall be UL listed and suitable for wet and outdoor installations. Light housing shall be 20 gauge steel seamless with white corrosion resistant finish of baked enamel, epoxy or porcelain. Lamp shall be rapid start and energy saving type. Ballast shall be 120 V, Class P, thermally protected, high power factor.
- B. Electrical components shall be grounded in accordance with Section 16450. Metal frames shall be bonded to the electrical system grounding conductor as well as to a locally driven rod. Final installation of grounding system shall ensure that no point in the metal framing shall have a resistance measurement to local earth ground exceeding 2 ohms.
- C. Conduit shall be UL listed with corrosion resistant coating for all electrical system wiring, with all fittings meeting the Massachusetts Electrical Code for outdoor installations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. For each work area where temporary pedestrian facilities are used, perform on-site assembly expeditiously to minimize interference with the walking public and vehicular traffic. Complete and place in service all required temporary pedestrian facilities prior to the start of the construction work in the area.
- B. Prepare substrate surfaces to support barriers and fences with slopes not to exceed 5% in the direction of the traveling path, and does not exceed 2% across the traveling path.
- C. Firmly secure temporary pedestrian facilities to substrates as required to resist all wind, snow, dead and live loads.

3.2 MAINTENANCE

- A. The Contractor is responsible to repair all temporary pedestrian facilities until they can be removed following construction
- B. The Contractor shall remove snow and ice, sweep, and make all necessary repairs
- C. The Contractor shall inspect all temporary facilities daily and make all necessary repairs to maintain the structural integrity and allow safe passage by the walking public and vehicular traffic.
- D. Maintain decking in an acceptable condition at all times.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Preparing subgrades for structures and landscaping
 - 2. Excavating, backfilling and compacting for structures, track bed, and embankments.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for bituminous and cement concrete pavements.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating, backfilling and compacting for utility trenches.

- B. This Section also includes placement and compaction of Gravel Borrow for structural backfill and the placement of Ordinary Borrow for fill and embankment areas. This section also includes placement of flowable compacted fill in utility trenches and other areas as directed by the Engineer.

- C. The placement of Gravel for base courses shall be in accordance with Standard Specifications Section 02509, except as modified herein. Crushed stone shall be installed only in areas directed by the Engineer.

- D. This Section also includes results of geotechnical laboratory tests conducted on selected samples obtained during the geotechnical subsurface investigation. The test results are included in Appendix C of this Section. The geotechnical boring logs are included in the Contract Drawings.

- E. Related Work specified elsewhere:
 - 1. Section 02010 - GEOTECHNICAL INSTRUMENTATION
 - 2. Section 02100 - SITE PREPARATION
 - 3. Section 02221 - DEMOLITION
 - 4. Section 02240 - DEWATERING
 - 5. Section 02260 - EXCAVATION SUPPORT AND PROTECTION
 - 6. Section 02270 - SLOPE PROTECTION
 - 7. Section 02282 - HANDLING, TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIAL
 - 8. Section 02356 - SOLDIER PILE AND LAGGING WALL
 - 9. Section 02365 - DRILLED SHAFTS
 - 10. Section 02369 - DRILLED MINI PILES
 - 11. Section 02920 - LAWNS

12. Section 03300 - CAST-IN-PLACE CONCRETE
13. Divisions 2, 15, and 16 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
14. Appendix A – Guidelines and Procedures for Construction on MBTA Railroad Property

1.2 DEFINITIONS

- A. Backfill: Soil and/or fill material and/or controlled low-strength material used to fill an excavation.
 1. Initial Backfill: Backfill placed beside a pipe from the springline to the crown of the pipe or utility and 12-in over pipe or utility in a trench unless otherwise noted, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to approximate the gravel sub-base layer (12-in plus the thickness of the bituminous or cement concrete final surface) to fill a trench.
- B. Bedding Course: Granular material placed under structures or utilities to a depth of 12-in unless otherwise noted and to the springline of the pipe or utility or to the base of the structure.
- C. Borrow: Geotechnically and analytically satisfactory soil imported from off-site for use as fill or backfill.
- D. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices. Also called overexcavation.
 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades. Fill (Urban Fill): In-situ material known as Fill, also known as urban fill or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Material commonly associated with urban fill includes, but are not limited to; glass, brick, ash, wood fragments and other similar granular materials. Urban fill shall not include boulders, ledge, consolidated rock, asphalt, concrete, railroad timbers, rail, cobblestones or any other abandoned building materials which would preclude the disposal of the urban fill as daily cover at a landfill. Material containing less than 10%, by volume, solid waste/debris, as determined by the Engineer, shall be classified as urban fill. Material that contains 10% or more solid waste/debris by volume, as determined by the Engineer, shall be classified as solid waste.
- G. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined for the purposes of the Contract as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix.

- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, manholes, catch basins or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Course placed between the final backfill and the bituminous or cement concrete pavement.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 CLASSES OF EXCAVATIONS

- A. All excavations required by the Contract Documents, except Contaminated Soils, Rock Excavation, Reinforced Concrete Excavation and Bituminous Concrete Excavation will be considered to be "Unclassified Excavation." This item does not include excavation for the convenience of the Contractor as per Paragraph 3.03A.6 of this Section, and does not include excavation identified as incidental to the work of other Sections.
- B. Unclassified Excavation: Removal of materials regardless of the nature of the material encountered, the moisture content thereof, and the type of equipment required for excavating; and the disposal of excavated material not required or not suitable for backfill and embankment.
- C. Earth Excavation
 - 1. Structure Excavation: Removal of material for the construction of foundations for buildings, bridges, aerial structures, grade separation structures, retaining walls, headwalls, and other indicated structures where sheeting, shoring, bracing, or dewatering is required for the safe prosecution of the work. Structural Excavation does not include excavation for subways, tunnels, or drainage and utility conduits and appurtenant structures. Structure excavation includes the disposal of excavated material not required or not suitable for backfill and embankment.
 - 2. Roadway Excavation: Removal of material for the construction of roadways, parking lots, and slopes; and the disposal of excavated material not required or not suitable for backfill and embankments. Roadway excavation does not include removal of material classified as salvaged topsoil, rock, trench, or muck excavation.
- D. Rock Excavation
 - 1. Class A Rock Excavation: Removal of any of the materials listed in paragraph 3 below when encountered within the limits of structure excavation or roadway excavation; and the disposal of excavated material not required or not suitable for embankment and backfill.
 - 2. Class B Rock Excavation: Removal of any of the materials listed in paragraph 3 below when encountered within the limits of trench excavation or when excavating for fences, highway

guard rail, posts, and bounds; and the disposal of excavated material not required or not suitable for embankment and backfill.

3. Materials: Removal of the following materials is classified as rock excavation:
 - a. Solid rock which cannot be excavated without blasting, use of rippers, or breaking with hand power tools such as jackhammers for removal.
 - b. Boulders, 1/2 cubic yard or more for Class B rock excavation and one cubic yard or more for Class A rock excavation, that require blasting for removal.
 - c. Masonry and concrete structures and pavements which require blasting, use of rippers, or hand power tools such as jackhammers for removal.

- E. Muck Excavation: Removal and disposal of saturated or unsaturated mixtures of soils and organic material not suitable for bearing material, regardless of moisture content.

- F. Borrow Excavation: Obtaining and transporting to the jobsite suitable material for the backfill, embankment, and subgrade, where sufficient suitable material for such purposes is not available from required excavations.

- G. Trench Excavation
 1. Class A Trench Excavation: Removal and satisfactory disposal of materials for the construction of masonry culverts, utilities, and other structures having a clear square span of less than eight feet, culvert ends, masonry walls, slope protection, test pits, paved waterways, construction of drains for slope or subgrade stabilization and in the construction, widening, straightening or deepening of drainage ditches and water courses in connection with pipes or structures having a clear span of less than eight feet. Class A trench excavation does not include removal of materials classified as salvaged topsoil, rock, or muck excavation.
 2. Class B Trench Excavation: Removal and satisfactory disposal of all materials in excess of the initial five feet of excavation, for the construction of utilities, drainage and water pipes. Class B trench excavation does not include removal of materials classified as rock or muck excavation.

- H. Embankment: Placing and compacting suitable material to form embankments and dikes, to fill areas where unsuitable material has been removed, and to fill holes, pits, and depressions to the lines and grades indicated. Disposal of excess excavated material by spreading on approved areas of the jobsite above the indicated lines and grades, when permitted by the Engineer, is not classified as embankment.

- I. Structure Backfill: Placing and compacting suitable material around structures, except drainage and utility structures, to the lines and grades indicated.

- J. Pervious Backfill: Furnishing, placing, and compacting pervious material behind abutments, wingwalls, and retaining walls, and around underdrains, as indicated.

- K. Impervious Backfill: Furnishing, placing, and compacting impervious material as indicated.

- L. Salvaging Topsoil: Removal of suitable topsoil from areas to be excavated and other areas as indicated or directed, and stockpiling the material at locations as indicated or directed.

- M. Fine Grading and Compacting: Grading, shaping, and compacting of excavations, backfills, embankments, and original ground upon which pavement, surfacing, base, sub-base, ballast, subballast, or structures are to be placed.

- N. Grading and Finishing: Final grading and finishing of all other areas of the work not listed in paragraph L above.
- O. Presplitting Rock: Presplitting rock along the indicated cut lines to produce a uniform plane of rupture, so that the resulting rock face will not be affected by subsequent fragmentation blasting and excavation operations.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Geotextile.
 - 2. Controlled low-strength material, including design mixture.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site and borrow soil and/or fill material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil and/or fill material proposed for fill and backfill.
 - 3. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and percentage of compaction to the Engineer before placing the next lift or constructing foundations.
- C. Qualifications for Approving Source: Prior to earthwork operations, submit the qualifications of the persons or Agency approving the source of supply of materials and control testing and inspection.
- D. Hold Point-Earthwork Operations: Submit, prior to the excavation of earthwork activities, a plan describing the earthwork operations including the frequency and locations of tests and inspections. No work shall be performed until this plan has been approved by the Engineer.
- E. Hold Point-Supply and Control Inspection Results: Submit the results of all sources of supply and control inspections and tests. Submittals reviewed beyond the second rejection (or required submittal) shall be provided at no cost to the Authority and shall be reviewed by the Engineer at the Contractor's expense. No work shall be performed until the Engineer has approved the source of supply.
- F. Hold Point-Material Handling: At least two weeks prior to the start of any excavation activity submit, in writing, the following for review and shall not start excavation activity until the entire submittal is acceptable to the Engineer.
 - 1. Description of the method of dewatering excavated material and control of effluent water quality.
 - 2. Identification of a licensed hauler and disposal facility for possible vacuum collection, trucking and disposal of contaminated aqueous liquids.
 - 3. Locations and methods of excavating, handling, and stockpiling (if applicable) excavated material, including drainage, as specified in this Section. Describe methods to keep materials from various sources separated during stockpiling operations (if applicable).
- G. Pre-excavation Photographs and Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by

earthwork operations. Submit before earthwork begins. Maintain catalog of up-to-date photographs at the site.

- H. Backfill Materials: Submit a 20 lb. sample, grain size analysis and moisture density curve performed in accordance with ASTM D422 and compaction test results (ASTM D1557 Procedure C) for each proposed source of backfill, imported material and on-site material to be reused, for review by the Engineer at least, one (1) week prior to use of the material. The grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
- I. In addition, a certification statement and analytical results shall accompany each physical sample of earth materials to be imported onto the site, including but not limited to crushed stone, loam, bedding sand, gravel sub-base, common fill and structural backfill. At a minimum the certification shall state the point of origin and that the material is free of contaminants. The certification shall include representative sample analysis from each point of origin of backfill to be used on the site. The sample(s) shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082). On-site soils defined as suitable for reuse in this Section and in Section 02282 – HANDLING, TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIALS can be used as backfill without providing the certification required above.
- J. All sampling of soils for chemical testing shall be performed by a person experienced in sample collection and shall be either: 1) a Licensed Site Professional registered in the Commonwealth of Massachusetts; 2) a Professional Engineer registered in the Commonwealth of Massachusetts; 3) a professional Geologist registered in the Commonwealth of Massachusetts; 4) a certified groundwater/environmental professional; or 5) an authorized representative of the one of the persons listed above. Samples of each material shall be submitted to a chemical analytical laboratory, certified by the Massachusetts Department of Environmental Protection.
- K. Submit additional samples and geotechnical and analytical test data and certifications for every 1000 cubic yards (every 200 cubic yards for moisture density curves) of material imported or reused on-site or anytime consistency of material changes in the opinion of the Engineer. Submit associated chemical laboratory data on the imported materials throughout the course of the Work, if requested by the Engineer, to evaluate the consistency of the source or process, at no additional cost to the Owner.
- L. Qualifications of person designated as “Competent Person” responsible for trenching activities.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Authority or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify the Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without the Engineer's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.6 RESPONSIBILITY OF THE CONTRACTOR

- A. The Contractor shall be responsible for adhering to regulations, specifications, and recognized standard practices related to soil and rock excavation during excavation and removal activities. The Authority shall not be responsible at any time for the Contractor's violation of pertinent state or federal regulations or endangerment of laborers or others.
- B. It is the responsibility of the Contractor to investigate subsoil conditions within the Project Limits. Borings, test excavations, and other subsoil investigations, if any, made by the Engineer and shown on Contract Drawings are made for design purposes. The Authority assumes no responsibility for the correctness of the information nor for the actual subsoil or other conditions which may be found to exist during the progress of construction.
- C. It is the responsibility of the Contractor to protect the fiber optic cables and other existing utilities within the Contract Limits. Coordination with the various utility companies shall be required for the protection of these lines as stated within these Contract Specifications.
- D. The Contractor shall be responsible for all costs associated with protection, repair, or relocation of utility lines within the Contract Limits.

1.7 QUALITY ASSURANCE

- A. The Engineer will make such tests as deemed necessary to determine compliance with these Specifications.
- B. Source of supply. No earthwork materials will be accepted on the jobsite without written approval from the Engineer. The Contractor shall perform sufficient tests and inspections necessary to determine the acceptability of the source of supply. A Certified Testing and Inspection Agency may be used to perform such test and inspections. The qualifications of the person or agency performing these tests and inspections shall be forwarded to the Engineer for approval. Subsequent to this approval, test results showing the acceptability of the source of supply, shall be forwarded to the Engineer for approval.
- C. The Engineer reserves the right to perform inspections and tests at any time during the execution of the work.
- D. Notification Point. The Contractor shall give the Engineer 2 days notice in advance of control tests and inspections.
- E. The Engineer will perform all sampling and testing of embankment materials, both during and after placement and compaction, at frequent intervals. Actual field density will be determined by ASTM D1556 or ASTM D2167 or, when in the opinion of the Engineer, nuclear density and moisture contents according to ASTM D2922 and ASTM D3017 produce reliable results. From the results of these tests, corrections, adjustments, and modifications of methods, materials, and moisture content may be required. No material may be covered before it is tested. Contractor shall notify the Engineer when an embankment is ready for testing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Soil, Fill and Borrow Materials:

1. Ordinary Borrow: With the following gradation requirement.

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
4-inch (102 mm)	100
No. 200	0-20

2. Gravel Borrow: With the following gradation requirement.

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
3-inch (76.2 mm)	100
1/2 inch (12.5 mm)	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

3. Processed Gravel for Subbase: MHD M1.03.1.
4. Sand Borrow: Sand borrow shall be used as pipe bedding for all pipe with the exception of Reinforced Concrete Pipe, placed between 6 inches below pipe invert to 6 inches above pipe crown
5. Sand Borrow for Subdrains: MHD M1.04.1.
6. Controlled Density Fill (CDF): Controlled density fill shall consist of a cementitious hard excavatable mixture of aggregate, Portland Cement, air entraining admixtures and water. The material shall be of the type specified in Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, Type 2E. Controlled density fill shall be used as trench backfill material around structures (not including manholes and catch basins) between the top of the crushed stone layer and the top of the structure. Controlled density fill shall also be used to fill abandoned utilities and around the excavation support systems as directed by the Engineer.

B. Aggregates and Related Materials:

1. Crushed Stone: Gradation as specified for MHD M2.01.01.

- C. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

- D. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

- E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- L. Controlled Density Fill (CDF): Materials shall meet the following standard specifications:

Portland Cement	ASTM C 150
Fly Ash	ASTM C 618
Fine Aggregate	ASTM C 33
Air Entraining Admixtures	ASTM C 260
Water	ASTM C 94 4.1.3

Fine Aggregate shall consist of clean sand with 100% passing the 1/2" sieve and not more than 10% passing the 200 sieve.

Mix proportions shall be as follows:

Portland Cement	30 - 50 lbs/cy
Fly Ash	250 - 400 lbs/cy
Fine aggregate	2000 - 3000 lbs/cy
Water	600 lbs/cy
Air Content	0 - 30%

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 02100 - SITE PREPARATION.
- C. Protect and maintain erosion and sedimentation controls, which are specified in Section 02100 - SITE PREPARATION, during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

- A. Comply with requirements of Section 02240 - DEWATERING.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives. Use of explosives is subject to consideration and prior approval of the Authority only on a case-by-case basis.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include bituminous and cement concrete sidewalks and roadways, bricks and cobbles, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 12 inches beneath bottom of concrete slabs on grade.
 - f. 12 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch if applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines

and grades to leave solid base to receive other work. If material remaining at bottom of trench is disturbed, recompaction shall be required.

2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces. If material remaining at bottom of trench is disturbed, recompaction shall be required.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line unless otherwise noted.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.
 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

- A. Notification Point - Notify Engineer when excavations have reached required subgrade.
- B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with backfill with crushed stone wrapped with non-woven geotextile fabric.

- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with crushed stone wrapped with non-woven geotextile fabric.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Engineer.
 - 1. Fill unauthorized excavations under other construction or utility pipe with crushed stone wrapped with non-woven geotextile fabric as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 MATERIAL TRANSPORT

- A. All soils transported on and off-site shall be loaded by the Contractor into properly licensed and permitted vehicles.
- B. Trucks used to transport the materials shall be constructed and loaded so as to prevent any of the load from dropping, sifting, leaking, or otherwise escaping during transport. All trucks shall be equipped with tarps or other substantial type covers which shall be used to prevent any materials from spilling during transport.

3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.

4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.13 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of water, mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Sand borrow bedding shall be placed by hand shovels, in layers not more than 4-inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids. Crushed stone bedding material shall be placed in layers not more than 6-inches thick in loose measure, and compacted with at least 4 passes using a vibratory plate or roller compactor.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 03300 - CAST-IN-PLACE CONCRETE.
- D. Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of material free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation in uncompacted layers not to exceed 9 inches.
- H. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed, the Contractor, as required by the Engineer, shall make special leakage tests of the structures. After the satisfactory completion of leakage tests and the satisfactory completion of any other required work in connection with the structures, the backfilling around the structures shall proceed using Controlled Density Fill (CDF) material. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures.

- I. Install warning tape directly above utilities, no less than 12 inches above the crown of the pipe or utility and no more than 16 inches above the crown of the pipe or utility.

3.14 EMBANKMENT FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.15 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent minimum; and areas within 10 feet of structures, building slabs, steps, and pavements at 95 percent minimum.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent minimum.
 - 3. Under lawns, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent minimum.

4. Under unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent minimum.
5. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent minimum.
6. For embankments, compact each layer at minimum 92 percent minimum.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1 inch.
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Section 02400 - DRAINAGE AND SEWER SYSTEMS.
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 1557.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 1557.
 2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.19 SUBBASE COURSE

- A. Place subbase course on subgrades free of water, mud, frost, snow, or ice.

- B. On prepared subgrade, place subbase course under pavements and walks as follows:
 - 1. Shape subbase course to required crown elevations and cross-slope grades.
 - 2. Place subbase 6 inches or less in compacted thickness in a single layer.
 - 3. Place subbase that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 4. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.20 DRAINAGE COURSE

- A. Place drainage course on subgrades free of water, mud, frost, snow or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 90 percent of maximum dry unit weight according to ASTM D 1557.

3.21 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor shall engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- D. An Independent Laboratory or the MBTA Laboratory will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length per lift, but no fewer than 2 tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained. MBTA will conduct confirmatory testing.

3.22 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the User Agency's property.

3.24 MONITORING OF EXCAVATION

- A. The Contractor shall monitor the performance of components of the excavation support system as applicable, both for vertical and horizontal movement, at intervals specified below. If the Response Values as specified in Section 02010, Table 02010-2 are reached at any time during the work, the Contractor shall immediately stop work and implement approved contingency plans.
- B. Possible effects of the excavation on the lateral support system:
1. Deflection of the wall into the excavation due to soil, groundwater, and surcharge loads.
 2. Settlement adjacent to the lateral support wall due to inward deflection of the wall.
 3. Settlement adjacent to the lateral support wall due to ground loss into the excavation through gaps and voids in the wall.
- C. Monitoring Deflection of Wall
1. Once the wall is installed to final elevation but before excavation begins, establish deformation-monitoring points on the top of the wall, spaced approximately every 20 feet along the wall (every other soldier pile). The monitoring points shall consist of painted marks on the steel member.

2. Perform a baseline survey of each deformation monitoring point before excavation begins. Survey both vertical and lateral (into proposed excavation) position.
 3. Perform daily survey of each top-of-wall deformation monitoring point from when excavation begins until full excavation depth is reached adjacent to the wall. Thereafter, perform weekly survey of monitoring points until the wall is backfilled.
- D. Monitoring Track Movement
1. Before the start of excavation and wall installation, install surface settlement points as defined in Section 02010 in the railroad ties along the tracks spaced approximately every 20 feet along the proposed retaining wall and to 100 feet beyond either end of the proposed retaining wall.
 2. Perform two baseline elevation surveys of the surface settlement points before the start of excavation/wall installation. Survey both vertical and lateral (into excavation) positions.
 3. Perform daily survey of settlement monitoring points from the beginning of excavation work until the track support structure is completed.
 4. Perform weekly survey following completion of the track support structure until all work for the access structure is completed including all concrete work, backfill and compaction. Landscaping work shall not be considered an outstanding work item.
 5. Any existing structures supporting tracks or embankments adjacent to tracks in the vicinity of work, such as bridges, abutments, retaining walls, or other structures where settlement, deflection, or failure could affect the tracks shall be included in any monitoring program.
- E. Make adjustments to survey schedule and monitoring point locations (including the addition of monitoring points) as requested by the Engineer if additional monitoring of wall performance is desired. Extra monitoring points and increases in survey frequency shall be considered incidental to the costs
- F. All monitoring data shall be reported to the Engineer within twenty four (24) hours of measurement in tabular and graphical format, allowing comparison of current data to previous data, including baseline data.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will be made for Unclassified Excavation, and Rock Excavation work under this section, but all other costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

4.2 MEASUREMENT

- A. The following classifications of work will be measured by the cubic yard unless otherwise indicated:
1. Unclassified Excavation
 2. Rock Excavation, Class A and Class B
- B. Fine Grading and Compacting, and Presplitting Rock will not be measured separately for payment, but all costs in connection therewith will be considered incidental to the items of work to which they pertain and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

- C. Grading and Finishing will not be measured separately for payment, but all costs in connection therewith will be considered incidental to the items of work to which it pertains and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES..
- D. Compacting original ground will not be measured separately for payment, but all costs in connection therewith will be considered incidental to the embankment to be constructed on the compacted original ground and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- E. Quantities of excavation and backfill will be determined from limits indicated or specified herein, or in the Construction Specifications, plus any additional excavation and backfill authorized or required by the Engineer not due to the Contractor's negligence. Where limits for excavation and backfill are not indicated, the quantities will be computed within the following limits:
 - 1. The horizontal limits for computing pay quantities shall be vertical planes one foot outside the neat lines of footings or structures.
 - 2. The upper limit for payment for excavation shall be the ground surface as it existed prior to the start of construction operations. Where it is required that the excavation be made in new embankment, the upper limit shall be the planes of the new embankment at the elevation indicated or directed for construction in advance of performing the required excavation, but in no case shall the upper limit be above the planes of the new embankment.
 - 3. The upper limit for payment of backfill, when not indicated, shall be the ground line at the time the excavation is made; except, when backfill is ordered to a higher limit by the Engineer, limit for payment shall be the higher limit ordered.
 - 4. The lower limits for computing pay quantities of excavation and backfill shall be a plane at the bottom of the completed footings, structures or trench, unless excavation of unsuitable material is ordered to lower depth.
 - 5. Trench Excavation for utility lines and structures will not be measured separately for payment, but all costs in connection therewith will be considered incidental to the items of work to which they pertain.
- F. Quantities of pervious and impervious backfill and borrow will not be measured separately for payment, but will be considered incidental to the earthwork to which it pertains and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES..
- G. Excavation for the Contractor's convenience, unauthorized excavation outside the limits indicated and backfill of such excavations will not be measured for payment.
- H. Re-excavation and rehandling of stockpiled material will not be separately measured for payment, but will be considered incidental to the earthwork to which it pertains.
- I. Unless otherwise indicated, grading, shaping, and compacting of that portion of excavations, backfills, embankments, and original ground, upon which pavement, ballast, subballast, Hot Mix Asphalt underlayment, or structures are to be placed, will not be measured separately for payment, but all costs in connection therewith will be considered incidental to the items of work to which they pertain and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- J. Rock Measurement: Volume of rock actually removed to the limits indicated in the Contract Documents measured in its original position. Payment includes, but is not limited to replacement with approved materials and disposal of excess rock.

- K. Granite Block Excavation will not be separately measured for payment, but will be considered incidental to the earthwork to which it pertains and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- L. Control Density Fill (CDF) will not be measured separately for payment, but all costs therefore will be and paid for under Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

4.3 PAYMENT

- A. The unit price bid per cubic yard for excavation associated with Rock Excavation materials, to include reinforced concrete and bituminous concrete, or other materials shall include all costs of excavating such material, including handling, on-site reuse, and off-site disposal, and furnishing all labor, materials, equipment, and incidentals necessary to satisfactorily complete the work. The unit price bid per cubic yard for Unclassified Excavation shall include the cost of excavating such material, handling and disposal of material and any on-site reuse of such material, as required by the Contractor or as directed by the Engineer and shall include placing and compaction, and furnishing all labor, materials, equipment and incidentals necessary to satisfactorily complete the work. The costs associated with contaminated excavated soil materials is separately measured and paid for in accordance with the provisions of Section 02282.

4.4 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS
0222.003	UNCLASSIFIED EXCAVATION	CY
0222.108	ROCK EXCAVATION	CY

END OF SECTION

SECTION 02369

DRILLED MINIPILES

PART 1 – GENERAL

1.1 GENERAL

- A. This Section specifies furnishing and installing drilled minipiles where shown on the Contract Drawing and as specified herein.
- B. Examine all other Sections of the Specifications for requirements, which affect work of this Section, whether or not such work is specifically mentioned in this Section.
- C. Where drilled minipiles are located within ten (10) feet of excavations, all excavation, associated construction and subsequent backfill and compaction shall be completed to the satisfaction of the engineer prior to commencement of drilled minipile installation. Where drilled minipiles are within ten (10) feet of the ramp/boat wall/retaining wall footings or other excavation, at a minimum, the top of the uncased bonded zone for the piles shall be 1 foot below the proposed bottom of excavation.
- D. Coordinate work with that of all other trades or contracts affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- E. Contractor shall note that installation of minipiles is along an active railroad right-of-way. The Contractor shall plan his work accordingly. All construction activities shall follow pertinent safety procedures as outlined by the Authority and as noted in various Sections included in these specifications.

1.2 DESCRIPTION OF WORK

- A. The Contractor shall be responsible for furnishing all work and materials for the installation of drilled minipiles. Drilled minipile work includes but is not limited to the following items:
 - 1. Drilled minipile foundation system including, but not limited to, appropriate drilling technique, pile diameter, pile length and reinforcement.
 - 2. Provide all equipment necessary for the installation of drilled minipiles at the locations indicated on the Drawings.
 - 3. Providing all equipment and materials for the protection of existing structures, track, pedestrians, and all ancillary facilities located within the work area.
 - 4. Installation of drilled minipiles through whatever material encountered to the depth required by design. The equipment shall be capable of drilling through boulders, and any other obstructions, encountered during installation at no additional cost.
 - 5. Hauling and legal disposal, in accordance with Section – 02282 Handling, Transportation, and Disposal of Excavated Material, of all excavated materials and excess grout from the drilled concrete minipile shaft which cannot be reused on site.

6. Provide debris shields and other equipment or materials required to contain all excavated material within the immediate work area.
7. Install temporary steel casing during drilling to limit ground loss at adjacent existing foundations, and adjacent to active railroad tracks.
8. Furnish and install of steel reinforcing, concrete, grout, permanent casing and centering devices as required.
9. Removal of grout/concrete overpour or other irregularities, which interfere with other structural elements or utilities.
10. Drilled minipiles shall be cut-off at the elevations shown on the Contract Drawings at no additional cost.
11. Perform two load tests per minipile design type, one sacrificial test and one proof test, as specified herein.

B. Related Work Specified Elsewhere:

1. Section 02240 - DEWATERING
2. Section 02260 - EXCAVATION SUPPORT AND PROTECTION
3. Section 02282 - HANDLING, TRANSPORTATION, AND DISPOSAL OF EXCAVATED MATERIAL
4. Section 02300 - EARTHWORK
5. Section 03300 - CAST IN PLACE CONCRETE
6. Appendix A - Guidelines and Procedures for Construction on MBTA Railroad Property

1.3 SUBMITTALS

- A. Provide submittals to the Engineer for review at least 14 days prior to commencing pile installation. Review of the submittals by the Engineer will not relieve the Contractor of the responsibility to provide and install minipiles capable of supporting the design loads specified herein. Submit items of this Article in a single submittal package. Submittals shall include the following:
1. Cement grout or concrete mix design proposed for minipile and strength test data for that mix by an independent testing laboratory certified by the Commonwealth of Massachusetts. Provide test results, and manufacturer's literature of any admixtures such as mineral fillers, fluidifiers, retarders, etc.
 2. Manufacturer's literature and certification for pile steel reinforcement. All reinforcement shall be epoxy coated.
 3. Description of equipment and procedures for installation of piles including method of advancing the hole through soils and boulders, method to ensure the drilled hole has the minimum required diameter before concreting/grouting the drilled hole, the method to flush the drilled hole, and method of measuring volumes of concrete/grout to be placed for each pile and pressure concreting/grouting system details, as applicable. Also include details of centering devices for steel reinforcing.

4. Method of pressure concreting/grouting the annular space between the permanent casing and the drill hole as the larger diameter temporary casing, if used, is withdrawn.
 5. Method of transferring loads from the proposed concrete pier caps to the minipiles, if different from the Contract Drawings, shall be detailed in shop drawing submittals. The pile reinforcing shall be spliced /coupled with the reinforcing detailed on Contract Drawings.
 6. Means of monitoring verticality of the drill hole in the two principal perpendicular planes during drilling and details of proposed corrective measures to be implemented as necessary.
 7. Submit record information as specified in Article 1.8 of this Section for all minipile installations, including test piles.
 8. Load test locations, procedures and equipment (refer to Articles 2.2 and 3.3 herein). Provide shop drawings with details of the load test setup including test minipile, reaction system layout, load cell and hydraulic jack, tell tales or strain gages, and anticipated subsurface conditions at the test pile location. Provide reaction system design calculations prepared by a Professional Engineer registered in the Commonwealth of Massachusetts. Provide calibration records for the load cell and hydraulic jack to be used, prior to conducting the load test. Submit load test report as specified in Article 3.3 of this Section. Drilling for production minipiles shall not begin until load test data have been reviewed by the Engineer.
- B. Submit record information specified in Article 1.8 of this Section (except grout test results) within 24 hours of completing each pile. The results of testing of grout samples shall be submitted within 24 hours of obtaining the data.
 - C. Work other than test pile installation shall not begin until the construction submittals have been received, reviewed and accepted in writing by the Engineer.
 - D. Provide written statement verifying the Contractor has successfully completed at least three projects of similar size and complexity in this type of installation. Identify the design consultant and owner for each project. Provide written documentation of the competence and experience of the person who will be in charge at the site.

1.4 PROJECT CONDITIONS

- A. The Contractor shall protect existing structures from damage. This includes existing railroad tracks, buildings, roadways, sidewalks, equipment, and utilities. All construction induced damage shall be repaired by the Contractor to the satisfaction of the Engineer at the Contractor's expense.
- B. The Contractor shall visit the site to review all details of the work and working conditions, including site access issues, to verify dimensions in the field and to advise the Engineer of any discrepancy before performing any work.
- C. The Contractor shall consult Contract Drawings and official records of existing utilities, both surface and subsurface, and their connections to be fully informed on all existing conditions and limitations as they apply to this Work and its relation to other construction Work.
- D. The Contractor shall protect existing utilities to remain in service within the pile installation Work zone in accordance with the requirements of authorities having jurisdiction over same. The Contractor shall

repair or replace any construction induced damage to the satisfaction of the Engineer at the Contractor's expense.

- E. Temporary steel casing will be required during drilling to prevent the loss of ground below adjacent structures and railroad tracks. Permanent casing is required to a depth equal to depth of bedrock surface or a minimum of 10-feet below final grade, whichever is greater.
- F. The Contractor shall be responsible for implementing all necessary traffic control measures, which may include but not be limited to traffic cones, barriers, barrels, signs, flagmen and police details.

1.5 SUBSURFACE SOIL DATA

- A. Review logs of borings, record of investigations, and other pertinent data for the site (Appendix A of these specifications). After obtaining MBTA's permission, take whatever additional borings or explorations deemed necessary which will be at the Contractor's expense.
- B. Refer to the attached boring logs for subsurface boring information. The Contractor is responsible for drilling through obstructions where they are encountered to the design tip elevation.
- C. Aforementioned data is for general information and is accurate only at the particular locations and time the subsurface explorations were made. It is the Contractor's responsibility to make interpretations and draw conclusions on the character of materials encountered and the impact on this work based on his expert knowledge of the area and of pile installation techniques.
- D. Perform two load test per minipile design type; one tension test on a sacrificial pile, and one tension proof test on a production pile at the specified locations in accordance with drawings.

1.6 QUALITY ASSURANCE

- A. Provide written statement verifying the Contractor has successfully completed at least three projects of similar size and complexity in this type of installation. Identify the design consultant and owner for each project. Provide written documentation of the competence and experience of the person who will be in charge at the site.
- B. Employ within the Contract Price, a Registered Land Surveyor or Registered Professional Engineer familiar with this type of work to:
 - 1. Establish lines and grades.
 - 2. Establish actual pile locations.
 - 3. Value-engineering, if needed.

1.7 TOLERANCES

- A. Maximum variation of any pile from its planned or indicated location at the cut-off elevation shall not exceed one (1) inch unless approved by the Engineer.
- B. Maximum verticality variation of any pile from design is 1 horizontal to 50 vertical (1:50) ratio.

- C. Cut-off elevation shall be within ½ inch of elevation shown on the plans.

1.8 PROJECT RECORD DOCUMENTS

- A. Submit as-installed records and drawings including the following information to the Engineer within one day after completing each minipile installation, including test piles. Data shall include:
 - 1. Date and time of drilling and grouting.
 - 2. Pile numbers, sizes, lengths, and locations of pile.
 - 3. Sequences of installations.
 - 4. Condition of the bottom of the drill hole.
 - 5. Verticality information.
 - 6. Tip elevation of each pile to nearest 0.1 ft.
 - 7. Cut-off elevation of each pile to nearest 0.1 ft.
 - 8. Show locations of centers of as-installed piles on a drawing in relation to design location to the nearest 0.01 ft. Indicate magnitude and direction from plan location.
 - 9. Volume of grout used and injection pressure.
 - 10. Reinforcing steel details, including elevation of splices to nearest 0.1 ft.
 - 11. Grout samples taken for testing.
 - 12. Elevation of centralizers to nearest 0.1 ft.
 - 13. Soil profile encountered during drilling to nearest 0.5 ft.
 - 14. Length and elevations of temporary steel casing used.
 - 15. Length and elevations of permanent steel casing used.
- B. Submit final as-installed records and drawings of each pile installed to the Engineer within three (3) days after completion of the Work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cement Grout

1. Cement grout shall conform ASTM C150 and be a mixture of Portland Cement (Type II) and clean, potable water proportioned and mixed to maintain solids in suspension without appreciable water gain and flowable to provide good bonding in the bearing stratum.
2. Grout water to cement ratio shall not exceed 0.40.
3. 28-day minimum compressive strength of 4,000 psi (3-day compressive strength of 2,000 psi).
4. Admixtures shall be used in accordance with manufacturer's recommendations.

B. Reinforcing Bars

1. *High Strength Center Bar*; ASTM A722, Grade 150 Dywidag (DSI) Threadbar, continuous without splices or welds, new, straight, undamaged, and epoxy-coated or encapsulated. Threaded, a minimum of 6 inch on the exposed end, to allow proper attachment of bearing plate and nut, if identified on the drawing. Threading may be continuous spiral deformed ribbing provided by the bar deformations (continuous thread bars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, provide the next-larger bar number designation from that is shown on the Plans, at no additional cost.
2. *Dowel Bar*; ASTM A516, Minimum Grade 60 Deformed Bar, free of rust, grease, oil, dirt, or other objectionable material at the time of placement into the pile.
3. *Fusion Bonded Epoxy Coating*. ASTM A 775. Minimum 0.016 inch thickness electrostatically applied. Bend test requirements are waived. Coating at the wall anchorage end of epoxy-coated bars may be omitted over the length provided for threading the nut against the bearing plate.
4. *Encapsulation*. Minimum 0.04-in thick, corrugate, HDPE tube conforming to AASHTO M252 or corrugated PVC tube conforming ASTM D1784, Class 13464-B.

C. Reinforcing Steel Splice Couplings

Couplings shall develop at least 125 percent of the specified yield strength of the rebar in compression and tension. No lap splices shall be used.

D. Permanent Steel Casing

Casings shall be steel, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of minipiles. No extra compensation will be allowed for concrete required to fill an oversized casing or oversized excavation. All temporary casings shall be removed from minipile installation. Any length of permanent casing installed below the minipile cutoff elevation shall remain in place.

Permanent steel casing/pipe drill casing shall be of the flush joint type and shall have the diameter and at least minimum wall thickness shown on the drawing. The permanent steel casing/pipe:

1. Shall meet the requirements of N-80 - API Specification with minimum yield strength of 80,000 psi.
2. May be new "Structural Grade" (a.k.a. "Mill Secondary") steel pipe meeting above but without

Mill Certification, free from defects (dents, cracks, tears) and with two coupon tests per truckload delivered to the fabricator.

For permanent casing/pipe that will be welded, the following material conditions apply:

1. The carbon equivalency (CE) as defined in AWS D1.1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications.
2. The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications.

For permanent casing/pipe that will be shop or field welded, the following fabrication or construction conditions apply:

1. The steel pipe shall not be joined by welded lap splicing;
2. Welded seams and splices shall be complete penetration welds;
3. Partial penetration welds may be restored in conformance with AWS D1.1;
4. The proposed welding procedure certified by a welding specialist shall be submitted for approval.

Threaded casing joints shall develop at least the required nominal resistance used in the design of the minipile.

E. Centralizers

Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material that is non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 1 inch of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing and between adjacent reinforcing bars.

F. Bearing Plates, Nuts, and Welded Stud Shear Connectors.

1. *Bearing Plates.* AASHTO M183/ASTM A36 or ASTM A572 Grade 50.
2. *Nuts.* AASHTO M291, Grade B, hexagonal, fitted with beveled washer or spherical seat to provide uniform bearing.
3. *Shear Connectors.* AASHTO Construction Specifications, Section 11.3.3.1.

2.2 LOAD TEST

- A. Calibrate load cells and hydraulic jack, including complete assembly of pumps, gages, and ram to be used in the load test for this project by an approved laboratory. Perform a minimum of three calibration runs at ram extensions of one inch, mid range and one inch less than full range within 2 weeks of load test.
- B. Conform to ASTM 3689-90 (tensile load testing) for equipment type, reaction system, load instrumentation, and deflection monitoring.

- C. Provide reaction frame capable of safely supporting 125 percent of the maximum test load.
- D. See Article 3.4 of this Section for remedial actions for non-conforming piles.

PART 3 - EXECUTION

3.1 PREPARATION FOR DRILLING

- A. The Contractor shall verify that site conditions will allow for access of proposed equipment and will support equipment for pile installation.
- B. The presence of utilities, existing structures and other obstructions, including but not limited to, boulders in the soil layers above and in the gravelly sand and glacial till and construction debris will require strict adherence to the planned drilling locations shown on the Drawings. Any interference encountered in the drilling of piles shall be brought to the attention of the Engineer.
- C. Utilize the same equipment for all production and test piles.
- D. Mark or stake all pile locations and provide ground surface elevation.
- E. Monitoring Track Movement
 - 1. Before the start of excavation and wall installation, establish elevations along Top of Rail of outbound track spaced approximately every 20 feet along the walls.
 - 2. Perform two baseline elevation surveys of the Top of Rail before the start of excavation/wall installation. Survey both vertical and lateral (into excavation) positions.
 - 3. Perform weekly survey of settlement monitoring points from the beginning of excavation until the structure is in place and the roadway is completed.
- D. Make adjustments to survey schedule and monitoring point locations (including the addition of monitoring points) as requested by the Engineer if additional monitoring of wall performance is desired. Extra monitoring points and increases in survey frequency shall be considered incidental to the costs associated with this Section.
- E. Survey instruments used for vertical deformation monitoring shall have a minimum accuracy of ± 0.05 in and a minimum setting accuracy of ± 1.0 arc seconds. Leveling staffs shall be non-telescopic in design (i.e. 'Chicago' style leveling staff). A bull's eye bubble shall be used to plumb the leveling rod.
- F. Survey instruments used for horizontal deformation monitoring shall have a minimum accuracy of ± 3.0 arc seconds and a minimum display reading less than or equal to the accuracy. Distances less than 30 feet shall be measured with a standardized steel tape used in conjunction with a tension handle. Distances greater than 30 feet shall be measured with an Electro-Optical Distance Measuring Instrument (EDM). Distances between 30 and 100 feet shall be verified with a standardized steel tape in conjunction with a tension handle. Electronic pointing shall be used to minimize error due to possible misalignment of the EDM axis and telescope. Centering shall be accomplished using high precision optical plummets or mechanical centering devices.

- G. EDM equipment used for lateral deformation monitoring shall, after calibration, have a minimum accuracy of ± 0.2 in plus 5 parts per million.
- H. Make adjustments to survey schedule and monitoring point locations (including the addition of monitoring points) as requested by the Engineer if additional monitoring of wall performance is desired. Extra monitoring points and increases in survey frequency shall be considered incidental to the costs associated with this Section.
- I. The Contractor shall submit the results of the settlement point readings to the Engineer in draft form at the end of each working day. All monitoring data shall be reported to the Authority and Engineer within twenty-four (24) hours of measurement in tabular format, allowing comparison of current data to previous data, including baseline, and showing a complete history of movement versus time.

3.2 INSTALLATION

- A. Drilled minipile installation shall generally consist of the following method:
 - 1. Drill holes to required depth using rotary or percussion methods.
 - a. Provide temporary steel casing during drilling. Casing shall be continuously joined and shall have the strength and rigidity to maintain the required excavation dimensions. Driving of casing will not be allowed. Drilling shall be performed such that the cuttings and wash fluid return through the inside of the casing. External flush will not be allowed. The method of drilling used shall prevent the loss of ground due to erosion, jetting, or blow-in at the bottom of the casing. No open hole drilling will be allowed unless approved by the Engineer.
 - b. Maintain and verify that hole is open and clear for installation of steel reinforcement and cement grout.
 - c. Minimum hole diameter of 10.8 inches as determined by outside diameter of casing unless the Contractor can verify that a larger diameter is developed by installation techniques.
 - d. Legally dispose of all materials removed from holes not reused on site in accordance with Section 02282 – Handling, Transportation, and Disposal of Excavated Material.
 - 2. Flush holes with water or slurry prior to installing reinforcing steel or cement grout until all contaminated water and cuttings are removed and a clean return is observed. Use an internal circulation method which will not alter soil stability or aggravate existing environmental conditions.
 - 3. Verify drill hole has not collapsed and has the specified minimum diameter along its entire length.
 - 4. Place cement grout by tremie method in accordance with PTI "Recommended Practice for Grouting of Post-Tensioned and Prestressed Concrete" as applicable. Place tremie pipe to bottom of pile. Maintain tremie pipe at least five (5) feet below grout surface until casing is filled with good quality grout to cut-off elevation. The Contractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures.
 - 5. During construction, the Contractor shall observe the conditions in the vicinity of the minipile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the minipile is

adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/approved construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor.

6. Install reinforcing steel with centralizers to full depth of pile at time of grouting. Provide reinforcing steel splices, if required. Centralizers shall be placed along the entire length of pile no greater than 10 feet apart.
 7. Install permanent casing to required depth prior to removing temporary drill casing unless casing used during drilling is left in place to serve as permanent casing.
 8. If drilling casing is not used as permanent casing:
 - a. As the grout column drops in the hole during withdrawal of the temporary casing, pump grout under pressure through the casing to fill any space between the temporary casing and the drill hole with grout. Also, verify that the annular space between the permanent casing and drill hole is filled with grout.
 - b. Maintain pressure on the grout and a positive flow of grout into the pile hole after withdrawing each length of temporary casing.
 - c. Check grout level before, during and after withdrawing casing to confirm that separation of grout has not occurred.
 9. Grouting of a pile shall be completed on the same day that the pile is drilled. Obtain grout samples from the end of the tremie grout line for each pile. Grout specimens will be prepared and tested by the Engineer or his/her representative, in accordance with ASTM C109, at no cost to the Contractor.
 10. Place at least 100 percent of the theoretical volume of grout based on the outside diameter of the casing, if temporary casing is not left in place to serve as permanent casing. Notify the Engineer immediately if the actual grout take is less than the theoretical volume of grout.
 11. Do not progress a new hole, pressure-grout, or post-grout, within a radius of 5 pile diameters or 5 feet, whichever is greater, of a minipile until the grout for that minipile has set for 24 hours or longer.
- B. Do not allow vibration or excessive wheel loads to influence piles during installation and construction. Keep excavation stable at all times.
1. Where obstructions make it impossible to install certain piles at locations shown on the Contract Drawings and/or to the proper depths, resort to all usual methods for pile installation. If in the judgment of the Engineer the Contractor is unable to complete the proper installation of any pile, after resorting to such methods, the Engineer may require that an additional pile or piles be installed or that other remedial action be taken, for which the Contractor will be paid in accordance with the applicable parts of the Contract General Conditions and Section 01151.
 2. Fill with grout any pile abandoned because of obstructions encountered before reaching the anticipated depth at no additional cost to the MBTA.

- C. The Contractor shall implement all necessary traffic control and safety measures, which may include but not be limited to traffic cones, barriers, barrels, signs, flagmen and police details during pile installation activities.

3.3 PILE LOAD TEST

- A. Perform two load tests per minipile design type. One tension test on a sacrificial pile and one tension proof test on a production pile in accordance with applicable ASTM D1143 standards, as specified herein, and as required by the Engineer.
- B. Use the same size or greater and type of test pile as specified for other minipiles used for this project and installed in the same manner. Install test pile such that the minipile will not develop friction resistance along permanent casing length above the natural gravelly sand/glacial till bearing stratum.
- C. Do not begin load test until grout reaches the required design compressive strength. Allow a minimum of 3 days for the grout to cure. The Engineer or their representative will sample and test grout during test pile installation as specified herein.
- D. Provide sufficient protection from the elements (rain, wind, etc.) and heating during the load test, as required, which could affect the test results.
- E. Apply test loads and record load-deformation data in accordance with applicable ASTM standard loading procedure, except as specified herein. Apply loads in 25 percent increments of the proposed design load up to twice the design load. Maintain each load increment until the rate of movement of top and bottom of pile is not greater than 0.08 inch per hour, but not longer than 2 hours. Take and record time, load and deflection readings at intervals of 1, 2, 4, 8, 15 and 30 minutes following the application of each load increment. Maintain the maximum test load until the rate of movement of top and bottom of pile is not greater than 0.08 inch per hour. Remove the test load in decrements of 25 percent of the total test load with a constant time of 15 minutes between decrements. Take and record time, load, and deflection readings before the next load decrement (every 15 minutes). After reducing the load to zero, take and record rebound readings at time intervals of 1, 2, 4, 8, and 15 minutes. In no case shall a load be changed if the rate of settlement is not decreasing with time.
- F. Tension Test on Sacrificial Pile:
 - 1. Perform tension test on a sacrificial pile by incrementally loading the test pile to failure or a maximum test load of 200 percent of the DL in accordance with the following loading schedule. Record the test pile movements at each load increment.

Tension Test Loading Schedule (Sacrificial Pile)

Load	Hold Time
0.05 DL Max. (AL)	Until Movement Stabilizes
0.25 DL	Until Movement Stabilizes
0.50 DL	Until Movement Stabilizes
0.75 DL	Until Movement Stabilizes
1.00 DL	Until Movement Stabilizes
1.25 DL	Until Movement Stabilizes
1.50 DL	Until Movement Stabilizes
1.75 DL	Until Movement Stabilizes

2.00 DL (Max. Test Load)	Creep Test (see below Note 3)
1.75 DL	15 minutes
1.50 DL	15 minutes
1.25 DL	15 minutes
1.00 DL	15 minutes
0.75 DL	15 minutes
0.50 DL	15 minutes
0.25 DL	15 minutes
0	Until Movement Stabilizes

2. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent of the DL. Dial gauges should be set to “zero” after the alignment load has been applied. Following application of the maximum load (2.50 DL) reduce the load to the alignment load (0.05 DL maximum) and record the permanent set.
3. Hold each load increment for at least 10 minutes. Monitor the tension test pile for creep at the 2.00 DL load increment. Measure and record pile movements during the creep portion of the test in increments of 1 minute, 2, 4, 6, 8, 10, 20, 30, 40, 50, and 60 minutes. Maintain the load during the creep test within 5 percent of the intended load by use of the load cell.

G. Tension Test on Production Pile:

1. Perform tension test on a production pile by incrementally loading the test pile to a maximum test load of 133 percent of the DL in accordance with the following loading schedule. Record the test pile movements at each load increment.

Tension Test Loading Schedule (Production Pile)

Load	Hold Time
0.05 DL Max. (AL)	Until Movement Stabilizes
0.25 DL	Until Movement Stabilizes
0.50 DL	Until Movement Stabilizes
0.75 DL	Until Movement Stabilizes
1.00 DL	Until Movement Stabilizes
1.25 DL	Until Movement Stabilizes
1.33 DL (Max. Test Load)	Creep Test (see below Note 3)
1.25 DL	15 minutes
1.00 DL	15 minutes
0.75 DL	15 minutes
0.50 DL	15 minutes
0.25 DL	15 minutes
0	Until Movement Stabilizes

2. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent of the DL. Dial gauges should be set to “zero” after the alignment load has been applied. Following application of the maximum load (1.33 DL) reduce the load to the alignment load (0.05 DL maximum) and record the permanent set.

3. Hold each load increment for at least 10 minutes. Monitor the tension test pile for creep at the 1.33 DL load increment. Measure and record pile movements during the creep portion of the test in increments of 1 minute, 2, 4, 6, 8, 10, 20, 30, 40, 50, and 60 minutes. Maintain the load during the creep test within 5 percent of the intended load by use of the load cell.
- H. The allowable design load will be taken as 50 percent of the maximum applied test load, or the test load resulting in a movement of 0.5 inch at the pile tip (measured using tell tales installed to bottom of pile), whichever is less. If the allowable compression load as determined by the load test is less than the required design load, the Contractor shall install an additional test pile and perform another load test at no additional cost to the MBTA.
- I. If test piles do not conform to the specified requirements, provide additional test piles and testing, as directed by the Engineer, at no additional cost to the MBTA.
- J. Submit load test report to Engineer for review within 2 days following completion of each test. Drilling for production minipiles shall not begin until load test report has been reviewed by the Engineer. Load test reports shall include the following:
 1. All test pile record information specified in Article 1.8 of this Section, including a scale drawing of test piles showing all relevant construction details and subsurface conditions encountered during installation.
 2. Tabular and graphical summary of the specified load-deformation data.
 3. Brief memorandum summarizing testing procedure, test results, and recommended allowable design load.

3.4 NON-CONFORMING PILES

- A. Non-conformance piles include piles that are installed out of tolerances, as specified in Article 1.7 of this Section, are damaged, the volume of grout placed is less than the theoretical volume of the hole, the grout tests do not indicate the specified strength has been achieved or the pile is not installed to specified bearing stratum. To mitigate and/or remedy non-conforming piles, the Contractor may be required to provide additional piles or supplement piles to meet specified requirements at no additional cost to the MBTA.

3.5 TEST MINIPILE ACCEPTANCE CRITERIA

- A. The acceptance criteria for minipile load tests are:
 1. Sacrificial Test
 - a. The minipile shall sustain the tension 2.0 DL test load with no more than 0.75 inch total vertical movement at the bottom of the pile, relative to the position of the pile prior to testing.
 - b. At the end of the creep test load increment, test piles shall have a creep rate not exceeding 0.04 inch/log cycle time (1 to 10 minutes) or 0.08 inch/log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep load hold period.
 - c. Failure does not occur at the maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continue pile movement.

2. Proof Test
 - a. The minipile shall sustain the tension 1.33 DL test load with no more than 0.75 inch total vertical movement at the bottom of the pile, relative to the position of the pile prior to testing.
 - b. At the end of the creep test load increment, test piles shall have a creep rate not exceeding 0.04 inch/log cycle time (1 to 10 minutes) or 0.08 inch/log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep load hold period.
 - c. Failure does not occur at the maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continue pile movement.

3. If a minipile load test fails to meet the acceptance criteria, the Contractor shall immediately test another minipile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the construction procedure, and approved by the Engineer. Any modification of construction procedures, or cost of additional test piles, or replacement production minipiles, shall be at the Contractor's expense.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

- B. Payment shall constitute full compensation for all costs to mobilize/demobilize the Contractor's equipment, providing the required submittals, monitoring and all materials, equipment, 2 minipiles tests, tools and labor necessary to furnish and to install the drilled minipiles to the specified capacity and elevations to the complete satisfaction of the Engineer.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02400

DRAINAGE AND SEWER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies construction of drainage facilities and sanitary sewer facilities. This work shall include construction of a new storm drain system, a new trackside underdrain system and miscellaneous reconstruction and improvements to the existing on site drainage system.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02300 - EARTHWORK
 - 2. Section 03300 - CAST-IN-PLACE CONCRETE
 - 3. Appendix A - Guidelines and Procedures for Construction on MBTA Railroad Property

1.2 SUBMITTALS

- A. Shop Drawings. Include details of sewers and drains, including relationship to other systems; true position and details of interfaces, connections, inlets, cleanouts, manholes, alignment, grade, changes of direction, offsets, bedding, protection, materials and other pertinent data.

1.3 PRESSURE AND LEAKAGE TESTING AND TOLERANCES

- A. Gravity Lines: Maximum allowable leakage for any section or sections, or for the total lengths of pipelines: 200 gallons per inch of diameter per mile per 24 hours.
- B. Polyvinyl Chloride PVC:
 - 1. Testing of Pipe: After completing installation and backfill of pipe, the Contractor shall, at his expense, conduct a line acceptance test using low pressure air. Equipment used shall meet the following minimum requirements: Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected; Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking; All air used shall pass through a single control panel. Three individual hoses shall be used for the following connections: From control panel to pneumatic plugs for inflation; from control panel to sealed line for introducing the low pressure air; from sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
 - 2. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig (172.3689 Kpa). The sealed pipe shall be pressurized to 5 psig (34.47378 Kpa). The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

3. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig (172.4 Kpa). Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig (27.579 Kpa) greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.
4. After the stabilization period (3.5 psig (24.1317 Kpa) minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (24.1317 to 17.2369 Kpa) (greater than the average back pressure of any groundwater that may be over the pipe) is not less than the time shown for the given diameter in the following table.

Pipe Diameter	Specification Time for Length Shown (min: sec)			
	<u>100 ft.</u>	<u>200 ft.</u>	<u>300 ft.</u>	<u>400 ft.</u>
<u>Inches</u>				
6	5:40	5:40	5:40	5:42
8	7:34	7:34	7:36	10:08
10	9:26	9:26	11:52	15:49
12	11:20	11:24	17:05	22:47
15	14:10	17:48	26:42	35:36
18	17:00	25:38	38:27	51:16
21	19:50	34:54	52:21	69:48
24	22:47	45:34	68:22	91:10

5. In areas where groundwater is known to exist, the Contractor shall install a 1/2 inch (1.27cm) diameter capped pipe nipple, approximately 10 inches long, through the manhole wall adjacent to one of the sewer lines entering the manhole. This shall be done at the time the line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11 1/2 feet, then the added pressure will be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same). In no case shall the starting pressure exceed 9.0 psig.
6. If the Contractor is unable to pass a pressure test because lines are "live", the Contractor shall perform closed circuit television inspections of the lines at no additional cost to the Authority. The Engineer must be able to witness the tests and must be provided with a video recording of each test for further inspection.

7. Test Failure: If the section of pipe fails to pass the leakage and pressure test, or if there is any visible leakage, the Contractor shall locate, uncover and repair or replace the defective pipe fitting or joint and retest all at his own expense. Pipe will be considered passing only when the leakage does not exceed the above standard. Passing the test does not absolve the Contractor from his responsibility if leaks develop later within the period of warranty.

C. RCP:

1. Leakage Tests: Leakage tests will be required by the Authority for all pipe and manhole installations. Tests shall meet all requirements of this paragraph. Leakage into or from the piping and structures, except storage tanks, will be determined respectively by infiltration tests or by exfiltration tests, as specified herein and as directed. The maximum allowable amount of infiltration into the piping or exfiltration from the piping as determined respectively by the infiltration tests or by the exfiltration tests, including manholes, shall be at a rate of not greater than 150 gallons (567.8l) per inch of pipe diameter per mile of pipe per 24 hours, and there shall be no gushing or spurting streams of water into or from the piping or manholes. The phrase, "per mile of pipe" shall refer to the total length of pipe measured through manholes. Where the groundwater level can be maintained at a height of not less than one foot (304.8 mm) above the top of the pipe for the full length of the section of pipe being tested for leakage, the leakage into the piping and manholes shall be determined as specified under "Infiltration Tests." Where the groundwater cannot be maintained at a level of not less than one foot (304.8 mm) above the top of the pipe for the full length of the section of pipe being tested, the leakage from the piping and manholes shall be determined as specified under "Exfiltration Tests". Perform all work, provide all necessary weirs or such other measuring devices as required, do all pumping and furnish all equipment necessary for the proper performance of leakage tests at no additional cost to the Authority. Leakage testing of piping shall be satisfactorily performed in sections as the work progresses, and as directed.
2. Infiltration Tests: The tests shall be conducted at such times as the groundwater level is at a height of not less than one foot (304.8 mm) above the top of the pipe for the full length of the section of the pipe being tested. The groundwater leakage into the pipe will be measured by the Authority at such point or points as he may direct. Construct such weirs or other means of measurement as required and pump as necessary for the tests to be properly made.
3. Exfiltration Tests: Where exfiltration tests are required, the section of pipe to be tested shall be subjected to an internal pressure. The lower end of the section of pipe to be tested shall be closed and the entire section of the pipe, including manholes, shall be filled with clean water so as to obtain a minimum head of 2 feet (0.6096 m) above the top of the pipes; the length of the section of pipeline being tested shall be such that with the head of water 2 feet (0.6096 m) above the top of pipe at the upper end of the section of the pipeline being tested will not exceed 8 feet (2.4384 m). The rate of leakage from each section of the pipe being tested will be determined by the Authority by measuring the amount of water required to maintain the minimum head of 2 feet (0.6096 m) above the top of the pipe for the full length of each section of the pipes being tested.
4. Should the infiltration or exfiltration test on any section of the pipelines, including manholes, show a rate of leakage into or from the pipeline exceeding the maximum allowable rate of infiltration or exfiltration specified herein, locate, repair, or replace defective joints and work in a manner satisfactory to the Authority and retest at no additional cost to the Authority until the rate of infiltration into or exfiltration from each section of the pipeline being tested does not exceed the rate specified herein for infiltration or exfiltration.

5. The completed pipe and joints shall be visually inspected by the Engineer. If the Contractor is unable to pass a pressure test because lines are “live”, the Contractor shall perform closed circuit television inspections of the lines at no additional cost to the Authority. The Engineer must be able to witness the tests and must be provided with a video recording of each test for further inspection.
6. Tests for ductile iron gravity lines shall be conducted as indicated above for RCP.

D. Ductile Iron Force Mains:

1. Pressure Testing: All pipe and appurtenances installed shall be hydrostatically tested in accordance with ANSI/AWWA C600, latest version unless stated otherwise herein. Test pressure, expressed in terms of feet of water, applied at any point in pipe equals arithmetic difference between specified test pressure plane elevation and elevation of horizontal center line of pipe at selected location. Multiply value by 0.433 to obtain pounds per square inch. Ensure pressure gauges are accurately calibrated. Do not attempt pressure testing until all air has been vented from the mains. All new force mains that shall become the property of the Authority shall be pressure tested at a minimum of 150 psi for a continuous period of two hours.
2. Leakage Testing: Conduct leakage testing in conjunction with pressure tests. Ensure that joints in piping are watertight and free from visible leaks during leakage test.
3. Leakage Test Pressure: Maintain specified normal operating line pressure for pressure testing of reach during leakage test. Maintain hydrostatic pressure within plus or minus 5 percent during entire time of leakage measurements.
4. Leakage Measurement: Do not attempt measurement of leakage until trapped air has been vented and constant test pressure has been established. Measure leakage by means of an approved water meter installed in the pressure piping on discharge of the pump. Ensure that water meter is accurately calibrated.
5. Allowable Leakage: Ensure that pipe reach does not exceed the allowable leakage rate. Calculate allowable leakage with following formula:
 - a. $Q = 0.0075 DLN$ where
 - b. Q = allowable leakage in gallons per hour
 - c. D = nominal diameter of pipe in inches
 - d. L = length of section tested in thousand feet (1000-foot maximum)
 - e. N = square root of avg test pressure in psi (12.25)
6. Calculate allowable leakage separately for each diameter and add resulting allowable leakage rates to obtain total allowable leakage for entire reach.

E. Drainage and Sanitary Structures and Catch Basins, Leakage Tests:

1. The manholes shall be made as nearly watertight as practicable.
2. The Contractor shall perform leakage tests on each manhole installed using an approved low air pressure testing system. This type of test shall be used only immediately after assembly of the manhole and only prior to backfilling. The manhole to pipe connection should only be a flexible connector. All lift holes shall be plugged with a non-shrinking mortar. For this test, each manhole shall be tested under 10-inch Hg vacuum. The test shall pass if the vacuum remains at 10-inch Hg or drops no lower than 9-inch Hg after 60 seconds for 4 or 5 foot manholes from 0 to 10 feet deep, 75 seconds for 4 or 5 foot manholes from 10 to 15 feet deep, or 90 seconds for 4 or

5 foot manholes from 15 to 25 feet deep. A volume equivalent shall be calculated for larger diameter manholes to determine the testing length based on these parameters.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products used at interface with utility companies shall conform to the requirements of connected utility companies.

2.2 PIPE AND FITTINGS

- A. Clay Pipe and Fittings
 1. Pipe: ASTM C 700, except crushing strength shall be in accordance with National Clay Pipe Institute Specification ER4, salt or ceramic glazed, bell and spigot except where plain ends are indicated.
 2. Joints and Gaskets: ASTM C 425.
- B. Plain Concrete Pipe
 1. Unperforated: ASTM C14, class as indicated, bell and spigot.
 2. Perforated: ASTM C 444, type as indicated, and all applicable requirements of ASTM C 14, class as indicated.
- C. Reinforced Concrete Pipe
 1. Circular Section: ASTM C 76; ends, class, and wall as indicated.
 2. Elliptical Section: ASTM C 507; ends and class as indicated.
- D. Joints and Gaskets for Circular Concrete Pipe: ASTM C 443.
- E. Cast Iron Culvert Pipe: ASTM A 142.
- F. Corrugated Metal Pipe: AASHTO M 36, type and couplings as indicated, coated and paved per ASSHTO M 190, Type C coating and Type A coating for coupling bands.
- G. Ductile Iron Pipe for Gravity and Force Mains:
 1. Ductile iron pipe shall be that of a United States manufacturer who can demonstrate at least 5 years of successful experience in manufacturing ductile iron pipe. The pipe shall be equipped with push on type, restrained joint, or mechanical joints, as required.
 2. All ductile iron pipe shall conform to ANSI/AWWA C 151/A21.51 and ASTM A 746.
 3. The ductile iron pipe shall be, at a minimum, Class 52 or as determined considering the trench load and internal pressure separately in accordance with ANSI/AWWA C150/A21.50. Ductile iron pipe shall be H2 Sewer Safe Pipe (Sewper Coat lined).
 4. The ductile iron pipe shall be asphalt coated on the outside and inside with a minimum of 1 mil bituminous paint according to ANSI/AWWA C151/A21.51 Section 51-8.1. Prior to the lining,

the inside and outside of the spigot end shall be coated with a minimum of 8 mil of epoxy. The inside of the bell end including the gasket cavity shall also be coated with 8 mil of epoxy.

5. The ductile iron pipe lining shall be as manufactured by Lafarge Calcium Aluminates or approved equal. The coating shall be a calcium aluminate mortar consisting of calcium aluminate cement and fused calcium aluminate aggregates. A seal coat shall be applied to the lining. The thickness of the lining shall be 0.125-in for 6-in through 12-in pipe and 0.1875-in for 14-in through 24-in pipe.
6. Gasket Materials: Push-on and mechanical joint gaskets shall be Nitrile (NBR) (Acrylonitrile Butadiene) or equal gasket acceptable for use in an environment which will handle fats, oils and greases unless otherwise noted or approved.
7. Fittings: Fittings shall be compact ductile iron Class 350 Mechanical Joint, conforming to ANSI Specification A21.53 (AWWA C 153), latest edition, for pipe sizes 16 inches and smaller, and Class 350 standard Mechanical Joint fittings conforming to AWWA C110/ANSI A21.10, latest edition except as specified, for pipe sizes 16 through 24 inches, unless specifically stated otherwise in the specifications or on the drawings. Fittings shall be suitable for use with restraints as specified hereinafter. Fittings shall be manufactured in the United States. Fittings shall be of the same material and have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or fraction of the circle on all bends.
 - a. Caps and plugs installed in all new work as indicated on the drawings shall be provided with a threaded corporation or bleeder valve so that air and water pressure can be relieved prior to future connection.
 - b. Solid sleeves shall be ductile iron with 350 psi rating. Sleeves shall conform to ANSI/AWWA C 110.

H. Polyvinyl Chloride Pipe:

1. All PVC pipe shall be continuously and permanently marked with the manufacturer's name, pipe size, and pressure rating or stiffness in psi (kpa).
2. The Contractor shall also require the manufacturer to mark the date of extrusion on the pipe. This dating shall be done in conjunction with records to be held by the manufacturer for 2 years, covering quality control tests, raw material batch number, and other information deemed necessary by the manufacturer.
3. Pipe:
 - a. All PVC pipe shall be joined by compression joints unless otherwise shown or specified, and shall conform to the following requirements:
 - b. Non Perforated Polyvinyl chloride pipe (PVC) shall conform to the requirements of ASTM D 3034, Class SDR 35. Material for PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12454-B or 12454-C as defined therein. All diameters shall be as specified on the Contract Drawings.
 - c. Perforated PVC pipe shall conform to the requirements of ASTM D 3034, Class SDR 35. Material for perforated PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12454-B or 12454-C as defined therein. The pipe shall have 3/8 inch perforations, 6 inch on center and 4 holes per row. The pipe shall be 6 inch diameter unless otherwise specified on the Contract Drawings.
 - d. Elastomeric seals for compression type joints for PVC pipe and fittings shall conform to the requirements of ASTM D 3212.

- e. Service pipes for storm services shall be a minimum of 8-inches and shall match diameter of existing services for reconnections. Service pipes for sanitary services shall be a minimum of 6-inches and shall match diameter of existing, services for reconnections.
4. Fittings:
 - a. All fittings shall conform to the requirements of ASTM D 3034 or ASTM F 679. The ring groove and gasket ring shall be compatible with PVC pipe ends. The flanged fittings shall be compatible with cast-iron or ductile iron pipe fittings.
 - b. The strength class of the fittings shall be not less than the strength class of any adjoining pipe.
 - c. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings are not acceptable.
 5. Connections:
 - a. Sanitary services shall be connected to new, parallel or replacement sanitary sewer lines with full bodied tees or wye fittings.
 - b. Storm services shall be connected to new, parallel, or replacement storm sewer lines with full bodied tees or wye fittings for all pipes up to 18-inches in diameter. Connections to pipes larger than 18-inches in diameter or odd sizes shall be made with saddle tap connections, as approved by Engineer.
 - c. Connections of storm and sanitary service lines to existing storm and sanitary main lines shall be made with full bodied tees or wye fittings wherever possible for existing lines less than 18-inches in diameter and with tapping saddles as approved by Engineer for existing lines greater than 18-inches in diameter and in odd sizes.
 6. Gaskets: Flexible elastomeric rings conforming to ASTM F 477.

I. Solid Wall High Density Polyethylene Pipe (HDPE):

1. The HDPE replacement pipe shall be manufactured from a high density, high molecular weight polyethylene resin, which conforms to ASTM D-1248 and meets the requirements for Type III, Class B, Grade P34, Category 5, and has a PPI rating of PE 3408, when compounded. The pipe produced from this resin shall have a minimum cell classification of 345434C or D under ASTM D 3350.
2. The wall thickness of the HDPE pipe shall be as determined by the Contractor for the minimum thickness required to meet the structural requirements listed under Design Criteria below, and shall meet the following:
3. Minimum Wall Thickness: 0-12 feet depth, minimum wall thickness SDR 26; over 12 feet depth, SDR 21 minimum wall thickness.
4. All pipe shall be made of virgin material. No re-work, except that obtained from the manufacturer's own production of the same formulation shall be used.
5. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
6. The interior surface of the HDPE pipe shall not be dark or non-reflective in nature that could inhibit proper television inspection.
7. The finished HDPE pipe shall be continuous over the entire length of an insertion run between the insertion pit and reception pit. The HDPE pipe shall be impervious and free of any leakage from the rehabilitated host pipe to surrounding ground, or from the surrounding ground to the inside of the pipe.

8. The manufacturer of the pipe shall supply the AUTHORITY with certificates of compliance indicating conformance for all material and testing requirements furnished under these Specifications.
9. Each standard pipe unit shall be clearly and permanently marked with the date of manufacture, class, production code, and manufacturer's trademark.
10. The Contractor and manufacturer shall exercise extreme care during transportation, handling, storing, and installation of the HDPE pipe to ensure that the pipe is not gouged or otherwise damaged in any way. The Contractor shall store the pipe with a cover to block ultraviolet light in accordance with the manufacturer's recommendations. If the HDPE pipe becomes gouged or otherwise damaged, before or during installation, it shall be replaced or repaired by the Contractor at no additional cost to the Authority.

J. Centrifugally Cast Fiberglass Reinforced Pipe (FRP):

1. General: Workmanship and methods shall be in accordance with the best practices of modern shops for this type of work and shall be the product of a manufacturing firm having at least five years experience in the manufacture of this type of pipe. Pipe shall have a smooth and even interior surface free from roughness or irregularities. Prior to fabrication of pipe, submit shop drawings showing lengths of pipe, pipe joint details, construction details and tolerances as required by the Authority. Each pipe shall be marked with the date of manufacture, mark or trademark of the manufacturer, and the class, wall thickness of the pipe, and serial number. No slurry mix shall be used on interior of pipe.
2. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.
3. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
4. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
5. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product.
6. Elastomeric Gaskets: Gaskets shall be supplied by qualified gasket manufacturers and be suitable for the service intended.
7. Pipes, Joints, and Fittings:
 - a. Pipe shall be manufactured by the centrifugal casting process to result in a dense, nonporous, corrosion-resistant, consistent composite structure.
 - b. Actual outside diameter (18" to 48") of the pipes shall be in accordance with ASTM D 3262. For other diameters, OD's shall be per manufacturer's literature.
 - c. Minimum wall thickness shall be the stated design thickness.
 - d. Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/8".
8. Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings or bell-spigot joints, "flush" or "non-flush", that utilize elastomeric sealing gaskets as the sole means to maintain joint watertightness. The joints must meet the performance requirements of ASTM D 4161. Joints at tie-ins, when needed, may utilize fiberglass, gaskets-sealed closure couplings.

9. Flanges, elbows, reducers, tees, wyes, laterals, and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Properly protected standard ductile iron, fusion-bonded epoxy-coated steel and stainless steel fittings may also be used.

2.3 STRUCTURAL STEEL FOR SITE ERECTION

- A. Corrugated: AASHTO M 167.
- B. Flat: AASHTO M 218.

2.4 UNDERDRAIN FILTER

- A. Pervious Backfill: Section 02300 - EARTHWORK.

2.5 DRAINAGE AND SANITARY STRUCTURES

- A. Precast Manhole and Catch Basin Sections: ASTM C 478.
- B. Precast Sections (for non-load bearing drainage structures other than manholes): ASTM C 139.
- C. Area Drains shall be cast iron in conformance with Construction Specification Section 05500 and as indicated on the Contract Drawings.

2.6 BRICK

- A. ASTM C32, Grade SS, 2-1/4 inches by 3-3/4 inches by 8 inches.

2.7 CONCRETE

- A. Concrete, General: Section 03300 - CAST-IN-PLACE CONCRETE.
- B. Cradles and Cradle-Arches: Class 4,000-3/4.
- C. Manholes and Other Load-Bearing Drainage Structures: Class 4000-3/4.

2.8 CEMENT MORTAR

- A. One part Portland cement, two parts sand by volume with sufficient water to form a workable mixture, mortar minimum strength of 3,000 psi.

2.9 FRAMES AND COVERS

- A. Frames and covers shall be heavy-duty Type A Massachusetts Standard and conform to the "Standard Specifications for Highways and Bridges", of the Commonwealth of Massachusetts. All frames shall have a minimum clear opening of 30 inches unless otherwise noted.

- B. Iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects affecting the strength and value for the service intended. The finished coating shall be tough and tenacious when cold and not brittle or with any tendency to scale off under reasonable temperature changes.
- C. Frames and Covers shall be Cast Iron, minimum Class 25 conforming to ASTM A 48, and as follows: Castings to be free from scale, lumps, blisters and sandholes. Machine contact surfaces to prevent rocking. Thoroughly clean and hammer inspect.
- D. Frames and covers to be as manufactured by E. L. LeBaron Foundry Co., Neenah Foundry Co., Campbell Foundry Company or equal. Frames and covers shall be capable of withstanding AASHTO H-20 loading unless otherwise indicated or specified.
- E. The Contractor shall furnish all manhole frames and covers conforming to the details shown on the drawings, or as herein specified. Frames and covers shall be of cast iron with diamond cover surface design. Manhole covers shall be machined to fit securely and evenly on the frame.
- F. Covers for all structures shall have the word "DRAIN", "SEWER" or other appropriate designation cast upon them.

2.10 FRAMES

- A. Single Catch Basin Frames shall be as manufactured by E. L. LeBaron Foundry Co., model LK120D for three flange, Neenah Foundry Co., Campbell Foundry Co., or equal.
- B. Double Catch Basin Frames shall be as manufactured by E. L. LeBaron Foundry Co., model LV2448-2 with longside flange removed, Neenah Foundry Co., Campbell Foundry Co., or equal.

2.11 GRATES

- A. Single and Double Catch Basin Grates shall be cascade type, as manufactured by E. L. LeBaron Foundry Co., model L24SG18, by Neenah Foundry Co., by Campbell Foundry Co., or equal unless otherwise shown on the Drawings.

2.12 HOODS

- A. Catch Basin Hoods shall be as manufactured by E. L. LeBaron Foundry Co., model L-202, Neenah Foundry Co., Campbell Foundry Co., or equal.

2.13 NO DUMP CURB MARKERS

- A. No-dump markers shall be installed on all existing-to-remain or proposed catch basins and inlets within the project area. Curb markers shall be 4" diameter, 0.090 mil. thick, PVC laminate, with urethane dome, as manufactured by Das Manufacturing Inc., Duracast style.

2.14 FLEXIBLE MANHOLE SEALS

- A. Flexible manhole seals shall be "New Lok Joint Flexible Sleeve" by Interpace, "A-Lok Manhole Sleeve" by L & L Concrete Products, "Press Wedge II" by Pre-Seal Basket Corporation, or approved

equal. Field applied seals shall be "K or N Seal" boot or equal. Manhole sleeves, gaskets and sealants shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc.

2.15 TRENCH DRAINS

- A. Provide trench drains and grates as manufactured from one of the following manufacturers, or Engineer approved equal:
 - 1. Neenah Foundry Co.
 - 2. J.R. Smith Manufacturing Co.
 - 3. Zurn
- B. Trench Drain Channels: Provide trench drain channels equal to Neenah Foundry Model No. R-4995-A1, or equal by J.R. Smith, or Zurn, or approved equal. Each trench drain channel shall have full length horizontal anchoring ribs to mechanically lock the channel into the concrete pavement as indicated on the Drawings.
- C. Trench drain grate shall be perforated galvanized steel, heel proof grate conforming to AD and MAAB.
 - 1. Slip Resistant Finish: All trench drains shall be factory coated with an anti-slip, non-gritted, product consisting of a random hatch matrix with a surface hardness of at least 55 on the Rockwell "C" scale and a bond strength to the trench drain of at least 4,000 psi. The anti-slip surface shall have a minimum coefficient of friction of 0.6 and be listed as slip resistant by UL.
- D. Accessories: Provide all necessary outlets, end plates, anchoring components, grate locks, etc. for the complete installation.

2.16 AREA DRAINS

- A. Provide area drains and grates as indicated on the Drawings, manufactured from one of the following manufacturers, or Engineer approved equal:
 - 1. Neenah Foundry Co.
 - 2. J.R. Smith Manufacturing Co.
 - 3. LeBaron Foundry Co.
- B. Area drain grates shall be heel proof conforming to ADA and MAAB, and be slip resistant.

PART 3 - EXECUTION

3.1 GENERAL

- A. Excavation. Excavate trenches as specified in Section 02300 - EARTHWORK.
- B. Bedding. Classes of bedding are defined in ASTM C12. Use class of bedding indicated; prepare trench and bedding as specified in ASTM C12. Place concrete for encasement against undisturbed soil.

- C. Pipe Laying. Lay all pipe in accordance with the manufacturer's written instructions. Additional requirements for specific types of pipe are included in subsequent articles herein.
- D. Structures. Construct manholes, junction chambers, inlets, headwalls, wingwalls, and other related drainage structures in connection with the installation of pipe. Install or cut pipe flush with the inside face of structure walls.
- E. Protection
 - 1. Protect joint materials from the air and sun to prevent drying and other deterioration.
 - 2. Take precautions to prevent flooding of trench prior to backfilling.
 - 3. Do not allow free water to come in contact with pipelines until Portland cement joint and sealing materials have set for at least 24 hours.
- F. Backfill. Backfill trenches as specified in Section 02300 - EARTHWORK.

3.2 CRADLES

- A. Where gravel, crushed stone, or concrete cradles are indicated, provide bell holes in subgrade to permit uniform cradle depth beneath entire pipe length.

3.3 JACKING PIPE

- A. At locations indicated jack reinforced concrete pipe, steel casing pipe, fiberglass reinforced pipe or corrugated metal pipe into place between limits indicated.
- B. Strength, reinforcement, and gauge of pipe designated to be jacked will be determined for vertical loads only. Provide additional reinforcement or higher strength or heavier gauge pipe as necessary to withstand jacking pressure, at no additional expense to the Authority.
- C. Excavate for jacking pipe not more than 0.1 foot wider than outside limits of pipe. When material tends to cave beyond that limit, use a shield ahead of the first section of pipe. Backfill caving and excavation beyond that limit with sand or grout to fill voids.
- D. Sluicing and jetting will not be permitted.

3.4 INSTALLATION OF CORRUGATED METAL PIPE

- A. Distortion: When circular pipe 48 inches in diameter and larger is to be placed under fills, distort the pipe for its full length before placing backfill. When specified, distort smaller circular pipe.
 - 1. Distort pipe from a true circle to increase the vertical diameter by approximately three percent through the full length.
 - 2. Pipe may be distorted either in the shop or in the field. If pipe is to be distorted in the field, use one of the following methods:
 - a. By mechanical pressure sufficient to introduce a permanent distortion in pipe; or
 - b. By distorting assembled pipe and retaining distortion by means of rods, wires, struts, or other means.

- B. Placement: Lay distorted circular pipe with major axis vertical. Maintain rods, wires, struts, or other means used to maintain distortion in place until completion of backfill or embankment, but remove prior to construction of headwalls and other structures at ends of pipe.
- C. Joining: Join sections of pipe with corrugated metal bands. Do not damage protective coating when tightening bolts. After final tightening, apply brush coat of bituminous paint to bands and bolts.

3.5 INSTALLATION OF REINFORCED CONCRETE PIPE

- A. Placement: Lay pipe upgrade with bell or groove end uphill. Place circular pipe having elliptical reinforcement with minor axis of the reinforcement in vertical position.
- B. Backfilling: Except where an exfiltration/infiltration test is to be performed, backfill of culvert-pipe and siphon-pipe trenches may be completed while joint mortar is still plastic. Should joint mortar become set before placing backfill, do not commence backfilling within 16 hours of joining pipe sections.

3.6 INSTALLATION OF DUCTILE IRON PIPE

- A. Handling Pipe: The Contractor shall take care not to damage pipe by impact, bending, compression, or abrasion during handling, and installation. Joint ends of pipe especially shall be kept clean. Pipe shall be stored above ground at a height no greater than 5 feet, and with even support for the pipe barrel. Only nylon protected slings shall be used for handling the pipe. No hooks or bare cables will be permitted. Gaskets shall be shipped in cartons and stored in a clean area, away from grease, oil, heat, direct sunlight and ozone producing electric motors.
- B. Alignment and Placement of Pipe: Jointing of ductile iron pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The last 8 inches of the outside of the spigot end of pipe and the inside of the bell end of pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be painted with a lubricant just prior to making up the joint. The spigot end shall then be gently pushed home into the bell. The position of the gasket shall be checked to insure that the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.
- C. Installation and jointing of push-on ductile iron pipe shall be in accordance with AWWA C 600 Sections 9b and 9c, latest revision, as applicable. Mechanical joints shall be installed with Mega-Lug, Uni-Flange or MJR restraints. Restraints shall be installed in full accordance with the manufacturers' instructions. All bolt heads on Mega-Lugs or Uni-flanged shall be tightened sufficiently so that they shear off to provide indication that proper tightening torque was achieved. MJR systems shall be installed with ductile iron locking ring, tapered MJ gland and a symmetrical locking ring. Restrained push on joints shall be installed with specified gasket joint restraints. Restraints shall be installed in full accordance with the manufacturers' instructions. Fittings and valves shall be restrained as shown on the drawings.
- D. Piping Support: Furnish and install supports to hold piping at lines and grades indicated or specified. Support pipe and appurtenances connected to equipment to prevent any strain imposed on equipment.
- E. Pipe and Fittings: Remove and replace defective pieces. Clear of all debris and dirt before installing and keep clean until accepted. Lay accurately to lines and grades indicated or required. Provide

accurate alignment, both horizontally and vertically. Provide firm bearing along entire length of buried pipelines.

- F. Appurtenances: Set valves, fittings and appurtenances as indicated.
- G. Push-on Joints: Insert gasket into groove bell. Apply thin film of nontoxic gasket lubricant over inner surface of gasket in contact with spigot end. Insert chamfered end into gasket. Force pipe past it until it seats against socket bottom. Where required install restraint and secure in accordance with manufacturer's instructions.
- H. Mechanical Joints: Wire brush surfaces in contact with gasket and clean gasket. Lubricate gasket, bell, and spigot with soapy water. Slip gland and gasket over spigot, and insert spigot into bell until seated. Seat gasket and press gland firmly against gasket. After bolts inserted and nuts made finger-tight, tighten diametrically opposite nuts progressively and uniformly around joint by torque wrench. Torque bolts to values specified above.
- I. Testing: Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.

3.7 INSTALLATION OF PVC PIPE

- A. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. Any pipe unit or fitting discovered to be defective, either before or after installation, shall be removed and replaced with a sound unit.
- B. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone shall be as specified in Section 02300 - EARTHWORK.
- C. Suitable bell holes shall be provided, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material. Special care shall be taken to hold the trench width at the crown of the pipe to the maximum indicated on the Trench Detail included in the Details Section of these specifications.
- D. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
- E. Pipe and fittings shall be installed to the lines and grades indicated on the Drawings. Care shall be taken to ensure true alignments and gradients.
- F. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
- G. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be checked to see that the rubber ring is properly seated. Apply lubricant to the spigot end only, paying particular attention to the bevel, in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall

be used to force the pipe units together so that they will fit with minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.

- H. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.
- I. Details of gasket installation and joint assembly shall follow the directions of the manufacturers of the joint materials and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.
- J. All premolded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory, as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.
- K. Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.
- L. After each pipe has been properly bedded, enough crushed stone shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes, provided for jointing, shall be filled with crushed stone and compacted, and then crushed stone shall be placed and compacted to complete the pipe bedding.
- M. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench. At all times pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.
- N. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe. Pipelines shall not be used as conductors for trench drainage during construction. Install PVC pipe and fittings in accordance with manufacturer's printed instructions.
- O. Allowable Pipe Deflection: Pipe provided under this Specification shall be so installed as to not exceed a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe. Upon completion of a section of pipe, including placement and compaction of backfill, the Contractor shall measure 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 reviewed by the Engineer. The section of pipe must be placed and backfilled for a minimum of 90 days before the deflection can be measured. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem without additional compensation.
- P. Cleaning: Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing pipe.

3.8 INSTALLATION OF FRP PIPE

- A. General: Installation of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer's requirements. In addition, installation of piping shall be in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
- B. Handling Pipe: Textile slings, other suitable materials or a forklift shall be used in the handling of pipes. Use of chains or cables is not recommended. Each pipe unit shall be handled into its position in the trench only in such manner and by such means, as the Engineer accepts as satisfactory. The Contractor will be required to furnish suitable devices to permit satisfactory support of all parts of the pipe unit when it is lifted.
- C. Laying Pipe: Except where a concrete cradle or envelope is required, all pipe shall be laid in crushed stone. In trenches, no blocking or supporting of the piping by concrete, stones, bricks, wooden wedges, or method other than bedding the pipe on crushed stone will be permitted. Each length of pipe shall be shoved home against the pipe previously laid and held securely in position. Joints shall not be "pulled" or "cramped" without approval of the Engineer.
- D. Jointing Pipe: After the pipe are aligned in the trench and are ready to be jointed, the following shall be performed: Ends of pipe and coupling components shall be cleaned. Joint lubricant shall be applied to pipe ends or bell interior surfaces and the elastomeric seals. Only lubricants approved by the pipe manufacturer shall be used. Suitable equipment and end protection to push or pull the pipes together shall be used. Recommended forces by the manufacturer for joining or pushing pipe shall not be exceeded. Pipes shall be joined in straight alignment and then deflected to required angle. Deflection angle shall not exceed the deflection permitted by the manufacturer.
- E. Alignment and Placement: All pipe shall be laid with extreme care as to grade and alignment. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
- F. Cleaning: Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing Drain. Place plugs in end of uncompleted conduit at end of day or whenever work stops. Flush lines between manholes if required to remove collected debris.

3.9 CONCRETE ENCASEMENT

- A. If pipe is indicated to be entirely or partly embedded in concrete, support and brace pipe in a manner that will prevent movement or displacement of pipe during testing and during placement and consolidation of concrete.
- B. Place concrete as specified in Section 03300 - CAST-IN-PLACE CONCRETE, being careful to tamp concrete under and around pipe without displacing pipe.
- C. Do not use earth form.

3.10 BACKFILL

- A. Partial Backfill Before Testing
 - 1. Deposit and compact backfill in four inch layers around bottom half of pipe and for full width of trench, leaving top half of pipe exposed.
 - 2. Deposit and compact additional backfill between joints, to a depth of 12 inches above top of pipe, leaving joints exposed.
- B. Final Backfill After Testing
 - 1. Backfill and compact as specified in Section 02300 - EARTHWORK, flush with finished grade. If permitted by the Engineer, surface of backfill may be slightly convex.
 - 2. Restore surface to its original condition or as required.

3.11 LEAKAGE TOLERANCES

- A. Gravity Lines. Maximum allowable leakage for any section or sections, or for the total lengths of pipe lines: 200 gallons per inch of diameter per mile per 24 hours.
- B. Force Mains: Zero leakage in 30 minutes at 150 percent of the maximum pressure that pump or ejector is capable of developing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02444

CHAIN-LINK FENCE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the furnishing and installation of chain-link fence and gates of Type I: Galvanized Steel and Type IV: Colored PVC-Coated Steel Fabric with Galvanized and Factory-Painted Steel Posts, Hardware, and Fittings.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 03300 - CAST-IN-PLACE CONCRETE
 - 2. Section 05500 - MISCELLANEOUS METALS
 - 3. Section 09900 - PAINTING
 - 4. Section 16450 - GROUNDING

1.2 SUBMITTALS

- A. Shop Drawings:
 - 1. Include cross sectional dimensions of posts, braces, rails, fence fabric, fittings, accessories and gate frames; design of gates; and details of all gate hardware.
 - 2. Include a layout drawing showing the spacing of posts and location of all gates; abrupt changes in grade; and all corner, gate, anchor, end, and pull posts.
- B. Certificates. Submit certified test reports giving results of tests specified herein for zinc coatings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with AASHTO M181, with the additions and modifications specified herein.
 - 1. Aluminum alloy line, end, and corner posts, and top rail, may be substituted for galvanized steel at the Contractor's option.
 - 2. Aluminum Alloy: ASTM B221 for shapes, and B429 for pipe, Alloy 6061-T6. Pipe dimensions specified are the nominal pipe sizes per ASTM B429 Schedule 40 except Schedule 80 dimensions and weights shall be used in areas where pedestrian traffic is adjacent to the fence line. Coat portions of posts to be embedded in concrete with two coats of an accepted coal-tar mastic, allowing 24 hours drying time between coats.

3. Steel pipe dimensions and weights: ASTM A120, Schedule 40 except Schedule 80 dimensions and weights shall be used in areas where pedestrian traffic is adjacent to the fence line. Dimensions specified are the nominal pipe sizes.
 4. Dimensions and weights specified herein are subject to a tolerance of plus or minus five percent.
 5. Zinc Coating: Minimum 2.0 ounces per square foot except where specified otherwise.
 6. Provide posts with accepted tops of same material as posts, so designed as to fit securely over post and carry top rail or cable; the base of top fitting shall carry an apron around outside of post.
- B. Line Posts
1. Steel, Five Feet and Shorter: 1-1/2 inch pipe; or 1.625 by 1.875 inch H column weighing 2.70 pounds per foot; or 1.625 by 1.875 inch C column weighing 2.20 pounds per foot.
 2. Aluminum, Five Feet and Shorter: 1.625 by 1.875 inch H column weighing 1.03 pounds per foot.
 3. Steel, Over Five Feet: 2 inch pipe; or 1.95 by 2.25 inch H column weighing 4.10 pounds per foot; for 1.70 by 2.25 inch C column with a weight of 2.66 pounds per foot.
 4. Aluminum, Over Five Feet: 2 by 2.25 inch H column weighing 1.24 pounds per foot.
- C. Gate Posts: Steel, minimum 3-1/2 inch pipe, except as otherwise specified in the Construction Specifications.
- D. End and Corner Posts
1. Steel, Five Feet and Shorter: 2 inch pipe, or 3.5 inch square C column weighing 5.163 pounds per foot.
 2. Aluminum, Five Feet and Shorter: 2 inch pipe.
 3. Steel, Over Five Feet: 2.5 inch pipe, or 3.5 inch square C column weighing 5.163 pounds per foot.
 4. Aluminum, Over Five Feet: 2.5 inch pipe.
- E. Top Rail, Cables, and Spring Tension Wire
1. Top Rail
 - a. Steel: 1-1/4 inch pipe, or 1.25 x 1.625 inch C section weighing 1.262 pounds per foot.
 - b. Aluminum: 1.25 inch pipe.
 - c. Couplings and Expansion Sleeves: Outside sleeve type, minimum six inches long.
 2. Cable: ASTM A475, 3/8 inch, seven-strand, common grade, Class A galvanizing.
 3. Cable attachments
 - a. Shoulder Eye Bolts: 5/8 inch diameter, of sufficient length to fasten to the post used.
 - b. Turnbuckles: Shackle end type, 1/2 inch diameter, with six-inch standard take-up and 3/8 inch diameter pins.
 - c. Thimbles: lightweight wire rope for use with 3/8 inch diameter cable
 - d. Wire Rope Clips: U-bolt diameter of 7/16 inch for use with 3/8 inch diameter cable.
 - e. Anchor Shackles: 3/8 inch diameter, 11/16 minimum distance between eyes, 7/16 inch pin diameter.
 - f. Seizing: 0.0181 inch diameter galvanized annealed iron wire.

4. Spring Tension Wire: Coil spring steel, 0.1770 inch diameter; base metal having a minimum tensile strength of 80,000 psi, galvanized with 1.6 ounces per square foot; or aluminum coated with 0.4 ounces per square foot.
- F. Braces and Tension Rods
1. Compression Braces: Same type and size as top rail.
 2. Tension Rods: 3/8 inch round rods with drop-forged turnbuckles or other approved type of adjustment.
- G. Fence Fabric
1. Type I, Galvanized Steel: ASTM A392, Size 9, Class 2 coating.
 2. Type IV, PVC-Coated Steel: ASTM A392, Size 9, except with PVC coating in lieu of galvanizing.
 3. Selvages, all Types
 - a. Fabric 60 inches high and under: knuckled at both selvages.
 - b. Fabric over 60 inches high: knuckled at one selvage and twisted and barbed at the other.
- H. Fabric Band and Stretcher Bars
1. Fabric Band: Minimum 1/8 by 3/4 inch section.
 2. Stretcher Bars: Minimum 1/4 by 3/4 inch section.
 3. Aluminum Alloy Items: ASTM B221, 6061-T6.
- I. Tie Wire and Miscellaneous Items
1. Tie Wire: Galvanized or aluminum-coated 0.148 inch steel wire, or aluminum alloy conforming to ASTM B211, 1100-H14.
 2. Hog Rings: Galvanized or aluminum-coated 0.120 inch steel wire, or aluminum conforming to ASTM B221, 6061-T6. Aluminum coating: minimum 0.24 ounces per square foot.
 3. Post Clips: Galvanized or aluminum-coated 0.192 inch steel wire, or aluminum alloy conforming to ASTM B211, 1100-H14. Aluminum coating: minimum 0.30 ounces per square foot.
- J. Barbed Wire and Extension Arms
1. Barbed Wire will not be used.
 2. Extension Arms will not be used.
- K. Gates
1. General. Furnish gates complete with necessary hinges, latches, and drop bar locking devices; corners shall be welded or fastened and reinforced with suitable fittings.
 2. Gates Frames, Six Feet and Under: 1-1/4 inch steel pipe or aluminum tubing.
 3. Gate Frames, Over Six Feet; 1-1/2 inch steel pipe or aluminum tubing.
 4. Cross-Trussing: 3/8 inch galvanized iron adjustable rods.
- L. Concrete: Section 03300 - CAST-IN-PLACE CONCRETE, Class 4000, 3/4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place posts at each corner, change of direction, abrupt change in grade, gate, and terminal, in addition to line and pull posts.
- B. Space line posts on not more than 10-foot centers. In determining the posts spacing, measure parallel to slope of finished grade. Place all posts in vertical position.
- C. Where fencing is installed on the top of concrete structures, use galvanized sleeve and grout posts. Set all other posts permanently in concrete.
- D. Coat aluminum posts with material specified for protection of dissimilar metals as specified in Section 05500 - MISCELLANEOUS METALS, from bottom to two inches above concrete prior to embedment.
- E. Excavate post hole footings not smaller than 12 inches in diameter and 36 inches deep. Crown top of concrete to shed water, and allow to cure not less than 72 hours before proceeding with further work on the posts. Backfill posts with acceptable material placed in layers and thoroughly compacted. Embed galvanized steel eye bolts in the top of footings, adjacent to the posts, to receive the bottom tension wire.
- F. Brace end, corner, pull, and gate posts to the nearest line post, with diagonal or horizontal brace rails used as compression members, and with truss rods with turnbuckles used as tension members. Brace line posts horizontally and truss in both directions as required, at approved intervals.
- G. Fasten fabric to outer face of posts, except where a property owner's existing fencing occurs directly against and adjacent to the Authority's fencing, fasten chain-link fabric to the inner face of posts. Stretch and securely fasten fabric to posts, rails, and top and bottom tension wire with either tie wires or metal bands. Stretch tension wires tight with turnbuckles spaced at not more than 1,000 foot intervals. Install bottom tension wire on straight grade between posts by excavating the high points of ground; in no case will filling of depressions be permitted. Fasten fabric to end, corner, pull, and gate posts with stretcher bar bands spaced at one foot intervals. Place fasteners at approximately 14 inch intervals on pipes and at approximately 18 inch intervals on tension wires. Insure that the bottom tension wire is installed so that the fence fabric selvage is not more than one inch from the surface of the ground or top of concrete, except where special closures at ground depressions are indicated. Run the bottom tension wire through eye bolts installed in the footing or top of wall at each post.
- H. Barbed wire will not be used.
- I. Provide steel angle metal closures where finish ground surface is more than one inch below the bottom tension wire. Bolt steel angle to fence posts, and install the reinforcing rods and bracing members as approved. Install rods of accepted length vertically. Where drainage ditches cross the fence line, provide concrete ditch lining and steel reinforcing bar grille.
- J. Electrical Ground. Where a power line carrying more than 600 volts passes over fence, install ground rod at the nearest point directly below each point of crossing. Ground all substation fences and gates and perform other electrical grounding as indicated and as specified in Section 16450 - GROUNDING.

3.2 TOUCH-UP AND REPAIR WORK

- A. Remove and replace fencing which is improperly located or is not true to line, grade and plumb within tolerances as indicated.
- B. Repair damaged vinyl-coated components as recommended by the manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02451

GUARD RAIL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies furnishing and installing wood guardrail.

1.2 RELATED WORK

- A. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 06100 – ROUGH CARPENTRY

1.3 SUBMITTALS

- A. Product Data: Provide manufacturers' literature completely describing products.
- B. Shop Drawings:
 - 1. Include cross sectional dimensions of posts, rail elements, and hardware.
 - 2. Include layout drawing showing spacing of posts; changes in grade or direction; and all rail and end sections.
- C. Certificates: Provide certifications of compliance for materials with standards designated.

1.4 QUALITY ASSURANCE

- A. Erect guardrail true to line and grade and to dimensions conforming to Contract Drawings and manufacturers' instructions and recommendations.

PART 2 - PRODUCTS

2.1 WOOD POSTS AND BEAMS

- A. Adhere to Specification Section 06100 for wood material standards.
- B. Where the pavement surface is within 3 feet of the guardrail face beam, install posts before placing the pavement surface.

2.2 BOLTS, NUTS, WASHERS

- A. ASTM A307, galvanized per ASTM A153 and per Specification Section 06100.

2.3 FABRICATION

- A. Fabricate all metal work in the shop. Do not punch, cut, or weld in the field. Where holes are required to be made in the field, drill such holes.
- B. Galvanize components of bolted assemblies separately before assembly. When necessary to straighten sections after galvanizing, perform such work without damage to the zinc coating.

PART 3 - EXECUTION

3.1 ERECTION

- A. Posts:
 - 1. Posts may be driven or set plumb in hand or mechanically-dug holes; then backfill with suitable material placed in layers and thoroughly compacted.
 - 2. When driving posts, use suitable caps and equipment which will not batter or injure the posts. Remove and replace posts damaged or distorted by driving.
 - 3. Where posts are to be set in areas of proposed bituminous concrete surfacing, erect posts prior to laying the surrounding finished surface.
- B. Beams:
 - 1. Erect rail/beam so as to form a smooth continuous face conforming to the required line and grade. If necessary splice beam by lapping in the direction of traffic. Holes in the beam element nearer the posts shall be slotted to facilitate erection and permit expansion. Rail shall make full contact at each splice.
 - 2. Draw bolts tight except at expansion joints. At expansion joints, draw bolts as tightly as possible without preventing the rail elements from sliding past each other longitudinally.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02470

SITE IMPROVEMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishing and installation of miscellaneous site improvements including bicycle racks, protective bollard posts and trash receptacles.
- B. Concrete, concrete reinforcement, miscellaneous metals, and incidentals thereto shall conform to the applicable requirements of Section 03300 Cast-in-Place Concrete and Section 05500 Miscellaneous Metals.

1.2 SUBMITTALS

- A. Shop Drawings
 - 1. Submit shop drawings and samples for the bicycle racks for review and approval prior to fabrication.
 - 2. Submit shop drawings including catalog cuts and literature for benches.
 - 3. Submit shop drawings for bollards.
 - 4. Submit detailed shop drawings of product including overall dimensions and options including catalog cuts, literature and full range of material samples for color selection for trash receptacles.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

- A. The bicycle racks shall be heavy duty high quality steel, with mainframe C.R.W. 2-3/8 inch diameter H.S 3/4, as shown on the Contract Drawings. The bicycle rack shall provide lock supports per ASTM A-36 3/4" H.R. Roundbar. The bicycle racks shall be manufactured by Cora Expo, or approved equal. The entire rack shall be galvanized after fabrication.
- B. Concrete footings shall be Class 4000.
- C. All fastening hardware shall be fabricated from stainless steel conforming to AISI Type 304 and ASTM A193 latest requirements.

2.2 BOLLARDS

- A. Provide bollards with foundation as indicated on the Drawings and on approved shop drawings.

2.4 TRASH RECEPTACLES

- A. Trash Receptacles: Provide 12 gauge galvanized steel trash receptacles, 26 inches square by 40 inches high, with four 5-inch by 21 3/4-inch side receptacle openings at the top; lid locks; 4-inch kick plates; and 12 gauge 4-inch long steel legs with levelers. Provide units complete with retainer bands for holding trash bags, automatic lid locks (all units keyed alike), and with manufacturer's standard anchoring kit for anchoring units

to concrete substrates.

1. Exterior shall be manufacturer's standard painted finish, grey color with white "PITCH-IN" decal applied to two opposite sides, and black on white MBTA "T" decal applied to the other two sides.
- B. Capacity: 36 gallons.
- C. All hardware shall be stainless steel conforming to AISI Type 304 and ASTM A193 latest requirements.

PART 3 – EXECUTION

3.1 BICYCLE RACKS

- A. Work shall be executed only by workmen experienced in the trade.
- B. Obtain exact dimensions, cut, fit and drill as necessary for proper assembly and installation of all work and for attaching items of other trades as required.
- C. The bending method for the rack pipe shall produce a smooth curved pipe without surface buckles, dents, and wrinkles and without excessive thinning of pipe walls.
- D. All steel fabrication, including any welding and dressing, shall be completed before galvanizing.
- E. Welding shall conform to the applicable requirements of AWS D1.1. All groove welds shall be ground flush and smooth.
- F. Install racks level and plumb at the locations indicated on the Contract Drawings and in accordance with approved shop drawings. Coordinate rack installation with installation of the surrounding surface at grade beneath the racks until adjacent work is completed. Repair all damage to the finish in a manner consistent with the manufacturer's recommendations.
- G. Protect racks from paint spatter, splashed concrete and other construction damage by wrapping and taping in place plastic sheeting or heavy kraft paper around the racks until adjacent work is completed. Repair all damage to the painted finish in manner consistent with the manufacturer's recommendations and with the original bicycle rack paint.

3.2 BOLLARDS AND POSTS

- A. Bollards and posts shall be set plumb in hand or mechanically-dug holes; then backfilled with suitable material placed in layers and thoroughly compacted. Align posts to the lines and grades indicated on the Plans. Place posts in a vertical position at the same height.
- B. Bollards shall be installed as indicated on the drawings, as recommended by the approved supplier, and as directed.

3.3 TRASH RECEPTACLES

- A. Preparation: Lay out units in the field for approval from the Engineer for precise location prior to installation.
- B. Installation: Permanently mount unit to substrate with 3/4" square stainless steel anchor bolt.

- C. Protection: Provide temporary protection for completed work until final acceptance. Remove protections and re-clean as necessary, immediately before final acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02513

BITUMINOUS CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the construction of bituminous concrete pavement on prepared subgrade or aggregate subbase or base course, on existing pavement, to the lines, grades, compacted thickness, and cross sections indicated.

1.2 QUALITY ASSURANCE

- A. Job Mix Formulae
1. The composition limits specified in Table 02513-C at the end of this Section are master ranges of tolerances of materials in general. In order to obtain standard texture, density, and stability, furnish to the Engineer for approval a specific job mix formula for the particular uniform combination of materials and sources of supply to be used on each project. Establish the job mix formula in accordance with the requirements of the Massachusetts Highway Department Section M3 Standards.
 2. Should a change of sources of materials be made, furnish a new job mix formula for approval before using the new material.
 3. Two or more job mix formulae may be approved for a particular plant; however, only material conforming to one job mix formula will be permitted to be used on any given day. If the Contractor elects to furnish bituminous concrete from more than one plant, the job mix formulae shall be adhered to by all plants.
 4. When unsatisfactory results or other conditions make it necessary, the Engineer may establish new job mix formulae.
- B. Methods of Sampling and Testing
1. Performance Graded Asphalt Binder
 - a. Viscosity: ASTM D4402.
 - b. Dynamic Shear: AASHTO TP5.
 - c. Flash Point: AASHTO T48.
 - d. Rolling Thin Film Over Test: AASHTO T240.
 - e. Mass Change %: AASHTO T240.
 - f. PAV Aging: AASHTO PP1.
 - g. Specific Gravity: ASTM D 3142.
 - h. Creep Stiffness and M-Value: AASHTO TP1.
 2. Cutback Asphalt
 - a. Viscosity: ASTM D 2170.
 - b. Flash Point: ASTM D 3143.
 - c. Distillation: ASTM D 402.
 - d. Water in Asphalt: AASHTO T55.

- e. Specific Gravity: AASHTO T228.
 - 3. Emulsified Asphalt: ASTM D 977.
 - 4. Mineral Aggregates and Filler:
 - a. Sieve Analysis, Aggregates: ASTM C 136.
 - b. Sieve Analysis, Mineral Filler: ASTM D 242.
 - c. Unit Weight of Aggregate: ASTM C 29.
 - d. Material Passing No. 200 Sieve: ASTM C 117.
 - e. Abrasion of Coarse Aggregate: ASTM C 131.
 - f. Soundness of Aggregates: ASTM C 88.
 - g. Specific Gravity, Coarse Aggregate: ASTM C 127.
 - h. Specific Gravity, Fine Aggregate: ASTM C 128.
 - i. Specific Gravity, Mineral Filler: AASHTO T100 to T133
 - 5. Bituminous Concrete Mixtures:
 - a. Density: AASHTO T166.
 - b. Compaction: ASTM D 2950.
- C. Composition and Compaction Acceptance Tests
- 1. Where plant inspection is maintained, bituminous concrete will be acceptable for use if the specified tests from samples obtained at the production plant indicate conformance to the approved job mix formula.
 - 2. For determination of pavement density, perform in-place density testing by the Nuclear Density Method, ASTM D 2950. The number of tests shall be determined by the MBTA QA lab.
 - 3. The Authority may also require bituminous cores to determine in-place density.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Performance Graded Asphalt Binder: AASHTO M320, grade as indicated, except that the requirements listed under Table 02513-A shall apply.
- B. Cutback Asphalts
 - 1. Medium-Curing: AASHTO M82, grade as indicated.
- C. Bituminous Emulsions
 - 1. Asphaltic Emulsions: AASHTO M140, grade as indicated. Use grade RS-1 for prime coat or tack coat.
 - 2. Cationic Emulsified Asphalt: AASHTO M208, grade as indicated.
 - 3. Clay-Type Asphalt Emulsion: A mineral colloid type of asphalt emulsion containing no chemical emulsifiers and meeting the following requirements:
 - a. Percent water, per AASHTO T59: 40 to 55
 - b. Percent residue by evaporation, per AASHTO T59: 45 to 60
 - c. Percent ash in residue, per ASTM D1010: 5 to 15

- d. Curing time, per Massachusetts DPW standard test procedures: firm set in 48 hours maximum
 - e. Resistance to water, per Massachusetts DPW standard test procedures: no re-emulsification.
4. Protective Seal Coat Emulsion: a homogeneous emulsion consisting of coal tar pitch dispersed in water by means of a mineral colloid, containing no asphaltic materials or chemical emulsifiers; capable of overcoming any separation or coagulation of its components by moderate stirring; meeting the following requirements:
- a. Percent Water, per AASHTO T59: 50 maximum
 - b. Percent non-volatile matter, per ASTM D1010: 48 minimum
 - c. Percent ash in non-volatile matter, per ASTM D1010: 20 to 45
 - d. Percent solubility on non-volatile matter in carbon disulfide: 40 minimum
 - e. Resistance to water, per ASTM D466: no blistering, loss of adhesion, or re-emulsification
 - f. Resistance to petroleum solvents, per ASTM D466 with solvents substituted for water: no penetration nor loss of adhesion.

D. Asphalt Anti-Stripping Additive

1. General: An additive to asphalt to assist in the coating of wet aggregate and to increase the resistance of the bituminous coating to stripping in the presence of water; shall be chemically inert to asphalt (heat stable) and when blended with asphalt shall withstand storage at a temperature of 400 degrees F for extended periods without loss of effectiveness.
2. Composition: An organic chemical compound free from inorganic mineral salts or inorganic mineral soaps, containing no ingredient harmful to the bituminous material or to the operator, and not appreciably altering the specified characteristics of the bituminous material; chemically inert to asphalt.
3. Heat Stability: The compound shall retain its effectiveness after heating in asphalt according to the prescribed method for 24 hours at 350 degrees F.
4. Resistance to Stripping. Treated Bitumen shall coat wet aggregate and shall retain at least 90 percent of the coating after 24 hours of static immersion. There shall be no loss of the retained coating after the immersion has been extended to one week.

E. Coarse Aggregate

1. General: Clean, crushed rock consisting of the angular fragments obtained by breaking and crushing shattered natural rock, free from a detrimental quantity of thin or elongated pieces, and free from dirt or other objectionable materials; having a percentage of wear of not more than 30; surface dry and having a moisture content of not more than 0.5 percent after drying. The use of crushed gravel stone will not be permitted.
2. Gradation: Blended from the stone sizes listed in Table 02513-B. Each stone size shall meet its respective gradation as tabulated in Table 02513-B. Sizes other than primary stone sizes may be used providing they are separately introduced on the cold feed belt and can be shown to be an improvement to the mix. Such usage shall require the prior written approval of the Engineer.

F. Fine Aggregate

1. General: Natural or stone sand or a blend thereof; or a blend of natural sand and stone screenings, or a blend of stone, sand and stone screenings;

- a. Natural Sand: Clean, inert, hard durable grains of quartz or other hard durable rock, free of loam, clay, surface coatings or other deleterious substances.
 - b. Stone Sand: Process from the stone screenings, of either a primary or secondary crusher to produce a product that when used alone or blended in any combination with natural sand shall meet the specified gradation requirements. Wash plant or other equipment used for processing stone sand shall be as accepted by the Engineer.
- G. Mineral Filler: Portland cement, limestone dust, hydrated lime, stone float, or stone dust, 100 percent passing a No. 50 sieve and not less than 65 percent passing a No. 200 sieve. Stone dust shall be produced from crushed ledge stone and shall be the product of a secondary crusher so processed as to deliver a product of uniform grading.
- H. Reclaimed Asphalt Pavement (RAP) shall consist of the material obtained from the highways or streets by crushing, milling, or planing existing hot mix asphalt pavements. This material shall be transported to the hot mix asphalt production facility yard and processed through an appropriate crusher so that the resulting material will contain no particles larger than the maximum aggregate size of the hot mix asphalt mixture in which it will be used. The material shall be stockpiled on a free draining base and kept separate from virgin aggregates. The material contained in the RAP stockpiles shall have a reasonably uniform gradation from fine to coarse and shall be protected from accumulation of excessive moisture and shall not be contaminated by foreign materials. The use of RAP will be permitted provided that the end product is in conformance with the approved job-mix formula. The proportion of RAP to virgin aggregate for base course mixtures and intermediate course mixtures shall be limited to a maximum of 40% for drum mix plants and 20% for modified batch plants. The maximum amount of RAP for surface course mixtures shall be 10%.

2.2 CLASS I BITUMINOUS CONCRETE MIXES

- A. Provide Class I bituminous concrete mixtures composed of mineral aggregate, mineral filler if required bituminous material, and anti-stripping additive if required, proportioned as specified herein to conform to the composition by weight tabulated in Table 02513-C and in the approved job mix formulae.
- B. Use sufficient mineral filler to correct any deficiencies in grading of fine aggregate.
- C. Anti-stripping additive, if required, shall be incorporated and thoroughly dispersed in the bituminous material in an amount equal to the percent by weight established by the Authority's Materials Testing Laboratory. This percent will be based on the efficiency of the additive as determined by laboratory tests. No modification of the established additive concentration will be permitted because of the use of hydrophobic aggregate. The Authority reserves the right to establish as minimum the percentage of additive required. Blend additive in the refinery with the asphalt in the presence of the Inspector.
- D. The percentages stated herein and in Table 02513-C are stated as proportional percentages of integral total aggregate for the mix.
- E. Furnish Intermediate Course, with anti-stripping additive, for use as protective (bottom) course of pavements where indicated.
- F. Furnish Patching Mix with one percent hydrated lime.

PART 3 - EXECUTION

3.1 PLANT REQUIREMENTS

- A. General: The plant used in the production of bituminous concrete shall comply with AASHTO M156, subject to the following additional requirements.
- B. Plant Scales
 - 1. Scales for measuring materials into the mixtures shall be springless dial type and shall be of standard make and design. Scale graduations and markings shall be plainly visible and dials shall be so located as to be easily readable from the operator's normal work station by direct sight or through repeating dials. Parallax effects shall be reduced to the practical minimum with clearance between indicator index and scale graduations not exceeding 0.06 inch. Dials shall be equipped with a full complement of adjustable index pointers for marking the required weight of each material to be weighed into the batch.
 - 2. Digital scales will be either electric/mechanical (load cell and lever system) or fully electronic (all load cell). Digital indicators shall be of standard make and design. Scale graduations and capacity shall be plainly visible on the faceplate of the indicator, if panel mounted. If the unit is of desktop or wall-mount variety, a data sticker shall be located on the side of the unit. Indicators must be located as to be easily readable from the operator's normal workstation by sight.
 - 3. Bitumen scales shall be accurate to 0.05 percent, have minimum graduations not greater than 0.025 percent, and shall be readable and sensitive to 0.0125 percent or less. Scales for any weigh box or hopper shall be accurate to 0.5 percent, have minimum graduations not greater than 0.5 percent and shall be readable and sensitive to 0.25 percent or less. The preceding percentages for both bitumen and aggregate scales are based on the maximum total batch weight of the mixtures.
- C. Testing of Scales
 - 1. All plant scales, including truck scales, shall be tested at the expense of the Contractor by a competent scale technician as follows:
 - a. Annually prior to use in Authority work.
 - b. At intervals of not more than 90 calendar days.
 - c. At any time ordered by the Engineer.
 - 2. A cradle or platform approved by the Engineer for each scale and at least ten standard fifty-pound test weights shall be provided for testing scales whenever directed by the Engineer. The use of a set of test weights for two or more plants will be permitted only when they can be made readily available with no more than an hour's notice.
- D. Automated Batching
 - 1. Automatic proportioning. Batch type mixing plants shall be equipped with approved automatic proportioning devices. Such devices shall include equipment for accurately proportioning batches containing the various components of the mixture by weight in the proper sequence and for controlling the sequence and timing of mixing operations. Interlocks shall be provided which will hold or delay the automatic batch cycling whenever the batched quantity of any component is not within the specified weight tolerance, when any aggregate bin becomes empty or when there is a malfunction in any portion of the control system. The weight setting and time controls shall be so equipped that they may be locked when directed by the Engineer.

2. Automatic Recordation. Recordation equipment shall be provided. Each recorder shall include an automatic printer system. The printer shall be so positioned that the scale dial and the printer can be readily observed at one location by the plant inspector. Use of repeating dials or an additional printer to achieve this condition will be permitted. The printer shall print, in digital form, on a delivery ticket the following data:
 - a. Date mixed.
 - b. Time of batching.
 - c. Tare weight of aggregate weigh box.
 - d. Tare weight of bitumen weigh bucket.
 - e. Accumulative weights as batched for each bin. (Total of last bin will be aggregate total).
 - f. Weight of bitumen.
 - g. Total weight of mix in truck (Pay weight). This printed ticket shall be used in lieu of truck scale weights.
3. Equipment Failure. If at any time the automatic proportioning of recording system becomes inoperative, the plant will be allowed to batch materials manually for a period not in excess of two working days. Manual batching for longer periods will require written permission of the Engineer.
4. Batching Controls
 - a. The batching controls shall meet the following delivery tolerances with respect to the various components weighed in each batch:
 1. Tare Weight of Aggregate Weigh Box: + 0.5 percent of total batch weight.
 2. Tare Weight of Bitumen Weigh Bucket: + 0.1 percent of total batch weight.
 3. Individual Aggregate Components: + 1.0 percent of total batch weight.
 4. Combined Aggregate Components: + 1.5 percent of total batch weight.
 5. Mineral Filler: + 0.5 percent of total batch weight.
 6. Asphalt: + 0.1 percent of total batch weight.
 - b. The total weight of the batch shall not vary more than plus or minus 2 percent from the theoretical design weight.
 - c. If directed by the Engineer, provisions shall be made for locking controls against tampering.

E. Plant Laboratory

1. A building shall be furnished at the site of the producing plant suitable for the housing and use of equipment necessary to carry on the various tests required and for recording and processing test results. This building shall be for the exclusive use of the Engineer or his representatives for testing and recording purposes.
2. The building shall have a minimum floor area of 100 square feet; the least dimension to be 6 feet. Windows and doors shall be adequately screened; satisfactory lighting, heating and water shall be supplied. A table, chairs, desk and work bench shall be provided. Provision shall be made for the safe performance of extraction test determinations by providing an adequate exhaust fan and suitable means of disposing of used solvent and other waste.
3. If the Engineer permits, the plant laboratory may be part of another building in which case it shall be entirely partitioned off from the remainder of such building.
4. Testing equipment shall be furnished as follows and installed in the building for use in testing the materials and mixtures supplied by the Plant for the work:
 - a. One Approved Rotary Extractor.
 - b. One Coarse Aggregate Sieve Shaker, power driven with a minimum clear sieve area of 324 square inches. The shaker shall be attached to a firm anchorage.

- c. One each of the following square opening screens for coarse aggregate shaker: 2 inch, 1-1/2 inch, 1 inch, 3/4 inch, 1/2 inch, 1/8 inch, No. 4 and No. 8.
 - d. One Fine Aggregate Sieve Shaker, power driven and independent of the coarse aggregate shaker, for eight inch minimum diameter sieves.
 - e. One each of the following standard eight inch minimum diameter square opening sieves: 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, No. 50, No. 100, and No. 200, with pan and cover.
 - f. One Sample Splitter with a minimum capacity of one cubic foot. It shall be the clam shell type and the chute width shall be adjustable from a minimum of 1/2 inch up to 2 inches.
 - g. One Solution Balance, 20 kilogram capacity, weighing directly to 1 gram, with two weighing beams and a taring beam; tare capacity to be 2 kilograms; weighing beams to read 1000 grams by 100 gram divisions and 100 grams by 1 gram division. Additional matching weights (one 1 kg., two 2 kg., one 5 kg., and one 10 kg.) shall be provided to fulfill the capacity of 20 kilograms. The platform to be 11 inches in diameter.
 - h. One Approved Scale with a minimum capacity of 2000 grams and with a sensitivity of 0.50 grams
 - i. Two Approved Dial Type Thermometers, range 50 degrees F. to 500 degrees F.
 - j. One Approved Hot Plate
5. Approval of a plant will be contingent upon approval of the aforementioned requirements for Plant Laboratory, including the building and appurtenances, furnishings, facilities including heat, light, power and water, the testing equipment, and any other incidentals.
- F. Sampling facilities. Adequate and convenient sampling facilities shall be provided to allow the Inspector to obtain representative samples from the full width and depth of the discharge area of each aggregate bin. The sampling tray shall be structurally supported during the sampling operation. Access to the sampling facilities shall be provided requiring no more difficulty than that to climb a ladder leading to a secure platform with railings.
- G. Inspection. The Engineer or his authorized representative shall have access at any time to all parts of the plant for:
- 1. Inspections of the conditions and operations of the plant.
 - 2. Confirmation of the adequacy of the equipment in use.
 - 3. Verification of the character and proportions of the mixture.
 - 4. Determination of temperatures being maintained in the preparation of the mixtures.
 - 5. Inspection of incidental related procedures.

3.2 PREPARATION OF MIXTURES

- A. Preparation of Asphalt Cement. Place bituminous materials in the mixer at a temperature between 275 and 375 degrees F., as directed.
- B. Preparation of Mineral Aggregate. Thoroughly dry and heat aggregates before placing them in the mixer. Control the temperature of the aggregates so that the temperature of the complete mixture shall be within the range specified in paragraph C. below.
- C. Preparation of Bituminous Concrete Mixtures. Combine the heated and dried aggregates and mineral filler and convey them into the mixer in the proportionate amounts of each size required to meet the job mix formula. After these materials have been mixed for the specified dry-mixing time, add the

asphalt cement and mix for the specified wet-mixing time. Measure asphalt cement by weight or by an approved metering device. The temperature of the mixture when discharged shall be between 275 and 325 degrees F.

3.3 TRANSPORTATION AND DELIVERY OF MIXTURES

- A. Vehicles for transportation of mixtures from the plant to the jobsite shall be clean of all foreign materials, tight, and evenly and lightly coated with a suitable thin oil or approved soap solution. No excess of lubricant shall be allowed to accumulate in low spots in the body. When necessary, vehicles shall be insulated so that the mixture is delivered for placement at the proper temperature.
- B. Arrange dispatching of trucks from the plant so that all material which is delivered to the jobsite during any day shall be placed and shall have received final compaction before nightfall of the same day, unless satisfactory artificial light is provided.
- C. Do not transport mixtures such a distance that segregation of the ingredients takes place or that any crust is formed on the top, bottom, or sides of the mixture which will not crumble or flatten out when the mixture is dumped or which might otherwise be deleterious to the mixture in place on the work.
- D. During transportation of the mixture from the plant to the spreader at the jobsite, keep the mixture fully covered at all times with canvas or other suitable material of sufficient size and thickness to furnish complete protection.
- E. Deliver the mixture to the jobsite at a temperature governed by the air temperature in the shade and away from artificial heat, as follows with a tolerance of plus or minus 20 degrees F.:

1. Normal Layered Construction:

Air Temperature	Delivered Mix Temperature
35 degrees F.	300 degrees F.
40 degrees F.	290 degrees F.
65 degrees F.	280 degrees F.
90 degrees F. and Over	275 degrees F.

2. Deep Lift Paving (3 inches and over), Base and Binder Courses only:

Air Temperature	Delivered Mix Temperature
35 degrees F.	280 degrees F.
40 degrees F.	270 degrees F.
65 degrees F. and over	260 degrees F.

3.4 PRIME COAT (OR TACK COAT)

- A. Where an existing hardened surface is used as a base for new pavement, or elsewhere where the surface to receive bituminous pavement is, in the Engineer's judgment, unsatisfactory to receive the pavement, give the surface a prime coat of bituminous material of the kind and grade indicated or directed. Where unsatisfactory conditions, requiring application of prime coat, are due to the fault of the Contractor, provide the prime coat at no additional expense to the Authority.
- B. Clean the existing surface of all foreign matter and loose material before applying prime coat. Apply the prime coat by mechanical means at the rate indicated or directed.

3.5 SPREADING AND FINISHING

A. General

- 1. Place bituminous concrete in courses as indicated.
- 2. When an existing surface or new base, upon which the bottom course is to be laid, contains unsatisfactory irregularities, in the Engineer's judgment, eliminate such irregularities by placing and compaction of mixture, so as to furnish a surface with true contour and grade before placing any specified bottom course.
- 3. Paint thoroughly the contact surfaces of curbing, manholes, catch basins, and other appurtenant structures in pavement, with a thin coating of bitumen immediately prior to placing any mixture against them.
- 4. Give special attention to proper testing of the surface of each course with a straightedge. Finished surfaces shall be even and uniform throughout.
- 5. Remove and replace with new mixture any mixture which becomes loose or broken, mixed with dirt, or defective in any way. Finish and compact the repaired area to conform to the surrounding area. Remove and replace areas of one square foot or more showing an excess of bitumen.
- 6. No mixture shall be placed unless the breakdown and intermediate rolling can be completed by the time the material has cooled at 175 degrees F., and provided that the density of the pavement attains at least 95 percent of the laboratory compacted density.

B. Spreading and Finishing Equipment

- 1. The equipment for spreading and finishing shall be mechanical, self powered pavers, capable of spreading and finishing the mixture to line, grade, width, and crown by means of fully automated controls for both longitudinal and transverse slope.
- 2. The pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. They shall be equipped with a quick and efficient steering device and shall have reverse as well as forward traveling speeds.
- 3. The pavers shall employ mechanical devices such as equalizing runners, straight edge runners, evener arms or other compensating devices to adjust the grade and confine the edges of the mixture to true lines. They shall be capable of spreading the mixture without segregation in layers to the depths and widths required. They shall be equipped with blending or joint leveling devices for smoothing and adjusting all longitudinal joints between adjacent strips or courses of the same thickness.
- 4. The screed shall be adjustable for profile and shall have an indicating level attached.

5. An approved device will be required for heating the screed to the temperature required for the laying of the mixtures without pulling or marring.
6. The term "screed" includes any "strike-off" device operated by cutting, crowding, or other practicable action, which is effective on the mixtures at permissible workable temperatures without tearing, shoving, or gouging and which produces a finished surface of the evenness and texture required.
7. The pavers employed on projects requiring in excess of 15,000 tons shall operate by the use of a sensing grid for operation to a stringline and matching shoe for joints.
8. The paver shall be provided with a "ski" which may be employed for paving on the previously laid bituminous concrete base, or binder as directed or permitted by the Engineer.
9. The paver employed on deep lift construction shall be capable of satisfactorily feeding the mix without intermittent stopping during the discharge of the mix from the trucks into the paving machine.
10. If during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other permanent blemishes in the pavement which are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued and other satisfactory spreading and finishing equipment shall be provided.
11. Complete all compaction rolling before the bituminous concrete temperature drops below 185 degrees Fahrenheit.

C. Machine Spreading

1. Deposit mixtures in the approved mechanical spreader, spread immediately, and strike off in a uniform layer to the full width required and to such depth that each course, when compacted, shall have the required thickness and shall conform to the indicated grade and cross section contour.
2. Deposit mixture in the center of the hoppers, exercising care to avoid overloading and spilling. Operate the pavers, while the mixture is being spread, at a speed which will produce a uniform surface texture.
3. Immediately after each course is screeded and before roller compaction is started, check the surface, adjust any irregularities, remove accumulation from the screed by rake or lute, and remove and replace any unsatisfactory spots in the course. Correct irregularities in line and grade along outside edges by addition or removal of material before the edge is rolled. Indiscriminate casting of mix on the new screeded surface, where irregularities are not evident, will not be permitted.
4. All edges shall be true and uniform.

D. Hand Spreading

1. Spreading by hand methods will be permitted only for particular locations in the work which because of irregularity, inaccessibility or other unavoidable obstacles do not allow mechanical spreading and finishing.
2. When hand spreading is permitted, place the mixture by dumping on approved steel dump sheets outside the area upon which it is to be spread; or by other approved methods. Immediately thereafter, distribute the mixture into place by means of hot shovels, and spread it with hot rakes or lutes in a loose layer of uniform density and correct depth. Tines of the rakes shall be not less than 1/2 inch longer than the loose depth of mixture, and spaces between tines shall be not less than 1 inch.

3. Do not dump loads faster than they can be properly handled by the shovelers, and do not distribute the dumped load faster than it can be properly handled by the rakers. Rake carefully and skillfully to avoid segregation and so that, after the first passage of the roller over the raked mixture, no back patching will be necessary.

3.6 COMPACTION

A. Compaction Equipment

1. After the paving mixture has been properly spread, initial compaction shall be obtained by the use of power rollers of approved design and weight per inch width of roller. The rollers shall be steel-wheeled supplemented with pneumatic-tired rollers where required, or where permitted, vibratory rollers.
2. Steel wheel rollers for initial and intermediate rolling shall have a weight of not less than 240 pounds per inch width of tread; for top course, minimum weight shall be 285 pounds per inch width of tread.
3. Pneumatic-tired rollers, when conditions warrant, shall be provided with devices capable of varying tire pressures. When the mixture being spread by each paver requires more than the minimum number of steel wheel rollers, at least one of the additional rollers for each paver shall be a pneumatic-tired roller, except where the use of a vibratory roller is permitted. When using a pneumatic-tired roller, care shall be taken that initial rolling by the steel wheel roller be restricted to one pass where upon the pneumatic-tired roller shall immediately follow the initial steel wheel rolling.
4. Vibratory steel drum rollers shall not be used on top course mix or structures. The machine shall have a device registering the number of vibrations per minute and a tachometer shall be provided to the Engineer in order to check the operation of the roller.
5. The V.P.M. on base and binder course material shall be a minimum of 1400 V.P.M. and a maximum of 1500 V.P.M., or in accordance with the recommendations of the manufacturer, when approved by the Engineer.
6. The vibratory roller shall be operated with the vibrating drum in the direction of the paver and the vibrating action of the roller shall be completely shut off during change of direction and care exercised to start this action only when the roller is in motion. In order to prevent creeping and aggregate crushing during rolling of layered pavement, care shall be taken not to exceed one pass in the direction of the paver with vibrator in action and one return in a static condition and for deep lift pavements these passes shall not exceed two operations in each direction, except that the number of vibratory passes in either direction may be varied in order to obtain the required density.
7. A smoothing roller of either the pneumatic-tired or steel wheeled type shall be used immediately behind the last pass of the vibrating roller. The use of a vibratory roller may be suspended by the Engineer if, in his opinion, unsatisfactory results are being obtained and no further mix shall be spread until a sufficient number of approved rollers are on the project to satisfy the compaction requirements.
8. A plate shall be attached to each roller which shall show the ballasted and unballasted weight per inch width of tread.
9. The number of rollers and passes required shall be governed by the compaction results; however, at least one steel roller shall be provided for each paver employed on the paving operation. This is independent of the requirements of the pneumatic-tired roller.

B. Compaction Procedures

1. Roll the mixture longitudinally, diagonally, and transversely as may be necessary to produce the required contour for surface. Start longitudinal rolling at the side and proceed toward the center of the pavement, except on superelevated curves start at the low side and progress to the high side, overlapping on successive trips by at least 12 inches.
2. Continue the rolling so that all roller marks, ridges, porous spots, and impressions are eliminated and the surface has the required contour and grade. Maintain the motion of the rollers at all times slow enough to avoid any displacement of the hot mixture. Correct any displacement or marring of the surface resulting from reversing the direction of the roller or from any other cause.
3. To prevent adhesion with the mixture, keep the wheels of steel rollers lightly moistened with water. Excess water or oil for this purpose will not be permitted.
4. To prevent "rolloff" of the pavement edges and longitudinal joints on deep lift paving, leave the outer eight inches of the deep lift mixture unrolled until the temperature of the mix ranges between 150 and 180 degrees F., whereupon compact it with a steel roller.
5. Along curbs, structures, and all places not accessible with a roller, compact the surface thoroughly with mechanical tamping devices, smooth and true to established line, grade, and contour.
6. Density of completed pavement shall not be less than 95 percent of the density obtained from laboratory compaction of a mixture composed of the same materials in like proportions.

3.7 JOINTS

- A. Place mixture as nearly continuously as possible. Pass the roller over the unprotected end of newly placed mixture only when the placing of the course is to be discontinued for such length of time as will permit the mixture to attain initial stability. In all such cases, including the formation of joints as herein specified, provide for proper bond with the new surface for the full specified depths of the courses.
- B. Maximum length of longitudinal joint shall be such that the temperature of the mixture at the joint shall not be less than 150 degrees F. when the abutting mixture is placed.
- C. Make longitudinal and transverse joints in a careful manner, well bonded and sealed, true to line and grade. Where directed, cut back longitudinal and transverse joints to expose the full depth of the course and, when laying of the course is resumed, paint the exposed edge of the joint with a thin coat of bitumen. Carefully rake the new mixture against the joint, then thoroughly tamp and roll.
- D. In making joints along any adjoining edge such as curb, gutter, or an adjoining pavement, and after the mixture is spread by the paver, place by hand just enough of the hot material to fill any space left open. Set up these joints with the back of a rake at the proper height and level to receive the proper compaction.
- E. Stagger longitudinal joints in successive courses so that there is a minimum of one foot overlap between longitudinal joints in adjacent courses.
- F. Overlap the rolling of successive widths of courses so as to leave smooth, uniform joints and cross sections.

3.8 FIELD QUALITY CONTROL

- A. Test the plane of the finished surfaces of base, binder, and surface courses with a 16-foot straightedge, except use a 10-foot straightedge on vertical courses and on the top course of resurfaced streets which contain manhole covers, valve boxes, and the like.
- B. Carefully apply the straightedge immediately after the first compaction by rolling, and from then on as may be necessary until and after the final compaction of the material in place. Hold the straightedge in successive positions parallel to the road centerline and in contact with the road surface; check the entire area from one side of the pavement to the other.
- C. Correct irregularities which vary 3/8 inch from a true finished surface in base and binder courses, and 1/4 inch in top courses.
- D. Irregularities which may develop before the completion of rolling and while the material is still workable, may be remedied by loosening the surface mixture and removing or adding material as necessary. Should any unsatisfactory irregularities or defects remain after final compaction, correct the defective work by removing and replacing with new material to form a true and even surface.

3.9 OPENING TO TRAFFIC

- A. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained, and the material has cooled sufficiently to prevent distortion or loss of fines, and the pavement has achieved a maximum temperature of 140 degrees F.
- B. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

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TABLE 02513 – A

SPECIFICATION REQUIREMENTS FOR PERFORMANCE GRADED ASPHALT BINDERS

TESTS AT PG TEMPERATURE deg. C.	PG 64-22	PG 64-28	PG 52-34
Viscosity, Brookfield 135 degrees C Pa-sec.	3 Max.	3 Max	3 Max
Dynamic Shear, 10 Rad./sec. Kpa	1.00 Min.	1.00 Min.	1.00 Min.
RTFO, % Change	1.0 Max.	1.0 Max.	1.0 Max.
RTFO, Residue Dynamic Shear, KPa	2.20 Min.	2.20 Min.	2.20 Min.
PAV Residue Dynamic Shear, KPa	5,000 Max.	5,000 Max.	5,000 Max.
Creep Stiffness (s), MPa	300 Max.	300 Max.	300 Max.
M Value	0.300 Min.	0.300 Min.	0.300 Min.

TABLE 02513-B

**GRADATION REQUIREMENTS FOR COARSE AGGREGATE
(PERCENT BY WEIGHT)**

Nominal Size of Stone Sieve Size	2 in.	1-1 /2 in.	1-1 /4 in.	3 /4 in.	1 /2 in.	3 /8 in.
2-1/2"		100				
2"	90-100	100				
1-1/2"		95-100	100			
1-1/4"	25-50		85-100			
1"		35-70		100		
3/4"	0-15	0-25	10-40	90-100		
5/8"					100	
1/2"	0-5		0-8	10-50	85-100	100
3/8"				0-20	15-45	85-100
No. 4				0-5	0-15	20-50
No. 8					0-5	0-15
No.16						0-5

TABLE 02513-C**MASTER RANGES FOR JOB MIX FORMULAE
(PERCENT BY WEIGHT)**

Standard Sieves	Base Course	Binder Course	Intermediate Course	Top Course	Dense Mix	Surface Treatment	Patching Mix
2" 1-1/2"	100 90-100						
1" 3/4"	65-90 55-80	100 80-100	100 76-98				
1/2" 3/8"	40-65	55-80	66-86 57-77	100 80-100	100 80-100	100	100 90-100
No. 4 8	20-45 15-33	28-50 20-38	40-60 26-46	50-76 37-54	55-80 48-63	80-100 64-85	50-65 24-36
No. 16 30	8-17	8-22	17-37 11-27	26-40 17-31	36-49 24-38	46-68 26-50	14-28 8-25
No. 50 100 200 Bitumen	4-12 0-4 4-5	5-15 0-5 4.5-5.5	7-19 6-16 3-6 4.5-6.0	10-23 5-16 2-7 5.5-7.0	14-27 6-18 4-8 7-8	13-31 7-17 3-8 7-8	5-21 3-15 2-8 4-6

TABLE 02513-D**ACTION LIMITS FOR AGGREGATE GRADATIONS AND BINDER CONTENT**

SIEVE DESIGNATION/BINDER CONTENT	ACTION LIMIT
Passing No.4 Sieve and Larger Sieve Sizes	JMF Target +/- 6%
Passing No. 8 Sieves	JMF Target +/- 5%
Passing No. 16 to No. 50 Sieves (Inclusive)	JMF Target +/- 3%
Passing No. 100 Sieve	JMF Target +/- 2%
Passing No. 200 Sieve	JMF Target +/- 1%
Binder	JMF Target +/-0.3%

Deviations from the final approved mix design for bitumen content and gradation of aggregates shall be within the action limits for individual measurements as specified in Table 02513-D. The limits still will apply if they fall outside the master grading band in Table 02513-C.

END OF SECTION

SECTION 02524

CURBS, GUTTERS AND WALKS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the construction of Portland cement concrete curbs, gutters, and walks.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02300 - EARTHWORK
 - 2. Section 03300 - CAST-IN-PLACE CONCRETE; for concrete, reinforcement, and incidentals pertaining thereto.
 - 3. Section 09360 - MODULAR TACTILE SURFACES

1.2 QUALITY ASSURANCE

- A. Tolerances. Construct concrete surfaces within 1/4 inch of the indicated elevation, and deviating not more than 1/8 inch from a ten-foot straightedge placed anywhere on the surface.
- B. Provide strict compliance with requirements for air entrainment and curing.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete: Section 03300 - CAST-IN-PLACE CONCRETE, 4,000 psi.
- B. Preformed Joint Filler: AASHTO M153.
- C. Hot-Poured Joint Sealer: AASHTO M173.
- D. Gravel Borrow: Section 02300 - EARTHWORK.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate for and prepare the subgrade as specified in Section 02300 - EARTHWORK, true to the indicated grade and cross section.

- B. Place and compact a foundation of gravel borrow to the indicated thickness upon the prepared subgrade.
- C. Test completed gravel foundation with a template supported on the side forms, prior to concreting.

3.2 JOINTS

- A. Expansion Joints. Construct expansion joints at intervals as indicated but not exceeding 30 feet, and wherever new concrete abuts existing construction.
- B. Contraction (Control) Joints. Using a grooving tool having a depth equal to at least 1/4 the sidewalk thickness, groove sidewalks in uniform intervals not exceeding six feet. Sidewalk Control Joints should also be saw cut after concrete has set overnight.

3.3 FINISHES

- A. Pedestrian and Wheelchair Accessible Ramps: Non-slip finish with a Tactile Warning Surface tile as defined in Specification Section 09360.
- B. All Other: Broom finish.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

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END OF SECTION

SECTION 02525

GRANITE CURBS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishing and installing granite curb, granite curb transitions and sloped granite edging, as indicated on the Contract Plans and in accordance with these Specifications or as a replacement for existing curb which is damaged or removed during the course of the work.
- B. The work under this section also includes removing and resetting, and removing and discarding existing curbing, as indicated on the contract plans and/or as directed by the Engineer.

1.2 QUALITY CONTROL

- A. Tolerances. Place curbing within ¼ inch of the indicated elevations or dimensions, deviating not more than ¼ inch from a ten-foot straight-edge placed anywhere on the surface.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All curbing work shall be in accordance with the Commonwealth of Massachusetts, Massachusetts Highway Department "Standard Specifications for Highways and Bridges," Section 500. Curb and Edging, and Materials Section M9.04.1, Granite Curb, Type VA 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavate for and prepare the subgrade as specified in Section 02300, true to the indicated grade and cross section.
- B. Place and compact a foundation to the indicated material and thickness upon the prepared subgrade.
- C. Test the complete foundation with a template supported on the side forms, prior to placing the curbing.
- D. Install High-Early strength concrete setting bed as indicated on the contract plans and/or as directed by the Engineer.
- E. All transition curbing shall be cut at the end adjoining adjacent curbing so that ends are vertically flush.
- F. The corner curbs shall be cut so they are constructed with flush joints.
- G. Transition curbing at ramps, as shown on the Contract Plans.

- H. Curbing which is to be removed and reset, will be installed as indicated above.
- I. Curbing which is removed and stacked and not wanted by the Authority shall be satisfactorily disposed of by the Contractor.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- B. No payment will be made for the replacement and removal from the site of curb which is damaged in the course of the work or for the resetting of curb which is removed, displaced from existing line or grade, or otherwise disturbed during the course of the work.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02577

PAVEMENT MARKING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the furnishing and application of reflective paint for pavement markings.
- B. All work shall be in accordance with the Commonwealth of Massachusetts, Highway Department (MHD) Standard Specification for Highways and Bridges.

1.2 SUBMITTALS

- A. Submit a schedule of pavement marking operations to the Engineer, for approval, not less than seven days prior to the proposed date of application of any pavement marking.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Acrylic Striping: Comply with MHD requirements. Pavement striping material shall be an acrylic type, low VOC, water based paint.
 - 1. White Color: Composition by weight:
 - Pigment: 58 percent minimum.
 - Total Solids: 76 percent minimum.
 - Titanium Dioxide: 1 pound/gallon minimum.
 - 2. Yellow Color: Composition by weight:
 - Pigment: 56 percent minimum.
 - Total Solids: 75 percent minimum.
 - Titanium Dioxide: 0.3 pounds/gallon minimum.

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. Use standard commercial-quality equipment of the type normally required for application of pavement markings. Operate the equipment in accordance with the manufacturers' instructions. Truck-mounted equipment is approved for the application of pavement marking except where in the Engineer's judgment travel will be unreasonably delayed or the quality of the work performed by the equipment is unsatisfactory.

3.2 LAYOUT OF WORK

- A. The Engineer will provide at a convenient location on the roadway a line of reference for use by the Contractor in establishing the location of markings. This line of reference will be at a maximum of 50-foot intervals by means deemed satisfactory by the Engineer. Follow this line of reference without deviation. Reapply any line deviating from the establishing control or of incorrect width, as directed by the Engineer.

3.3 APPLICATION OF MARKINGS

- A. Apply pavement markings as follows:

MATERIAL	MATERIAL APPLICATION TEMPERATURE DEGREES F	LINE THICKNESS MILS	REFLECTORIZED BEAD APPLICATION
M7.01.08	180-195	15	6 LBS/GAL
M7.01.09	180-195	15	6 LBS/GAL
M7.01.10	40-120	15	6 LBS/GAL
M7.01.11	40-120	15	6 LBS/GAL
M7.01.03	400-425	6-188	1 LB/20 SF DROP ON
M7.01.04	400-425	5-188	1 LB/20 SF DROP ON

- B. Use no thinners for the above-listed pavement marking applications except in accordance with the manufacturer's specifications and at the direction of the Engineer.
- C. Heat no paint or pavement marking material above the temperature marked on the container.
- D. Apply markings only in seasonable weather and in accordance with good painting practices. The surface shall be dry and free of sand, grease, oil or other foreign substances prior to the application. Prepare the surface to accept the application as part of the work of this section, with no additional compensation. The Engineer will make the final determination for all of the foregoing.
- E. Bituminous concrete pavements shall have been in place for 48 hours prior to the application of pavement markings. When it is necessary to expedite the flow of traffic, the Engineer may reduce the waiting period as is deemed necessary.
- F. The ambient (air) temperature for paint application is to be a minimum of 45 Degrees F and rising at the time of marking operations. If work has started and air temperatures fall below 45 Degrees F and continuous cooling is indicated, work shall be stopped. In cool weather conditions, temporary drops down to 40 Degrees F will be tolerated providing temperatures also vary upwards. Sustained striping (greater than one hour) at 40 Degrees F shall not be allowed. Starting work at air temperatures lower than 45 Degrees F shall not be allowed.

- G. If for any reason material is spilled or tracked on the highway, or any markings applied by the Contractor, in the Engineer's judgment, are of incorrect width or pattern or fail to conform to the established line of reference, remove such material by a method that is not injurious to the roadway surface and is acceptable to the Engineer, clean the roadway surface, prepare the surface for a reapplication of markings, and reapply the markings as directed without additional compensation for any of the foregoing corrective operations.

3.4 PROTECTION OF MARKINGS

- A. Protect markings until sufficiently dry to bear traffic on highways that are open to traffic. Protect markings by traffic cones not less than 18 inches in height except in the case of markings which cure to a no-track condition in 180 seconds or less. In the latter case, protection may be provided by a convoy of vehicles with suitable warning devices to warn overtaking or on-coming traffic that the pavement marking operation is in progress.
- B. Broken Lines. On tangents and on curves of 1000 foot radius or greater place at least one cone on every other bar. On curves of less than 1000 foot radius place one cone on every bar unless otherwise directed by the Engineer.
- C. Solid Lines. On tangents and on curves of 1000 foot radius or greater space cones not over 50 feet apart and on curves of less than 1000 foot radius space cones not over 50 feet unless otherwise directed by the Engineer. On edge lines adjacent to the median, wider spacing may be used as directed by the Engineer. In order to control the proper positioning of the cones during the drying period, assign sufficient personnel as determined by the Engineer. Such control is dependent on traffic density, cone widths, and the like.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
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END OF SECTION

SECTION 02650

EXISTING SITE UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the maintenance, support, protection, relocation, reconstruction and adjustment-to-grade, restoration, and abandonment of existing utilities affected by the construction work.
- B. For the purpose of this Section, utility means any public or private service, such as electric light and power systems; gas distribution systems; telephone, telegraph, cable television and other communication services; water distribution; storm drain and sanitary sewer services; police and fire communication systems; street lighting and traffic signs and signals; parking meters; and steam distribution systems.

1.2 GENERAL

- A. The location of existing underground pipes, cables, conduits, and structures as shown on the Existing Utilities Plans have been collected from the best available sources and the Authority together with its agents does not imply or guarantee the data and information in connection with the underground pipes, cables, conduits, structures and other parts as to their completeness nor their locations indicated. The Contractor shall contact utility owners and request marking location of all their lines in the work areas. The Contractor shall assume there are existing water, gas, electric and other utility connections to every building and structure, whether they appear on the Drawings or not. Any expense and/or damage to these shall be the responsibility of the Contractor.
- B. Foundations and lines for services, police and fire alarm boxes, street and pedestrian lights, and traffic signals may not be shown on the Drawings. The appropriate utility companies and/or agencies shall be contacted and consulted for locations of the above.
- C. All utility companies, public and private, shall be notified, including those in control of utilities not shown on the Drawings (see Chapter 370, Acts of 1963, Massachusetts) prior to designing, excavating, blasting, installing, backfilling, grading, or restoring pavement. The Contractor shall premark the area of excavation or work and notify the Dig Safe Center (1-888-DIG-SAFE) at least three business days prior to any excavation or work. In addition, notification shall be given to all affected private and/or public utilities to permit street marking of their lines.
- D. Some unknown utilities may exist in the areas to be excavated. The Contractor shall take the necessary precautions when excavated in areas of potential utility conflict. Precautions may include, but are not limited to soil vacuum excavation, hand digging, or other non-destructive means. The Contractor shall further be prepared to pre-excavate or pre-trench to locate potential utility conflicts prior to performing such activities as, but not limited to jacking, tunneling, installing temporary excavation support, etc.

- E. Interruptions of utilities shall not be permitted without written consent of the utility owner. The Contractor shall coordinate with all utilities and provide all temporary utilities and connections to avoid interruptions.

1.3 SUBMITTALS

- A. Submit working drawings and, if applicable, shop drawings showing the details, procedures, and scheduling for performance of the existing utility work. Show actual location of existing utility facilities; interferences which these facilities present to the new work; location of settlement markers; method proposed to proceed with the construction; details of proposed support systems; and, if applicable, method of testing and procedure for restoration.
- B. Submit written evidence of affected utility owners' approval of the details, procedure, and scheduling.
- C. Provide written notice two weeks in advance of the intended date to commence operations, to affected utility owners and parties having surface, subsurface or overhead structures in the construction area. Furnish the Engineer copies of all notices.
- D. If a settlement or movement monitoring system is required, submit copies of readings to the Engineer and affected utility owner within 24 hours of the reading.
- E. Submit to the Engineer, certifications from the respective suppliers that the products to be incorporated in the work are in conformance with applicable requirements.

1.4 NOTIFICATION

- A. Notify the appropriate utility agencies and the Engineer at least 48 hours prior to starting any work involving or adjacent to utility service facilities.
- B. Where an existing utility facility is encountered that is not indicated or that is determined to be a different utility facility than that indicated, promptly notify the Authority. The Contractor is responsible for determining the owner of the facility and the disposition of the facility.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products and materials shall be as specified in the Construction Specifications.

2.2 SALVAGE MATERIAL

- A. Reuse materials designated to be salvaged, provided they are inspected and approved by the respective utility owner and the Engineer. Salvaged material not designated for reuse or returned to the owner shall become the property of the Contractor.
- B. Maintain and have available for inspection by the Engineer a detailed record, including signed vouchers and receipts, of new and salvaged materials received from, used, or returned to the various utility owners.

PART 3 - EXECUTION

3.1 GENERAL

- A. Conform to the specifications and standard practices of the affected utility owners. Coordinate with utility owners, which work shall be done by the Contractor and which work shall be done by utility owner at Contractor's expense. Ensure continuity of all existing utility services to all users except when the utility owner determines that temporary interruption is required.
- B. Unless otherwise indicated or authorized in writing by the Engineer, maintain all utility facilities complete in place.
- C. Abandoned Facilities
 - 1. Demolish and remove abandoned utility facilities in conflict with work.
 - 2. Do not undertake demolition or removal of the service until written approval for such work has been obtained from the utility owner.
 - 3. When abandoned facilities are indicated to be left in place, plug, or cap or bulkhead the ends of conduits and pipes, as indicated. Pipe or conduit greater than 15-in in diameter shall be completely filled with Controlled Density Fill. Remove abandoned utility manholes, junction boxes, and similar structures to a minimum depth of two feet below finish grade and fill the remaining void with sand or select fill, as specified in Section 02300 - EARTHWORK, after the plugging, or capping, or bulkheading of conduits and pipes has been completed. Puncture or break the bottom slabs of manholes and similar structures to provide drainage. Backfill and compact excavations resulting from removal of utility facilities, as required.
 - 4. Bulkheads for pipes greater than 15-in in diameter shall be constructed of solid concrete masonry bricks or solid concrete masonry blocks with full mortar joints. The bulkhead shall be watertight. Recess the bulkhead 1/2-in and seal with non-shrink grout.
- D. Provide, install, and maintain all temporary facilities required to provide interim utility service when a utility facility is to be relocated and when a utility facility to be replaced is abandoned prior to replacement.
- E. Where an existing utility facility is encountered which is not indicated, or which is determined to be a different utility service than that indicated, promptly notify the Engineer who will assist in determining the owner of the facility and the disposition of the facility.
- F. If, upon exposure, the condition or location of a facility to be supported complete-in-place is found by the Engineer to be unsafe for support or for maintenance of service, replace or reconstruct the facility as required, with prior approval of the Engineer and the utility owner.

3.2 SETTLEMENT OR MOVEMENT

- A. Provide suitable settlement or movement monitoring systems where indicated or required by the affected utility owner.
- B. In case of settlement or other movement which might cause damage, take immediate remedial measures to correct the conditions and damages caused by the settlement.

3.3 RECONSTRUCTION AND ADJUSTMENT-TO-GRADE

- A. Relay, reset, or otherwise reconstruct miscellaneous structures and facilities as indicated.
- B. Adjust-to-grade manholes and inlets as indicated, by raising or lowering the upper portion thereof.
- C. Backfill under utilities supported or exposed using controlled density fill to allow for the proper support and compaction under the utility. Contractor shall coordinate with the utility owner to determine the acceptability of the use of controlled density fill and shall work with the Owner to develop alternate means to ensure the proper backfill and compaction under the utility.

3.4 AS-BUILT UTILITY LOCATION AND CONDITION SURVEY

- A. For each new or relocated utility installed, including those installed or relocated by others in the Project Area, perform an as-built location survey by coordinates prior to backfilling the excavation.
- B. The survey data shall be obtained by Global Positioning Survey (GPS) and certified by a Professional Land Surveyor registered in Massachusetts.
- C. A complete digital base plan shall be provided in AutoCAD DWG format Release 2000i or later on a Compact Disk (CD), properly referenced to the coordinate system established in the contract. The following standards shall be applicable:
 - 1. Text: Text shall be drawn using a STYLE of "L100-XX" (where XX refers to the plotted scale) and a font file of "SIMPLEX" as defined in the AutoCAD survey template provided by the Engineer. The style shall be defined as a "fixed height" style, and have a height of 0.10 times the drawing plotted scale. (i.e. 4.0 for 40 scale plan, 2.0 for 20 scale etc.).
 - 2. Precision and Accuracy:
 - a. Horizontal Survey:
 - 1. Precision: Horizontal control and surveyed points shall maintain a minimum precision of 1:10,000.
 - 2. Accuracy: No more than 10% of the survey points shall be in error by more than 1/100 inch or 0.25 mm when viewed at the requested scale.
 - b. Vertical Survey:
 - 1. Precision: Vertical Control shall have a maximum error of closure no greater than .075 feet or .02 meters.
 - 2. Accuracy: No more than 10% of elevations when interpolated from a Surface shall be in error of more than 1/2 a contour interval.
 - 3. Surface Data: The data format shall conform to Autodesk Land Development Desktop Project files. If the Contractor uses a different software product to create a surface, then the surface must be represented as a TIN (Triangulated Irregular Network) of 3D lines on a separate, distinct layer within the AutoCAD drawing file. 3D faces or 2 dimensional lines are NOT acceptable.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- B. An allowance item is included in the schedule of bid prices to reimburse the Contractor for all Utility Company costs in connection with charges from utility owners who may need to provide marking of locations for their lines or for providing other documented information to the Contractor for protection of the Utility Companies facilities in the work areas as specified herein. Reimbursement therewith to the Contractor for Utility Companies shall be paid for under the allowance Item No. 0211.495 - SITE UTILITIES. All Contractor costs related to protection of existing utilities shall be covered under Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

4.2 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS
0211.495	SITE UTILITIES	AN

END OF SECTION

SECTION 02713

EXTERIOR WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies furnishing, installing, testing and disinfecting permanent water supply mains and distribution piping.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02300 - EARTHWORK
 - 2. Section 02650 - EXISTING SITE UTILITIES
 - 3. Section 03300 - CAST-IN-PLACE CONCRETE

1.2 SUBMITTALS

- A. Submit to the Engineer shop drawings showing the details, procedures, and scheduling for water utility Owner when the Authority's service line is ready for connection to utility Owner's piping. Shop drawings shall include maximum anticipated working pressure in each main and branch, the proposed pressure test pressure, and fittings material class.
- B. Submit to the Engineer manufacturer's information for the meter pit and yard hydrants.
- C. Submit to both the Engineer and the water utility Owner detailed hydrostatic test and disinfection plans, including all proposed materials, concentrations, equipment, temporary piping, valving, connections, flow rates, equipment, methods of metering and measuring, and method of flushing and disposal.
- D. Submit to both the Engineer and the water utility Owner for acceptance all manufacturer's and independent laboratory certified test reports as specified above and in cited standards.

1.3 QUALITY ASSURANCE

- A. Field Pressure and Leakage Tests
 - 1. AWWA Standards for Piping Type
- B. Chlorine Residual Test
 - 1. Test Method
 - a. During Disinfection: AWWA Manual M12, APHA/AWWA Standard methods drop dilution, Method E.

- b. At End of Retention Period: APHA/AWWA Standard methods OTA or Amperometric Titration, Method D or F.
 - c. After Post-Disinfection Flush: APHA/AWWA Standard Methods Amperometric Titration, Method F.
 - 2. Requirements
 - a. Test to be performed by approved independent testing laboratory. Certified test results to meet requirements of AWWA C 601 and water utility Owner.
 - b. In lieu of independent testing laboratory, Contractor may subcontract for water utility Owner to conduct residual chlorine testing at Contractor's expense.
- C. Bacteriologic Tests
- 1. Procedure: AWWA C 601 and APHA/AWWA Standard Methods.
 - 2. Requirements: Zero coliform organisms, and meet requirements of water utility Owner and public health authority. Certified tests by approved independent testing laboratory or by public health authority at Contractor's expense.

1.4 JOB CONDITIONS

- A. Relations with the Utility Owner – The Acton Water District
- 1. Establish through the Engineer a direct and continuous contact with the utility Owner to which the Authority's new distribution piping will be connected. For contact information and phone numbers see the Acton Water Department website.
 - 2. In all cases, verify from the utility Owner the maximum working pressure than can be encountered at point of interface with utility Owner's piping, and indicate this pressure on the shop drawings.
 - 3. Do not cut into utility Owner mains or piping. The utility Owner will schedule and conduct interruption of utility services, perform cutting-in, and provide service meter at each point where new Authority piping is to be connected to the utility Owner mains and piping, at the expense of the Authority.
 - 4. Do not connect to utility Owner meter or piping without written authorization from the utility Owner. Connection shall be made by the Contractor or utility Owner as indicated.
 - 5. If agreed to by the utility Owner, the Contractor may, at his own expense, elect to have all or any part of the disinfection work performed by the utility Owner.
- B. Cross-Connections: Do not connect or cross-connect to fire water distribution piping or with other water piping; except that suitable approved temporary cross-connections may be made for disinfection only, providing that all such temporary cross-connections are removed after disinfecting. Fire distribution piping may be disinfected separately from metered water distribution piping to eliminate need for cross connections.
- C. Disinfection: Disinfect both domestic and service water piping and fire water piping.

PART 2 - PRODUCTS

2.1 PIPE

- A. Pipe shall be one inch inside diameter high density polyethylene tubing, pressure rated for water service and meeting the requirements of AWWA Standard C901-08 "Standard for Polyethylene Pressure Pipe and Tubing for Water Service" and ASTM D2737-03 and "Standard Specification for Polyethylene Plastic Tubing" and NSF Standards 14 and 61. Provide tubing in minimum lengths of 100 feet.
- B. Match existing pipe as needed.

2.2 FITTINGS

- A. Fittings and accessories will be in conformance with the pipe manufacturer's recommendations.

2.3 FLANGES

- A. For Ductile Iron Pipe: AWWA C 110, coated and lined as specified for iron pipe.
- B. For Steel Pipe: Welded slip-on type flanges, ASTM A 181 or ANSI B16.5 150-pound standard flanged mechanical coupling adaptor, bituminous lined inside and AWWA Type A bituminous primed outside in accordance with AWWA C 203 requirements, flange to mate with AWWA C207, ANSI B16.1, or ANSI B16.5 flange as required; bituminous coated steel bolts.
- C. Flange Gaskets: ANSI B16.21 neoprene, 1/8 inch thick.

2.4 VALVES

- A. For Service and Domestic Water: Type and size as indicated, conforming to the following:
 - 1. Yard Faucets and Miscellaneous through 2-1/2 inches: Approved MSS Standard globe and angle valves, malleable iron or cast bronze.
 - 2. Gate, three inch and larger: AWWA C 500.
 - 3. Butterfly, three inch and larger; AWWA C 504.
 - 4. Check: AWWA C 506 double or approved commercial single.
- B. Valve Boxes: ASTM A48, 30B minimum, screw type adjustable length, stay-put type removable cover with the word WATER or FIRE as applicable.
- C. Precast Vaults and Pits: ASTM C 139, air-entrained, and Section 03300 - CAST-IN-PLACE CONCRETE.
- D. Cast-In-Place Vaults and Pits: Section 03300 - CAST-IN-PLACE CONCRETE, Class 4000-3/4.
- E. Iron Castings: ASTM A48, 30B minimum, with lettering as indicated.

2.5 SERVICE CONNECTIONS

- A. As required by the municipality, the utility owner, or as specified in the Construction Specifications.

2.6 COUPLINGS

- A. Pressure rating at least equal to that of related pipeline with a minimum rating of 150 psi.

2.7 JOINTS

- A. Provide mechanical joint or push-on joint pipe with necessary accessories, conforming to ANSI A21.11.
 - 1. Provide gasket composition suitable for exposure to liquid within pipe.
 - 2. Provide gasket composition suitable for exposure to potable water.
 - 3. Provide mechanical joint gaskets with copper tips to provide electrical continuity.
 - 4. Provide serrated brass wedges for push-on joints to provide electrical continuity; two per joint for pipe 12-in. and smaller and four per joint for larger pipe.
- B. Restrained joints shall be furnished for installation on all fittings, sleeves, hydrants and valves. Restraints for mechanical joints shall be Megalug Series 1100 as manufactured by Ebaa Iron Co., Uni-flanged Series 1400 Mechanical Joint Restraint or equal. Restraints for push on joints shall be Series 1700 as manufactured by Ebaa Iron Co., or Series 1390 as manufactured by Uni-Flange.
- C. Restraint systems for push-on pipe utilizing steel-wedge gaskets will be acceptable.

2.8 CORPORATIONS, CURB STOPS AND SADDLES

- A. The corporation stops shall meet the most recent revision of the AWWA standard "Threads for Underground Service Line Fittings" (AWWA C 800). Corporation stops shall be designed for 175 psi pressure and have full keyway and rigid liners.
- B. Curb stops shall include a drain suitable for use with polyethylene tubing specified hereinbefore. Stops shall have integral checks, O-ring seal and shall be furnished with rigid liners.
- C. Curb stop boxes shall be cast iron Buffalo type with recessed lid with pentagon bolt, adjustable sliding type.
- D. Surface saddles for 2 inch taps shall be double strap with bodies of ductile iron. The straps shall be electrogalvanized carbon steel. Units shall be complete with Buna N gaskets.

2.9 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves shall be mechanical joint type.
- B. Tapping valves shall meet the requirements of AWWA C 500. The valves shall be flanged by mechanical joint outlet with non-rising stem and designed for vertical burial. Tapping valves shall be

rated at 200 psi working pressure and shop tested at 300 psi. Bolts on bonnet and stuffing box shall be stainless steel (316 stainless steel), stuffing boxes shall be “O” ring type. The operating nut shall be 2-inches square. The valve shall be provided with oversized seat to permit use of full size cutters. Gaskets shall cover the entire flange surface. Valves shall open right (clockwise).

- C. Valves shall be Mueller H-667 or approved equal.
- D. Valve boxes shall be provided for each gate valve and tapping sleeve and valve.

2.13 YARD HYDRANTS AND METER PITS

- A. Yard hydrants and meter pits shall be as shown in the drawings and as approved by the Engineer. The water meter shall be installed by the utility owner.

PART 3 - EXECUTION

3.1 EXCAVATIONS

- A. Conform to the requirements of Section 02300 - EARTHWORK and the AWWA Standards and Manual cited herein.
- B. Dewater as required and disinfect excavation in accordance with Section 11 of AWWA C 601 where required.

3.2 INSTALLATION

- A. Vaults and Pits: Install vaults and pits as indicated on the Plans. Provide six inches of backfill sand bedding for precast vaults. Construct cast-in-place vaults generally as specified for manholes, Section 02400 - DRAINAGE AND SEWER SYSTEMS. Provide pervious backfill subdrains and drainage as indicated or required for proper drainage.
- B. Pipe Laying:
 - 1. Provide pipe bedding as called for in the pipe manufacturer’s recommendations.
 - 2. Inspect all pipe, fittings, and valves for soundness and for imperfections of coatings, wrappings and linings prior to installation.
 - 3. Deflection at joints shall not exceed the maximum recommended by the pipe or coupling manufacturer for each type of coupling and each size of pipe.
 - 4. Blocking will be permitted only where indicated.
 - 5. Field welding will be permitted only where specifically authorized. Pipe may be cut in the field by approved means. After welding or cutting, repair damage to linings and coatings and prime and inspect the cut surface as specified in AWWA C 203, Section 2.14. Repair damaged cement linings in accordance with AWWA C 602 Section 16, or discard the pipe.

6. Prime steel pipe couplings and exposed pipe ends before installation, but do not enamel or wrap until after hydrostatic leak test.
7. Install all temporary piping, valving, meters, gages, and equipment required for hydrostatic testing and disinfection in accordance with approved shop drawings.

C. Anchorages and Buttresses

1. Construct concrete anchorages and buttresses where indicated. The soil bearing area shall not be less than indicated.
2. Harness all valves and fittings not provided with an anchor, buttress or restrained joint with steel rods and rod socket pipe clamps or by steel rods and rod connectors connected to mechanical joint bolts as indicated.

D. Fittings and valves shall be restrained for the minimum lengths listed on the following table:

MINIMUM RESTRAINED LENGTHS	
FITTING	RESTRAINT LENGTH
12" – 45° Bend	13-feet in each Direction
8" – 45° Bend	9-feet in each Direction
6" - 45° Bend	7-feet in each Direction
12" – 22-1/2° Bend	6-feet in each Direction
10" - 45° Bend	11-feet in each Direction
8" - 90° Bend	23-feet in each Direction
8" – 22-1/2° Bend	4-feet in each Direction
8" – 11-1/4° Bend	2-feet in each Direction
6" – 22-1/2° Bend	3-feet in each Direction
6" – 11-1/4° Bend	2-feet in each Direction
12" – 11-1/4° Bend	3-feet in each Direction
12" Vertical Offset	
Upper 45° Bend	27-feet in each Direction
Lower 45° Bend	12-feet in each Direction
8" Vertical Offset	
Upper 45° Bend	19-feet in each Direction
Lower 45° Bend	8-feet in each Direction
6" Vertical Offset	
Upper 45° Bend	14-feet in each Direction
Lower 45° Bend	6-feet in each Direction
12" x 12" x 12" Tee	42-feet in Branch
12" x 12" x 10" Tee	29-feet in Branch
12" x 12" x 8" Tee	16-feet in Branch
12" x 12" x 6" Tee	1-foot in Branch
8" x 8" x 8" Tee	25-feet in Branch
8" x 8" x 6" Tee	10-feet in Branch
8" x 8" x 4" Tee	1-foot in Branch
6" x 6" x 6" Tee	15-feet in Branch
6" x 6" x 4" Tee	1-foot in Branch

MINIMUM RESTRAINED LENGTHS	
FITTING	RESTRAINT LENGTH
16" x 12" Reducer	32-feet Larger Direction only
12" x 10" Reducer	28-feet Larger Direction only
12" x 8" Reducer	31-feet Larger Direction only
12" x 6" Reducer	42-feet Larger Direction only
8" x 6" Reducer	17-feet Larger Direction only
8" x 4" Reducer	29-feet Larger Direction only
6" x 4" Reducer	16-feet Larger Direction only
12" Valve or Dead-end	58-feet in each Direction
10" Valve or Dead-end	49-feet in each Direction
8" Valve or Dead-end	41-feet in each Direction
6" Valve or Dead end	31-feet in each Direction
4" Valve or Dead-end	22-feet in each Direction
2" Valve or Dead-end	18-feet in each Direction

- Lengths shown are based on 150 psi test pressure, 4-1/2-foot bury, soil type GP, trench Type 3, and 2:1 safety factor. Changes in conditions will require revision in lengths.

3.3 TESTING AND DISINFECTING

A. Hydrostatic Tests

- Conduct both pressure test and leakage test by the open trench method as specified in AWWA C 600. Conduct leakage test as soon as practicable after completion of the pressure test.
- Conduct all hydrostatic tests in the presence of the Engineer, and prior to coating joints and disinfecting. Do not conduct any hydrostatic tests until after all associated concrete work has cured for a minimum of 7 days for standard concrete and at least 36 hours for high early strength concrete.
- As soon as practicable after completion of hydrostatic tests, drain lines in an approved manner, and disconnect and remove temporary test piping and equipment which will no longer be required.

B. Field Coating. After completion of hydrostatic tests and before disinfecting, prime or reprime as required and coat all uncoated metal components of the piping system, including joints, harnesses and tie rods, generally as specified in AWWA C 201 for mechanical couplings, except that exposed ends of steel pipe up to the coupling shall be wrapped with hot applied coal tar tape. Inspect field-applied bituminous coatings for holidays as specified in AWWA C 203.

C. Disinfection. Disinfect and test all lines in accordance with the requirements of AWWA C 601 and as specified herein. Disinfect before final backfill around hydrants and valves. Remove disinfection equipment and temporary piping after approval of the disinfection tests.

D. Operating Tests. Following approval of the disinfection, conduct operating tests in the presence of the Engineer to verify that each valve and hydrant is in proper working condition. Whenever practicable, conduct operating tests during flushing of chlorine from the line.

3.4 BACKFILLING

- A. Conform to the requirements of Section 02300 - EARTHWORK and the AWWA standards and Manuals cited herein.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- B. The allowance item 1520.006 INSTALL WATER SERVICE is included in the schedule of bid prices to reimburse the Contractor for fees and demand charges imposed by the Water Supply District of Acton in relation to the Contractors work responsibility for installation and connection of the 2” water supply line from the Town water main in Railroad Street.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS
1520.006	INSTALL WATER SERVICE	AN

END OF SECTION

SECTION 02856

COMMUTER RAIL TRACK CONSTRUCTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Track bed preparation and construction to include clearing, grubbing, grading, sub-ballast installation and compaction and ballast installation and compaction within the limits of work of the station.
- B. Track construction above the Contractor installed bottom ballast layer will be performed by others.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 01571 – MAINTENANCE & PROTECTION OF RAILROAD TRAFFIC
 - 2. Section 02100 – SITE PREPARATION
 - 3. Section 02300 – EARTHWORK

1.2 SUBMITTALS

- A. None.

1.3 QUALITY ASSURANCE

- A. Sub-ballast
 - 1. Notify the Authority, at least 30 days prior to delivery, of the source and location of the materials to be used in order that approval test may be made.
 - 2. Use only the one approved material to complete order. Do not change source of material unless new source and material is approved, in writing, by the Authority.
 - 3. Sub-ballast shall be handled during all stages of production and delivery in a manner that will provide an all uniform product and will prevent contamination or segregation.
 - 4. To satisfy the requirements of this specification sub-ballast may be screened, crushed, washed or otherwise processed to produce a uniform acceptable product.
 - 5. Blending of materials to improve quality shall not be permitted.
- B. Ballast
 - 1. Notify the Engineer not less than 30 days before start of track construction of the proposed source and location of the crushed stone ballast. The Engineer will obtain samples of the proposed material and test it for classification, quality, and grading, and will notify the Contractor of the test results.

2. Acceptance of stone ballast will be based upon tests, made periodically by the Engineer during the progress of the trackwork construction, from stone ballast samples obtained from in-place locations designated by the Engineer.
3. Ballast material shall be as approved in writing by the Engineer prior to job-site delivery.

1.4 DELIVERY, STORAGE AND HANDLING

A. Sub-ballast

1. Load sub-ballast only into rail cars or trucks which are in good order, tight enough to prevent leakage and waste of material, and clean and free from rubbish or any substance which would foul the sub-ballast material.
2. Handle prepared sub-ballast at production plant, during shipment, and at work site so that it is kept clean and free from segregation.
3. Do not make repeated passes of equipment over the same level in stock pile area.
4. To be accepted, sub-ballast offered shall conform to this specification in all respects. Sub-ballast is subject to inspection at delivery and is at the supplier's risk until acceptance. Sub-ballast rejected for non-compliance with this specification will be returned at the supplier's expense.

B. Ballast

1. Keep ballast clean and free of segregation during handling at the producing plant and at site. Ballast containing any substance which would foul or damage the ballast will be rejected.
2. The Contractor's proposed method of handling ballast shall be subject to acceptance by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS TO BE FURNISHED BY THE AUTHORITY

- A. None.

2.2 MATERIALS TO BE FURNISHED BY THE CONTRACTOR

A. Ballast

1. Ballast shall conform to the latest MBTA Commuter Rail Material Specification No. 9248 or AREMA Size No. 4 per AREMA Chapter 1, Part 2, Table No. 3 as modified by these specifications. Ballast shall be crushed, quarried, washed stone conforming to the current AREMA Specification Chapter 1, Section 2, and the following ballast quality requirements:
 - a. Deleterious Substances. The amount of deleterious substances present in prepared ballast shall not exceed the following limits, when using test methods specified herein.

	<u>Percent by Weight</u>	<u>Method of Test</u>
Soft and Friable Pieces	3.0	ASTM C235
Material Finer than		

No. 200 Sieve	0.5	ASTM C117
Clay Lumps	0.5	ASTM C142

- b. Flat or elongated particles having a length equal to or greater than five times the average thickness of the particle shall not exceed five percent by weight of the total when visually inspected.
- c. Water absorption shall not exceed 0.4 pounds per cubic foot when tested in accordance with ASTM C127.
- d. Percentage of wear, when tested in the Los Angeles abrasion machine in accordance with ASTM C535, grading No. 2, shall not exceed 18 percent.
- e. Soundness of the prepared ballast shall be such that when tested in the sodium sulphate soundness test in accordance with ASTM C88, weighted average loss shall not exceed 1.5 percent after 10 cycles of test.
- f. Cementing value of the ballast shall not exceed an average value of 320 pounds per square inch for five specimens when tested in accordance with the Logan Walter Page Method (U.S. Department of Agriculture, Bulletin No. 347, 1916, Pg. 15) except as modified as follows:
- g. A sufficient amount of pea size pieces of the rock, amounting to about 500 grams (1.1 pounds) is revolved in Los Angeles Abrasion Cylinder with three cast iron balls 4.76 centimeters (1.875 inches) diameter and weighing approximately 0.43 kilograms (0.95 pounds) at the rate of 30 and 33 revolutions per minute, and the stiff dough at room temperature resulting from about 500 grams (17.64 ounces.) of dust screened through a 100 mesh sieve, mixed with sufficient water, thoroughly kneaded for five minutes, allowed to stand in an air tight container for two hours, is molded into cylindrical briquettes 2.54 centimeters (1 inch) in height under a pressure of 132 kilograms per square centimeter (1877.5 pounds per square inch), after which they are dried for 20 hours in air at room temperature, 4 hours in a hot air bath at a temperature of 100 degrees Celsius, (212 degrees Fahrenheit), then cooled for 20 minutes in a desiccator and immediately tested in a compression testing machine for static crushing strength, the bearing heads being suspended by pivots to secure uniform distribution of load, which is applied at 600 pounds per minute, approximately.
- h. Determine ballast weight per cubic foot in accordance with ASTM C29.
- i. Ballast samples shall be obtained in accordance with ASTM D75.

B. Sub-Ballast

- 1. Sub-ballast shall be crushed stone or granulated, expanded or air-cooled slag with an average hardness of 5.5 minimum on Mohs Scale of Hardness.
- 2. Sub-ballast shall be composed of clean, hard, uncoated particles free from lumps of clay, shale, and other objectionable materials.
- 3. Gradation shall be in accordance with ASTM C136 and C117 as follows:

Sieve Size	Percent Passing by Weight
1 inch	100
3/8 inch	50 to 85
No. 4	35 to 65
No. 10	25 to 50
No. 40	15 to 25
No. 200	4 to 10

- a. The fraction passing the No. 200 sieve shall be less than two-thirds of the fraction passing

- the No. 40 sieve.
 - b. Soft Particles: ASTM C235 - 5 percent of sample weight maximum.
 - c. Clay lumps and friable particles; ASTM C142 - 0.5 percent maximum.
 - d. Wear ASTM C131 - 20 percent maximum.
 - e. Absorption: ASTM C127 - 0.5 percent maximum.
4. Crushing of sub-ballast shall not be required except the supplier may, at his option, elect to crush any oversize particles present in the deposit as an alternative to screening.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Material shall not be placed on subgrade that is muddy, rutted, snow covered or frozen.
- B. Before placement of subballast, subgrade shall be proof-rolled using pneumatic-tired equipment heavily loaded or, on granular subgrades by vibratory roller. Where soft places are located, these shall be undercut to a suitable depth, no less than 6 inches, and backfilled with granular aggregate.
- C. Subballast shall be compacted and bladed sufficiently to produce a uniform subgrade support and a surface tolerance of plus or minus 0.1 foot of designated top of subballast.
- D. Subballast shall be hauled and placed by trucks or earthmoving equipment in such a way that rutting or disturbance of completed subgrade is avoided. Disturbed or rutted subgrade shall, be removed from the fill, disposed of, and replaced, at the instruction of and to the satisfaction of the Engineer, at no additional cost to the Authority.
- E. Subballast shall be placed to depth shown on Contract Drawings and applied in layers that when compacted shall not exceed 4 inches each. Water may be uniformly added to facilitate compaction. Compaction shall be by pneumatic-tired equipment heavily loaded or by vibratory roller or other equipment approved by the Engineer. Small vibrators or pneumatic tampers may be used at places of work where heavy compactors cannot work. All compaction effort shall be uniformly distributed so that all layers are evenly compacted to a density not less than 100 percent of the maximum dry density determined by ASTM D698, when tested in accordance with ASTM D1556, ASTM D2167 or ASTM D2922.
- F. Place and compact stone ballast on the prepared subgrade in layers not exceeding four inches each, compacted, with the final layer of compacted ballast not less than two inches below the final grade of the bottom of the ties before track construction operations commence.
- G. Deliver ballast at a rate no faster than can be satisfactorily incorporated into the work, maintaining a proper interval of operations and at such times as to permit proper inspection by the Engineer.
- H. Self-spreading vehicles of Authority-approved type may be used. When stone is initially spread by self-spreading vehicle, a power grader of Authority-approved type may be used to assist the spreading operations. If results of spreading with the power grader are found unsatisfactory, permission for use of the grader will be withdrawn.
- I. Shape stone ballast to a true section conforming to the ballast section shown on the Contract Drawings. Thoroughly compact until the stones are firmly interlocked and the surface is true and unyielding.
- J. Compact stone ballast with rollers or with vibratory compactors subject to the following:
 - 1. Compact by rolling using either an approved self-propelled, three-wheel, two-axle roller of such weight that will provide compression under the rear wheels of not less than 350 pounds per linear inch of tread; or using an approved two or three-wheel tandem roller having a weight per inch of drive roll of not less than 350 pounds, and with every part of the surface receiving compression

from the drive wheels.

2. Compact by vibration using vibration compactors of either the roller or pad type. Dynamic force for either type shall be not less than 20,000 pounds and the frequency range shall be 1100 to 1500 vpm. Use machines equipped with a governor which can be set and locked to control the rate of impulse as required by the Engineer. Provide a tachometer or other suitable device for accurately checking the frequency of vibration during the compacting operation.

- K. Complete and in place installation of track including ties, rail, final ballast lift, track surface and alignment and bridge guard rail where shown on the contract plans shall be performed by others.

3.2 STOCKPILING

- A. Stockpiling sites shall be level, well drained, free of all foreign materials, and of adequate bearing capacity to support weight of materials to be placed thereon.
- B. Except where stockpiled on concrete foundations or on otherwise acceptably stabilized area, a compacted sand stockpile base not less than 1 foot deep shall be provided to prevent contamination of piled material.
- C. Stockpiles shall be built in layers not to exceed 3 feet in depth and each layer shall be completed over entire area of stockpile before beginning the next layer. Subballast delivered to the stockpile in trucks shall be uniformly spot-dumped and stockpile built as specified. Coning of piles or spilling of material over edges of pile will not be permitted.

3.3 DEFECTIVE MATERIAL

- A. Unless otherwise permitted by the Engineer, rejected materials shall be removed from site of the work within 48 hours of each rejection.

3.4 SUBBALLAST ADMIXTURE

- A. Calcium Chloride may be used for control of moisture. If used, calcium chloride shall conform to requirements of ASTM D98.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02858

SUBSTITUTE TRANSPORTATION SERVICE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included: This Section specifies both Planned and Contingency Substitute Transportation Services (busing) to be provided by the Contractor when rail service shutdown is required.
- B. There are two types of Substitute Transportation Services (STS) specified herein:
 - 1. Planned STS is related to one weekend rail service shutdown for the placement of the overhead pedestrian walkway and will be paid for by an allowance item described herein. Weekend rail service shutdown shall be identified in Construction Phasing plan schedule subject to approval by the Engineer.
 - 2. Contingency STS is related to any other rail service shutdown(s) including any request for shutdown by the Contractor for their convenience or in the event that the Contractor fails to have the track open for peak revenue service. Contingency STS will not be covered under the allowance, but all costs in connection with such outage shall be sole responsibility of the Contractor. The Contractor shall request contingency track outage two weeks in advance. The Contractor shall note that there will be no guarantee of approval of rail service shutdown if requested solely for the Contractor's convenience.
- C. The Contractor shall ensure that both STSs are coordinated with the MBTA's Fitchburg commuter rail line train schedule to provide minimal impact to the revenue service.
- D. Contractor shall enter into an agreement with a private carrier to provide STS. This agreement shall be included in the Substitute Transportation Plan that is submitted to the Engineer for review and approval prior to the initiation of service.
- E. Notification to passengers about shutdowns and STSs will be provided by the MBTA via flyers, station posters, local newspaper announcements, a website, and a hotline number.

1.2 SUBMITTALS

- A. Contractor shall submit both Planned and Contingency STS Plans to the Engineer no less than (30) thirty calendar days after Notice to Proceed. The Contractor shall obtain the Engineer's approval prior to beginning of any construction activity that could adversely impact the revenue service on the Fitchburg Line.
- B. The Contractor shall notify the Engineer of any intended deviation from the approved STS Plan not less than (15) fifteen calendar days prior to the start of scheduled busing service.
- C. Submittal of STS Plan(s) shall include, but not to be limited to the following:
 - 1. Proposed Private Carrier.

- a. Copy of the agreement between the Contractor and the proposed private carrier.
 - b. Provide required documentation including proof of insurance, licensing and name, location, contact information, and ownership of the proposed carrier.
 - c. Describe the vehicle fleet proposed to provide STS including the manufacturer, date of manufacture, capacity and condition of the vehicles.
 - d. STS shall comply with Americans with Disabilities Act requirements, and the MBTA policy issued by the System-Wide Accessibility Department dated 1/9/12 and titled "Ensuring Accessibility During Mass Diversions".
 - e. Provide three alternatives for comparable service.
2. Proposed Operating Plan.
- a. Describe the proposed routes of service.
 - b. Departure/pick-up times at the station shall match existing commuter train departure/pick-up time per the MBTA's most recent Fitchburg Line schedule.
 - c. Arrival/drop-off times for each destination shall be within ten minutes of the existing arrival/drop-off time per the MBTA's most recent Fitchburg Line schedule at that specific destination.
 - d. Multiple routes may be operated in order to meet the schedule requirement.
 - e. Describe the provisions to be used for managing unanticipated delays and emergencies.
3. Quality Assurance Plan.
- a. Provide supervisory staff to monitor on-time performance.
 - b. Provide a plan for penalties and incentives.
 - c. Describe the method by which performance will be monitored and reported to the Engineer on a weekly basis. This will include a log of actual departure and arrival times, records of any incidents or delays over 5 minutes, and an estimate of hourly ridership by route.
 - d. A complaints log shall be maintained by the carrier and provided at the request of the Engineer.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 SERVICES

- A. The STS shall comply with the following requirements:
- 1. Work shall be conducted and completed in accordance with recognized and customarily accepted industry practices.
 - 2. Private carrier shall maintain insurance to levels outlined as:
 - a. Commercial General Liability - \$10,000,000 per occurrence/aggregate.
 - b. Automobile Liability Insurance - \$10,000,000 per occurrence/aggregate.
 - c. Automobile Collision and Comprehensive Coverage – Equal to the full replacement value of all revenue and non-revenue vehicles with a \$50,000 deductible.
 - d. Statutory Worker's Compensation and Employer's Liability Insurance – Limits of not less than \$500,000.

- e. Fidelity Bond - \$100,000 minimum.
 - f. Liability Insurance.
3. Service shall be staged to minimize disturbance to revenue train service during shutdown of a rail line.
 4. STS shall be provided for each affected station during any shut down of a rail line during revenue service hours.
 5. Private carrier shall be a fully licensed commercial vehicle operator in the Commonwealth of Massachusetts.
 6. All vehicle drivers shall have appropriate licensure per the Commonwealth of Massachusetts.
 7. Private carrier shall have applicable commercial vehicle insurance per the Commonwealth of Massachusetts.
 8. Vehicles shall be operated with due regard for safety, security, comfort, and convenience of passengers and the general public. Vehicle operators must have a valid Commercial Driver's License (CDL) with appropriate endorsement and each operator must submit to a medical examination at the start of service. Vehicle operators must be trained, tested, and certified in all operational procedures relating to the system. Training must include techniques for dealing with the public in a helpful and courteous manner.
 9. Vehicles shall be kept clean and in the highest state of repair and conform to standard maintenance protocol per MBTA standards.
 10. Vehicles shall have fully operating heating and cooling systems per MBTA standards and shall be temperature controlled for the comfort of passengers.
 11. All vehicles used for the STS shall have interior storage space for passengers carrying luggage.
 12. All vehicles used for the STS shall be Americans with Disabilities Act (ADA) compliant and accept all service animals.
 13. The STS will have adequate capacity to provide all passengers with a seat. The ridership numbers published by the MBTA are to be referred to for information purposes only and are not necessarily indicative of the number of passengers that will require STS.
 14. Pick up and drop off locations at the stations shall be in the immediate proximity of the existing train platforms.
 15. Signage shall be provided via coordination with the MBTA.
 - a. Directional signage shall be located at the station entrance and at the loading and unloading locations.
 - b. Informational signage, indication the hours of service, route and destination point, contact number for problems and/or emergencies, and a statement indicating that no fares will be collected shall be located in the immediate vicinity of the loading and unloading locations.
 - c. Outbound substitute transportation vehicles shall have on-board signs visible from outside of the vehicles with letters of not less than eight (8) inches in height indicating the route and destination that they are serving.
 16. All STS shall be non-revenue. There are no fare collection requirements; nor shall any fares be collected.
 17. The STSs may include express service subject to MBTA approval.

B. The Contingency STS Plan shall include the same provisions outlined above and also the following:

1. Mobilizing emergency STS in the event that revenue service is delayed beyond the period provided for in the STS Plan as a result of the Contractor's work on or near the tracks.
2. Mobilizing emergency STS in the event that emergency work is needed.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for any approved Contingency STS as specified herein, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- B. An allowance is included in the schedule of bid prices to reimburse the Contractor for all cost in connection with the one Planned STS as specified herein. Reimbursement therewith shall be paid for under the allowance Item 0130.439 – BUSING.
- C. The Contractor shall furnish itemized statements of the work performed and give the Engineer access to accounts, bills and vouchers relating thereto, and unless the Contractor does furnish such itemized statements, bills and vouchers, they shall not be entitled to payment for the related work.
- D. Planned and Contingency STS costs shall include:
 1. All substitute transportation service items, including, but not limited to buses, fuel, drivers and/or operators, signage, insurance, licenses and certificates as needed.
 2. Mobilization of bus services and operations, including emergency/contingency services.
 3. Operating Railroad Support service to include train and engine crews and equipment as may be required by the Authority to maintain their regular schedule.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS
0130.439	BUSING	AN

END OF SECTION

SECTION 02900

TREES, SHRUBS AND GROUNDCOVERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishing and installing trees, shrubs, and groundcovers as indicated on the Drawings and as specified herein.
- B. Examine all other Sections of the Specifications for requirements which affect the work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 WORK TO BE PERFORMED

- A. The scope of the work, without limiting the generality thereof, consists of furnishing all labor, materials and equipment for the following items of work and all work incidental thereto as shown on the Drawings and as herein specified.
 - 1. Installation of trees, shrubs, and groundcovers.
 - 2. Installation of erosion control devices in planting beds as required.
 - 3. Protection, maintenance and guarantee of planted areas.

1.3 RELATED WORK SPECIFIED ELSEWHERE

Section 02920 LAWNS

1.4 REFERENCES, STANDARDS, AND SPECIFICATIONS

- A. "Standardized Plant Names:" American Joint Committee on Horticultural Nomenclature, 1942 Edition.
- B. "American Standard for Nursery Stock", American Association of Nurserymen, 1973 Edition (ANS).

1.5 SUBMITTALS

- A. Nursery source(s) of plant materials, and certification of specification compliance by nursery.
- B. Proposed maintenance program for plants during one-year guarantee period.
- C. Erosion Control Matting - Manufacturers literature and two (2) samples 12" x 12".
- D. Aged Pine Bark Mulch - Quart size resealable bag.

- E. Manufacturer's literature for slow release fertilizer tablets.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Topsoil shall be a "sandy loam " determined by mechanical analysis and based on the "USDA Textural Classification." Submit samples for testing at an approved testing laboratory. Top soil shall conform to the following sand, silt and clay distribution for material passing the #4 sieve:

<u>Textural Classification</u>	<u>% Total Weight</u>
Sand (0.05 – 2.0 mm dia. range)	less than 52%
Silt (0.002 – 0.05 mm dia. range)	28%-50%
Clay (less than 0.002 mm dia. range)	7%-27%

Soil test shall include breakdown of sand subfractions from course to very fine.

- B. Maximum grain size shall be one and one-quarter inches largest dimension. The maximum retained on the one-quarter inch sieve shall be 20 percent by weight of the total sample. Test shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
- C. Top soil shall be free of all plants and their roots and other debris and extraneous matter. It shall be uncontaminated by salt, water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC²) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm (test material passing #4 sieve).
- D. Top soil shall have an acidity range of pH 5.5 to pH 6.5 and shall contain not less than 6% nor more than 12% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230° F. plus or minus 9°. To adjust organic matter content, the soil may be amended, prior to site delivery, by the addition of composted humus. Use of organic amendments is acceptable only if random soil sampling indicates thorough incorporation.
- E. All top soil provided from off-site sources shall be brought to the site meeting all specification requirements. There shall be no mixing or amending of soil on site. No loam shall be spread prior to screening. The loam shall not be handled or moved when in a wet or frozen condition.

2.2 SOIL ADDITIVES

- A. Additives shall be used to counteract soil deficiencies as recommended by the soil analysis.
- B. Commercial fertilizer shall be a product complying with State and United States Fertilizer Laws. Deliver to the site in the original unopened containers, which shall bear the manufacturer's Certificate of Compliance covering analysis, which shall be furnished to the Engineer. At least 50% by weight of the nitrogen content shall be derived from organic materials. Phosphorus shall be soluble. Fertilizer shall contain not less than the percentages of

weight of ingredients as follows, but shall be adjusted to meet all recommendations of the soil analysis.

	<u>Nitrogen</u>	<u>Phosphorus</u>	<u>Potash</u>
For deciduous trees and shrubs	10%	6%	4%
For evergreen trees and shrubs	7%	7%	7%

- C. Humus shall be natural humus, reed peat or sedge peat. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. The acidity range shall be approximately 5.5 pH to 7.5 pH and the organic matter shall be not less than 85% as determined by loss on ignition testing in accordance with A.O.A.C.'s latest methods of testing. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.
- D. Peat moss shall be composed of the partly decomposed stems or leaves of any of several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign materials. Peat moss shall have an acidity range of 4.5 pH to 6.5 pH as determined in accordance with the latest methods of testing of A.O.A.C. Its water absorbing ability shall be a minimum of 1,100% by weight on an oven-dry basis.
- E. Manure shall be well-rotted unleached stable manure not less than eight months and not more than two years old. It shall be free from sawdust, shavings or refuse of any kind and shall not contain over twenty-five percent straw. The Contractor shall furnish information as to the kind of disinfectant or chemicals, if any, which may have been used in storage of the manure.
- F. Bone meal shall be fine ground, steam cooked, packinghouse bone with a minimum analysis of 23% phosphoric acid and 4% nitrogen.
- G. Lime for adjustment of pH: An acceptable dolomite limestone containing not less than 85% of total carbonates, ground so that 50% will pass a 100 mesh sieve and 90% will pass a 20 mesh sieve.
- H. Aluminum Sulfate for adjustment of pH: Unadulterated, 57% (Ortho Division, Chevron Chemical Company), or equal.

2.3 SLOW RELEASE FERTILIZER TABLETS

- A. Slow release planting tablets: Fertilizer shall be provided for each plant through the use of tightly compressed, long-lasting, slow-release fertilizer tablets which are designed and certified by the manufacturer to provide controlled release of fertilizer over a minimum two (2) year period. Each tablet shall consist of 21 grams of water soluble fertilizer with a minimum guaranteed analysis as follows:

Total Nitrogen	20%
7% water soluble N	
13% water insoluble N	
Available Phosphoric Acid	10%
Available Potash	5%
Calcium	2.8%
Magnesium (water insoluble)	0.5%

Sulfur	2%
Boron	0.02%
Copper	0.05%
Iron	0.5%
Manganese	0.05%
Zinc	0.05%

2.4 EROSION CONTROL MATERIAL

- A. Erosion control matting for planting beds sloped 3:1 or greater shall be jute mesh as specified in Section 02920 Lawns.

2.5 MISCELLANEOUS MATERIALS

- A. Mulch shall be dark brown, aged shredded pine bark mulch which has not been dyed, passing one inch square mesh and retained on 1/8 inch square mesh. It shall be free of long stringy material.
- B. Water necessary for planting operations and maintenance shall be supplied and paid for by the Contractor. Contractor shall furnish his own hose and hose connections from the outlets where water is available.
- C. Tree stakes shall be type, dimensions, and quantity as shown on the drawings.
- D. Guying wires shall be as shown on the Drawings.
- E. Wrapping materials shall be standard manufactured tree wrapped paper, brown in color with crinkled surface and fastened by use of organic twine ties.
- F. Hose shall be new 2 ply reinforced black rubber garden hose not less than ½ inch diameter of length suitable to protect the tree. Turnbuckles where required shall be galvanized having a 3 inch minimum lengthwise opening fitted with screw eyes.
- G. Provide one (1) sample of fertilizer in manufacturer's packaging and two (2) certificates showing composition and analysis.

2.6 PLANT MATERIALS

- A. All plants shall conform to ANS standards. Plants shall be of high quality, heavy, symmetrical, tightly knit plants, superior in form, number of branches, compactness and symmetry.
 1. Plants shall be nursery grown in accordance with good horticultural practices, unless specifically authorized to be collected, and grown under climatic conditions similar to those in the locality of the project for at least two years. They shall have been root pruned within the last two years.
 2. Plants shall be freshly dug. No heeled-in plants or plants from cold storage will be accepted.
 3. Plants shall comply with all applicable State and Federal Laws with respect to inspection for plant diseases and infestations. They shall be free from physical damage or adverse

conditions that would prevent thriving with the specified result. They shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae, and shall have healthy, well developed root systems.

4. If a range of size is given, no plant shall be less than the minimum size and not less than 50% of the plants shall be as large as the upper half of the specified range. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required.
 5. Plants that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected. Thin, poorly branched, or sparsely rooted plants will be rejected, regardless of their otherwise full compliance with ANS Standards.
 6. Shrubs of a single variety shall be matched specimens from a single block source unless otherwise noted.
- B. Substitutions of plant materials will not be permitted unless authorized in writing by the Engineer.
- C. Label all plants. Plant material labels shall be durable, legible labels stating the correct plant name and size using weather resistant ink or embossed process. Attach securely to all plants, bundles, and containers of plant material delivered being careful that those attached directly to plants will not restrict growth.
- D. Selection of Nursery Stock
1. At least 20 days prior to the expected planting date, the Contractor shall request, in writing, that the Authority provide a representative to select and tag all trees to be planted under this section. At the discretion of the Authority, groundcovers and shrubs shall also be selected and tagged by the Authority's representative. This request shall be made 10 days prior to the date on which stock selections are to be made. The letter of request shall also have attached a letter of certification from the supplier attesting to the fact that the stock to be selected from is, in fact, the patented tree required under this Section.
 2. The Contractor shall arrange for and bear the cost of transportation, meals in transit, and overnight accommodations, if necessary, for the Authority's representative during the period of time required to select and tag the required number of sized stock.
- E. Plants shall be subject to approval by the Engineer upon delivery for conformity to specification requirements.
- F. Balled and burlapped (B&B) plants shall have firm natural balls of earth of diameter not less than that recommended by the "American Standard for Nursery Stock", and of sufficient depth to include the fibrous and feeding roots. All plants which are six inches in caliper or over shall be double burlapped.
1. All plant material being transported shall be covered while in transit.
 2. Plants moved with a ball will not be accepted if the ball is cracked or broken before or during planting operations.

- G. Rejected plants will be removed immediately from the site by the Contractor.

2.7 WATER

- A. The Contractor shall be responsible for supplying all water necessary for the work of this section including installation and maintenance of planting until final acceptance.
- B. Water shall be clean and free of substances harmful to plants, animals and humans.

PART 3 - EXECUTION

3.1 PREPARATION OF SITE - GENERAL

- A. Prior to planting operations, the Contractor shall request an inspection be made of the finished loam and planting bed areas. No planting shall take place until the Engineer approves the topsoil grade. All planting areas shall be sloped to drain. Finished surfaces shall be corrected to eliminate depressions holding water. Contractor shall confirm to the Engineer that all proposed tree pits have been over-excavated and backfilled per Drawings prior to planting. The commencement of work by the Contractor shall indicate his acceptance of the areas to be planted, and he shall assume full responsibility for the work of this Section.

3.2 TREES AND SHRUBS PLANTING OPERATIONS

- A. Planting Season: Planting shall be done within the following dates:

Deciduous & Perennial Plants: Sept. 1 to Dec. 15
March 15 to May 15

Bulbs: Oct. 1 to Nov. 15

Evergreen Plants: Sept. 1 to Nov. 15
March 15 to May 15

1. If special conditions exist, which may warrant a variance in the above planting dates, a written request shall be submitted to the Engineer stating the special conditions and the proposed variance. Permission for the variance will be given if, in the opinion of the Engineer, the variance is warranted.
- B. The Contractor shall inform the Engineer when planting will commence, anticipated delivery date of material and shall have made and provided for the staking of all plants and plant beds. Failure to notify the Engineer in advance, in order to arrange proper scheduling may result in loss of time or removal of any plant or plants not installed as specified or directed.
 - C. Loam Stockpile: Maintain at all times during the planting operations one or more loam stockpiles of approved quality loam for tree pits and shrub and groundcover beds.
 - D. Excavation of Plant Pits:
 1. Stake out on the ground locations for plants and obtain approval of the Engineer before excavation is begun.

2. Establish finish grades for shrub and groundcover beds. Excavate and regrade subgrade as necessary. Separate subgrade soils from the upper "Topsoil" portions and remove immediately wherever encountered during planting operations. Loosen top six inches of subgrade in pits and beds immediately prior to placing planting soil.
 3. Notify the Engineer in writing of all soil or drainage conditions which the Contractor considers detrimental to the growth of plant material.
- E. Protect plants at all times from sun or drying winds. Plants that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil, wet moss or other acceptable material and shall be kept well watered. Plants shall not remain unplanted for longer than three days after delivery.
- F. Plants shall not be bound with wire or rope at any time so as to damage bark or break branches. Plants shall be lifted and handled from the bottom of the ball only. All plant roots and earth balls shall be kept damp and thoroughly protected from sun and drying winds at all times.
- G. Set plants at same relationship to finished grade as they bore to the ground from which they were dug, but with the trunk flare exposed. After settlement, the crown of the plant ball shall be one (1) to two (2) inches higher than the surrounding finished grade. Planting soil shall be backfilled in layers of not more than nine inches and each layer shall be tamped before the next layer is placed. When plant beds have been backfilled approximately 2/3 full, water thoroughly before installing remainder of the planting soil to top of bed, eliminating all air pockets. Do not backfill beds with planting soil until the exact location of all plants is approved by the Engineer.
- H. Planting shall be set in the center of pits, plumb and straight. Brace rigidly in position until the planting soil has been tamped solidly around the ball and roots.
- I. Remove wire wrap from root balls. Do not leave any portion of wire wrap in planting pit. Cut ropes or strings from the top of the balls after the plant has been set. Cut off or fold back and bury burlap from top 2/3 of root ball. Remove plastic twine and burlap completely.
- J. Mulch and water all plants immediately after planting.
- K. Smooth planting areas to conform to specified grades after full settlement has occurred and mulch has been applied.
- L. Fertilizing Schedule
1. Provide slow release planting tabs in the quantity recommended by the fertilizer manufacturer for the species and size of tree and shrub involved.
- M. Pruning: Prune new plants only at time of planting and in accordance with the American Association of Nurserymen Standards in such a manner as to preserve the natural character of the plant. Pruning shall be done by experienced personnel under the supervision of the Engineer.
1. Remove all dead wood, suckers and broken or badly bruised branches. Do not cut leader. Use only clean sharp tools.

- N. Only trees specified on the Drawings shall be guyed and anchored at the time of planting. Guys shall be placed around the trunk in such a manner that no branches will be subject to undue strain. Wires shall not come in direct contact with the bark of a tree. Guys shall be kept tight at all times.

3.3 EROSION CONTROL

- A. Erosion control matting shall be installed over all planting beds with a slope of 3:1 or greater.
- B. It shall be the responsibility of the Contractor to provide any additional erosion control measures to render all planting areas erosion free throughout the construction period. The Contractor may accomplish this by any of several alternate methods, any of which may be used provided such method is acceptable to the Engineer. Approval of the method by the Engineer does not free the Contractor of responsibility for controlling erosion.

3.4 PROTECTION AND MAINTENANCE OF PLANT MATERIAL

- A. Protection and maintenance shall begin immediately after each plant is planted with the following requirements:
 - 1. Maintenance of new planting shall consist of pruning, watering, cultivating, weeding, mulching, resetting plants to proper grades and or upright position and furnishing and applying such sprays as are necessary to keep the plantings free of insects and disease. Pesticides shall be approved by the Engineer prior to use and shall be used in accordance with the specifications of the prevailing Public Health Authority.
 - 2. Planting areas and plants shall be protected at all times against trespassing and damage of all kinds for the duration of the maintenance period. If any plants become damaged or injured, they shall be treated or replaced as directed by the Engineer at no additional cost to the Owner.
 - 3. All trees shrubs and plants shall be watered twice within the first 24 hours of planting and at least twice each week thereafter. The soil around each tree or shrub shall be thoroughly saturated. Trees shall receive a minimum of ten gallons of water each, and shrubs a minimum of five gallons each at each watering.
- B. Upon completion of planting and prior to acceptance, the Contractor shall remove excess soil and debris from the site and repair any damage to structures, pavements, lawns, etc., resulting from planting operations at no additional cost.
- C. Full and complete written instructions for maintenance of the plantings shall be furnished by the Contractor to the Authority within 10 days after the planting of the first plant.

3.5 INSPECTION

- A. When planting is substantially complete, the Contractor shall request in writing that the Engineer inspect all work. After such inspection the Engineer shall submit a final punchlist to the Contractor.

3.6 PRELIMINARY ACCEPTANCE (START OF ONE YEAR GUARANTEE)

- A. After all necessary corrective work and clean-up have been completed and maintenance instructions have been delivered to the Authority, Preliminary Acceptance of the planting shall be given by the Owner after the Engineer has determined that all work of the planting, including written guarantees and including all items on the final punchlist, have been completed and that all work conforms to the Contract Documents.
- B. The Engineer shall certify in writing to the Authority as to the preliminary completion of the project.
- C. Acceptance of plant material by the Engineer shall be for general conformance to specified size, character and quality and shall not relieve the Contractor of responsibility for full conformance to the contract documents including correct species.

3.7 GUARANTEE PERIOD AND REPLACEMENTS

- A. All trees, shrubs and groundcovers shall be guaranteed by the Contractor for a period of one year. The guarantee period shall begin on the date of preliminary acceptance of the planting. Plants shall be alive and in satisfactory growth at the end of the guarantee period.
- B. The Contractor shall provide maintenance for plant materials during the guarantee period and shall submit to the Authority for review and approval, a proposed maintenance program. The Contractor shall make periodic inspections as necessary, at no extra cost to the Authority, during the guarantee period to determine what changes, if any, should be made to the Maintenance Program. Any changes should be submitted in writing to the Engineer. The Contractor, at his option, may provide additional maintenance. In either case, the Contractor will be responsible for replacement of any dead or damaged plants at the end of the guarantee period.
- C. The Contractor shall replace, without cost to the Authority, and as soon as weather conditions permit and within specified planting period, all dead plants and all plants not in vigorous, thriving condition, as determined by the Engineer during and at the end of the guarantee period. The plants shall be free of dead or dying branches and branch tips, and shall bear foliage of a normal density, size and color. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification.
- D. The Contractor shall make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Authority.
- E. The guarantee of all replacements plants shall extend for an additional period of one year from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the extended guarantee period, the Authority may elect subsequent replacement or credit for each item.
- F. The guarantees shall be in writing, signed by the Contractor, in a form acceptable to the Authority.

3.8 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the guarantee period, the Engineer shall inspect all guaranteed work for final acceptance upon written request of the Contractor. The request shall be received at least 10 calendar days before the anticipated date for final inspection.
 - 1. Prior to final acceptance of the planting, the Contractor shall remove and dispose of all guying and staking material from trunks of trees.
- B. Upon completion and re-inspection of all repairs or replacements necessary, in the judgment of the Engineer at that time, the Engineer shall certify in writing to the Authority as to the final acceptance of this portion of work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02910

STATION STORAGE FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishing and installing Station Storage Facilities as described herein, complete, with components in conformity with the Contract Drawings, manufacturer's specifications, and located to the lines and grades shown on the Contract Drawings.

1.2 QUALITY CONTROL

- A. Design of the station storage facility shed shall meet all applicable requirements as provided in the current edition of the Commonwealth of Massachusetts State Building Code, as noted on the Contract Drawings, and as specified below:
 - 1. Basic Snow Load, Zone 2, shall be a minimum of 30 psf, modified for specialized roof characteristics as appropriate.
 - 2. Wind Load, Exposure C, Zone 3, shall be a minimum of 21 psf, applied where and as required.
 - 3. Special Impact Load, 200 lbs., applied at location to cause maximum effect.
 - 4. No Earthquake Load required.

1.3 SUBMITTALS

- A. The following shall be submitted for review:
 - 1. Manufacturer's literature, brochures and/or specifications for all material as specified herein and as shown on the Contract Drawings.

1.4 PROCUREMENT, DELIVERY, STORAGE AND HANDLING

- A. Procure, store and deliver work under this Section in a manner to prevent damage to components during transit and/or from the elements.
- B. Deliver storage facilities and set in locations as shown on the Contract Drawings.
- C. Each storage facility shed shall be protected from scratches, gouges, or rough handling which may mar the surface finish during installation.
- D. Damaged items shall be replaced without additional cost.

PART 2 – PRODUCTS

2.1 STORAGE FACILITIES

- A. The size of each storage facility shall be a minimum of 20'-0" long by 8'-0" wide by 8'-6" high, out-to-out dimensions.
- B. Storage facilities shall be a 'Conex' type steel portable storage container, as manufactured by Genstar Container Corporation; a precast modular building, Model Micro 1012, as manufactured by Concrete Systems, Inc., Londonderry, NH; or equal.
- C. Storage facilities shall be constructed of either 16 gauge sheet steel or of an equivalent design in precast concrete. Roof ventilation openings shall be provided as required for the size of the shelter. Lifting bars shall be provided to facilitate the movement of the storage facility. All embedded structural and sheet steel shall be hot dipped galvanized.
- D. Storage facilities shall be provided with a double front door of vandal resistant design. In each door, there shall be a minimum of two ventilation openings, covered with fine mesh stainless steel, copper, or brass screening. The exterior of the ventilation opening shall be hooded to minimize the entrance of precipitation. The interior of the ventilation opening shall be equipped with a sliding plate to allow the adjustment of airflow. The doors shall be hinged and provide a weatherproof seal design employing a water shedding gasket. Steel doors shall be provided with cast iron handles, welded to a three-point locking device which will ensure that the door cannot be locked until it is in the fully closed position. Other materials shall have an equivalent design. Doors shall be provided with a two-position retaining device to secure the door when open.
- E. Hinges shall be separate castings welded to the housing and door. The hinges shall be equipped with manufacturer's standard hinges and pins and shall be lubricated by the manufacturer before the storage facility is shipped.
- F. Anchoring hardware shall be galvanized steel, in sizes and configurations recommended by the manufacturer. Where anchor bolts are located inside the shed, removable covers shall be provided for access to the foundation bolts. Where anchors, bolts or fasteners are exposed, they shall be configured or secured in such a way as to prevent their casual removal by use of vandal-proof heads or fastenings.
- G. Exterior of storage facilities shall be painted a color selected by the Engineer. Painting shall conform to the requirements of Section 09900, Painting.
- H. Utilities:
 - 1. Branch Circuit Panel Boards
 - a. The storage facilities shall be provided with one branch circuit panel board for power supply conforming to the requirements of Section 16050.
 - b. Power supply shall be brought into each storage facility through the floor of the building through the cable entrance pipes located below the branch circuit panel board.
 - 2. Lighting
 - a. Each shed shall be provided with (cold weather rated ballast) fluorescent fixtures. The fluorescent fixture shall provide complete illumination of 30 foot candles minimum in all

areas of the building. Lights shall be operated from wall mounted switches conveniently placed near each door

3. Convenience Outlets (Receptacles)
 - a. Three convenience outlets shall be furnished and installed along the interior of the perimeter walls, four feet above the floor. All receptacles shall have Ground Fault Circuit Interrupted (GFCI) protection.
4. Branch Circuit Wiring
 - a. Wiring for lights, and convenience outlets shall be minimum #14 AWG, flexible, THHN wire installed in Electrical Metallic Tubing (EMT).

PART 3 – EXECUTION

3.1 GENERAL

- A. Locate and install the storage facility as shown on the Contract Drawings. The facility shall be set plumb and level, true to line and grade. The installation shall be coordinated with the concrete pad and ramp installation.
- B. Concrete pad and ramp placement, curing, testing, reinforcing and protection, and form work shall be as specified in Section 03300, Cast-In-Place Concrete, and shown on the Contract Drawings. The size of the concrete pad shall in no instance extend beyond the sides of the storage facility shed.
- C. Anchoring of the storage facility shall comply with the manufacturer's recommendations, applicable code or regulation, and best construction practices for the work to be performed.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02920

LAWNS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items:
 - 1. Seeding.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02100 – SITE PREPARATION; topsoil stripping and stockpiling.
 - 2. Section 02300 – EARTHWORK; excavation, filling and backfilling, and rough grading.

1.2 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging. Certification of each seed mixture for sod, identifying source, including name and telephone number of supplier.
- C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- D. Qualification Data: For landscape Installer.
- E. Material Test Reports: For existing surface soil and imported topsoil.

- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Authority for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment. Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
- D. Topsoil Suitability: Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.6 SCHEDULING

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit. Do not plant during inclement weather including but not limited to heavy rain, high winds, frost and similar conditions.

1.7 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days from date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water lawn at a minimum rate of 1 inch per week.
- D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the 1-1/2 inch grass height or less.
- E. Lawn Postfertilization: Apply fertilizer after initial mowing and when grass is dry. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with Association of Official Seed Analysts' "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Proportioned by weight as follows:
 - a. For Grassplots and Islands:

Creeping Red Fescue	50%
Kentucky Blue	25%
Domestic Rye	10%
Red Top	10%
Ladino Clover	5%
 - b. For Slopes and Shoulders:

Creeping Red Fescue	50%
Kentucky 31	30%
Domestic Rye	10%
Red Top	5%
Ladino Clover	5%
 - c. Erosion Control:

Winter Rye	80% minimum
Creeping Red Fescue	4% minimum
Perennial Rye Grass	3% minimum
Red Clover	3% minimum
Other Crop Grass	0.5% maximum
Inert Matter	1.0% maximum

- d. Crown Vetch (Penngift variety) Seed

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
 - 2. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.
- B. Aluminum Sulfate: Commercial grade, without additives.
- C. Sand: Clean, washed, natural or manufactured, free of toxic materials, gradation suitable for use.

2.4 PLANTING ACCESSORIES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.5 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.6 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

2.7 PLANTING SOIL MIX

- A. Planting Soil Mix: Topsoil mixed with suitable soil amendments and fertilizers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 1. Protect adjacent and adjoining areas from hydroseeding overspray.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Authority's property.
- C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 2. Loosen surface soil to a depth of at least of 8 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.
 3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
 4. Legally dispose of waste material, including grass, vegetation, and turf, off Authority's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll to grade and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate of 3 to 4 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mesh and 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

3.5 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
1. Mix slurry with nonasphaltic tackifier.
 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.6 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches.
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove erosion-control measures after grass establishment period.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 02960

WETLAND MITIGATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section specifies operations related to restoration of temporary wetland impact areas and the construction of the two wetland mitigation areas, including grading, plantings, post-construction maintenance and monitoring of the mitigation areas.
- B. The work under this section will include a wetland mitigation program as specified herein, as indicated on the Contract Drawings, and as described in the Acton Conservation Commission Notice of Intent and Order of Conditions included as an attachment to the specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Other specification sections that directly relate to the work of this Section include the following:
 - 1. Section 02100 - SITE PREPARATION
 - 2. Section 02300 - EARTHWORK
 - 3. Section 02240 - DEWATERING
 - 4. Section 02250 - STORMWATER POLLUTION PREVENTION
 - 5. Section 02900 - TREES, SHRUBS AND GROUNDCOVERS
 - 6. Section 02920 - LAWNS

1.3 REFERENCES

Massachusetts Bay Transportation Authority Acton Conservation Commission Order of Conditions and Notice of Intent for Acton Station included as an attachment to the specifications.

Department of the Army Section 404 Programmatic General Permit for Massachusetts, January 21, 2010 included as an attachment to the specifications.

1.4 QUALITY ASSURANCE

- A. The wetland mitigation program shall be observed and supervised by a qualified Society of Wetland Scientists Certified Professional Wetland Scientist (PWS). The Contractor shall comply with the recommendations of the Professional Wetland Scientist.

1.5 SUBMITTALS

- A. Description of wetland seed mixture including the manufacturer, date of last germination test, number of pounds of material to be used, method of application, and the number of square feet that can be covered.
- B. Test results for proposed wetland topsoil, including results of percent organic matter testing. Wetland topsoil testing shall be conducted in accordance with Section 02920, Lawns.
- C. Qualifications, experience, and proof of Certification of Professional Wetland Scientist.

PART 2 - PRODUCT

2.1 VEGETATION PLANTING MATERIALS:

- A. Planting Materials shall be as indicated on the Wetland Mitigation Drawings.

2.2 WETLAND SEED MIXTURE:

- A. The Wetland Seed Mixture shall be as specified on the Wetland Mitigation Drawings.

2.3 HIGH ORGANIC CONTENT LOAM:

- A. The topsoil used in the wetland mitigation areas shall consist of high organic content loam, with a minimum of 10% organic matter by weight, procured from an approved source, and which is clean and free of seeds and fragments from invasive and non-native plant species.
- B. Wetland soils shall be free of trash, clay clods, or any toxic substances.
- C. Soils from areas containing purple loosestrife (*Lythrum salicaria*), reed canarygrass (*Phalaris arundinacea*), common reed grass (*Phragmites australis*) or other invasive or non-native species shall not be used in the mitigation areas.

2.4 DELIVERY

- A. Vegetation to be planted shall be maintained in viable condition during transport to the planting location. Protect such plants from desiccation. If planting operations require more than one day to complete, plant materials shall be stored in a protected fashion as deemed appropriate by the Professional Wetland Scientist. Storage of any such material, and other non-essential activities, shall not occur within existing wetlands.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. Prior to any work, the boundaries of all wetland resources adjacent to the wetland mitigation sites shall be clearly marked.
- B. Prior to any earth moving, erosion and sedimentation controls, as specified in Section 02250 shall be installed as indicated in the Stormwater Pollution Prevention Plan. This silt/erosion control system shall be maintained fully functional until the mitigation areas are completely stabilized.

- C. Clear and grub existing upland vegetation from the portion of the mitigation areas to be excavated as specified in Section 02100-Site Preparation. Vegetation removal and subsequent grading shall be done in a manner that does not damage or destroy existing vegetation that is to remain on-site. An adequate supply of woody material shall be salvaged and retained for use as wildlife enhancement
- D. Remove surface soils, subsoils, and any other materials from the slopes and the mitigation areas as specified in Section 02300 so surface elevations conform to 1.0 foot below the proposed final grades. The PWS shall verify the presence of appropriate wetland hydrology based on field observations. If the PWS does not believe appropriate wetland hydrology is present, the PWS shall notify the Engineer and make a recommendation for revised grading.
- E. Upon establishment of proper subgrade, backfill slopes and mitigation areas to conform to final grades shown on the Plans with 1.0 foot of high organic content loam.
- F. Upon completion of final grading, install wildlife habitat enhancement features including dead and dying woody debris under the direction of the Professional Wetland Scientist as indicated on the Wetland Mitigation Plan.
- G. Any dewatering during mitigation area construction will be done by pumping out excess and seepage water as specified in Section 02240.

3.2 SITE PLANTINGS

- A. Establish planting vegetation in the wetland mitigation areas as shown on the Wetland Mitigation Plan and as specified in Section 02900.
- B. Seed all exposed soils with wetland seed mixture as shown on the Wetland Mitigation Plan and as specified in Section 02920.

3.3 FINISHING

- A. Upon completion of vegetation planting in the mitigation areas, to the satisfaction of the Professional Wetland Scientist, the contractor shall place at the limit of work, temporary fencing, or other temporary structures for the protection of the wetland mitigation areas from erosion, siltation, or other external factors such as wildlife foraging and human trespassing.
- B. Any areas adjacent to the mitigation areas that were disturbed in the course of construction shall be returned to preconstruction contours and permanently stabilized with loam and an appropriate seed mixture as recommended by the Professional Wetland Scientist and in accordance with Section 02900.
- C. A minimum of four (4) photographs shall be taken from the same locations by the Contractor prior to the commencement of site preparation and following completion of the mitigation areas. Each photograph shall note the direction from which the photo was taken, date, time, weather, and other relevant observations. Photographs shall be retained for inclusion in the mitigation monitoring reports. The photo sites shall be identified on the as-built plan.

3.4 MAINTENANCE AND MONITORING

- A. Fertilize, irrigate and maintain areas as necessary to promote vegetation establishment, control invasive species, and achieve the success standard of establishment of indigenous wetland plant species covering at least 75% of the surface of the mitigation areas within two growing seasons.

- B. Plant materials planted in the mitigation areas shall be examined by the Professional Wetland Scientist not less than 21 days and not more than 28 days after planting. Trees and shrubs which have not survived the initial planting shall be replaced by the Contractor as specified in Section 02900.
- C. After one growing season (between 310 and 380 days after the initial planting), an inspection shall be made by the Authority and the Professional Wetland Scientist to determine the acceptability of the plant growth. The Contractor shall replace all plantings that have not survived after one growing season, as directed by and at no additional cost to the Authority.
- D. A Mitigation Area Monitoring Report for the sites shall be prepared annually by the Professional Wetland Scientist and submitted to the Authority as described in the most recent version of the US Army Corps of Engineers New England District Mitigation Plan Checklist Guidance document. (Available at: <http://www.nae.usace.army.mil/reg/index.htm>). If monitoring indicates remedial measures are necessary to achieve the required success standards, the Professional Wetland Scientist shall develop a corrective plan of action which shall be submitted to the Authority for approval, and implemented by the Contractor under the supervision of the Professional Wetland Scientist and in coordination with appropriate regulatory agencies at no additional cost to the Authority.
- E. Wetland Mitigation shall be completed at least two growing seasons before Substantial Completion. If after two growing seasons at least 75% of the surface of the replacement areas has been revegetated with indigenous wetland plant species, the Contractor shall apply to the Acton Conservation Commission for a Certificate of Compliance. If monitoring data indicates that this objective cannot be met, the Professional Wetland Scientist shall develop a corrective plan of action which shall be submitted to the Authority and implemented by the Contractor under the supervision of the Professional Wetland Scientist and in coordination with appropriate regulatory agencies. Corrective actions will continue until the Contractor acquires a Certificate of Compliance at no additional cost to the Authority.
- F. If less than 75% of the surface of the replacement areas has been revegetated, the Contractor shall refertilize the mitigation areas annually for two consecutive growing seasons at no additional cost to the Authority. The areas shall be refertilized by broadcasting slow release fertilizer as specified in Section 02900.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 03254

ELASTOMERIC BEARING PADS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies elastomeric bearing pads for pedestrian platforms and pedestrian bridge.

1.2 SUBMITTALS

- A. Submit manufacturer's literature or shop drawings for products provided under this Section.
 - 1. The Contractor shall submit bridge bearing shop drawings to the Engineer for review and approval. Fabrication of the bearings shall not begin until the Contractor receives approved shop drawings. The drawings shall include, but not be limited to the following.
 - a. Plan and elevation of each bearing type and size
 - b. Complete bearing assembly details and sections showing all materials (with ASTM or other designations) incorporated in the bearings.
 - c. All fabrication dimensions and required surface finishes.
 - d. Vertical and horizontal load capacities.
 - e. Shop coating requirements.
 - f. Bearing seat and all bearing anchorage details.
- B. Certificate of Compliance
 - 1. The Contractor's bearing supplier shall submit Certificates of Compliance for the bearings indicating the materials, fabrication, testing, and installation are as specified herein.
- C. Samples: Furnish one sample elastomeric bearing pad for each type of pad used in the work for destructive testing. Samples will be selected by the Engineer at random from the lots delivered to the project site.

1.3 QUALITY ASSURANCE

- A. Test specimens will be cut from the sample elastomeric bearing pads and will be tested for conformance to these Specifications. For such test specimens a reduction of 10% in the minimum requirements for original tensile strength and ultimate elongation will be permitted.
- B. Hold Point - Do not set elastomeric bearing pads in place until the samples have been tested and approved by the Engineer.
- C. Welding Qualifications
 - 1. Welds shall be made only by welders who are qualified by tests as prescribed by AWS D1.5 to perform the type of work required.

D. Tests and Inspection

1. Production bearing sampling and testing shall be performed in accordance with the more stringent of AREMA, Chapter 15, Part 11, and AASHTO Division II, Section 18.7, as applicable.
2. Each bearing shall be visually examined both during and after testing. Any resultant defects, such as bond failure, physical destruction or debonding, shall be cause for rejection. Defects such as extruded or deformed elastomer or cracked steel shall also be cause for rejection.

1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Every bearing shall have the Project Identification Number, Lot Number, and Individual Bearing Number indelibly marked with ink.
- B. After assembly including sole plates, bearing components shall be held together with steel strapping or other means, to prevent disassembly until the time of installation. Packaging shall be adequate to prevent damage from impact as well as from dust and moisture contamination during shipping and storage.
- C. Bearings delivered to the site shall be stored under cover on a platform above the ground surface. Bearing shall be protected at all times from damage. When placed, bearings shall be dry, clean, and free from dirt, oil, grease, or other foreign substances.
- D. Bearing assemblies shall not be disassembled unless otherwise permitted by the Engineer or Manufacturer.

PART 2 - PRODUCTS

2.1 ELASTOMERIC BEARING PADS

- A. Type: Either plain bearing pads, consisting of elastomer only, or laminated bearing pads, consisting of layers of elastomer restrained at their interfaces by bonded laminates, as indicated.
- B. Elastomer portion of the elastomeric compound: 100% virgin chloroprene.
- C. Plain Type: Molded individually cut from previously molded strips or slabs, or extruded and cut to length: cut edges at least as smooth as ANSI 250 finish.
- D. Laminated Type: All components laminated bearing pads molded together into an integral unit and all edges of the non-elastic lamination covered by a minimum of 1/8 inch of elastomer -except at laminate restraining devices and around holes that will be entirely closed on the finished structure. Laminates: rolled mild steel sheets conforming to ASTM A1011 Grade 36.
- E. Physical Requirements
 1. Finish, appearance, flash, and rubber to metal bonding, as defined in Rubber Manufacturers Association Handbook:
 - a. Thickness: no undersize and not more than 10% oversize.
 - b. Length and Width: As indicated, plus or minus 1/8 inch
 - c. Finish: commercial finish (Table V. Symbol F.3)

- d. Flash: tear trim tolerance (Table VI. Symbol T.063)
 - e. Rubber-to-Metal Bonding (min.): 40 pounds per inch width (Grade 2. Method B. Table VIII).
2. Static load deflection: for any layer of elastomeric bearing, 7% maximum 800 psi average unit pressure when tested under laboratory conditions.
 3. Physical Properties
 - a. Hardness, per ASTM D 2240: 60, plus or minus 6
 - b. Tensile strength, per ASTM D 412: 2500 psi minimum
 - c. Ultimate elongation, per ASTM D 412: 350% minimum
 4. Heat Resistance per ASTM D 573, 70 hours at 212° F.
 - a. Change in durometer hardness: plus 15 points maximum
 - b. Change in tensile strength: minus 15% maximum
 - c. Change in ultimate elongation minus 40% maximum
 5. Compression set, per ASTM D 395, Method B, 22 hours at 212°F: 35% maximum
 6. Ozone cracking, per ASTM D1 149, 100-pphm ozone in air by volume, 20% strain, 100 plus or minus 2°F, 100 hours, mounting procedure A per ASTM D 518: no cracks.
 7. Adhesion, per ASTM D429, Method B, bond made during vulcanization: 40 pounds per inch.
 8. Low Temperature Test
 - a. Sample preparation: 96 hours at-20 plus or minus 2°F, axial load 500 psi strain of 20% effective rubber thickness.
 - b. Shear resistance after one hour at 25% shear strain: 75 psi maximum.

2.2 STRUCTURAL STEEL

- A. All masonry plates and sole plates shall conform to the requirements of ASTM A709 Grade 36.
- B. All steel angles for fastening pre-cast panels to pier caps shall conform to the requirements of ASTM A709 Grade 50.

2.3 ADHESIVE FOR BONDING

- A. Epoxy Material, Fed. Spec. MMM-A-134, FEP Film or Equal.

2.4 PREFABRICATED PAD

- A. Rubber-Cotton Duck Pad 1/8" thick, in accordance with AREMA, Section 15, Part 11 (11.2.4.4b).

2.5 FASTENERS

- A. All Anchor Bolts shall conform to the requirements of ASTM F1554, Grade 105

2.6 PROTECTIVE COATING

- A. Steel for Bearing Assemblies shall be Hot-Dip Galvanized as applicable.
- B. Plates and Bars: ASTM A123

- C. Anchor Rods, Nuts, and Washers: ASTM A153

PART 3 - EXECUTION

3.1 GENERAL

- A. Install elastomeric bearing pads in accordance with the details contained in the Contract Drawings. Make any adjustments required to install the bearing pads in the correct horizontal and vertical location.

3.2 FABRICATION

- A. The Sole Plate shall be galvanized, except for the 1" wide strips where the sole plate is to be welded to the girder bottom flange.
- B. Welding: In accordance with AASHTO/AWS D1.5
- C. Gross bearing dimensions shall a tolerance of $-0, +1/8"$.

3.3 INSTALLATION

- A. Bearings for pre-cast concrete platform panels shall be fabricated and installed in accordance with Section 03410 – Plant -Precast Structural Concrete.
- B. Bearings for bridge structures shall be set such that no horizontal bearing deformation exists at 50-degrees F.
 - 1. Temperature of steel adjacent to the bearing during field welding shall be kept below 250-degrees F.
 - 2. Sole plate-to-bottom flange welds shall terminate $1/4"$ from edge of plate.
 - 3. After welding, apply galvanizing repair paint with a minimum dry film thickness of 3-mils to the welds and bare strips.
 - 4. Bearing assemblies shall be installed in accordance with the bearing alignments shown on the contract plans. Upon final installation of the bearings, the Engineer and Manufacturer's representative shall inspect the bearing components to assure that they are level and aligned to within ± 0.005 radians. Any deviations in excess of the allowed tolerances shall be corrected.
 - 5. Bearing assemblies shall be handled by their bottom surfaces only. The bearings shall not be lifted by their tops, sides and/or shipping bands.
 - 6. The bearing assemblies shall be aligned with the superstructure as shown on the plans. On expansion bearings, special care must be taken to properly align the bearing with the designated expansion direction of the structure as shown on the plans.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items:
1. Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following applications:
 - a. Footings.
 - b. Foundation Walls.
 - c. Slabs-on-Grade.
 - d. Mini Pile Caps.
 - e. Retaining Walls.
 - f. Pier Stems
 - g. Slabs for Miscellaneous Equipment and Future Equipment.
 - h. Sidewalks, Curbs, Gutters, and Ramps.
 - i. Foundations for Fence Posts.
 - j. Foundations for Bollards, Benches, Bicycle Racks, and other miscellaneous site items.
 - k. Thrust Blocks.
 - l. Cutting and Patching of mechanical and electrical penetrations through cast-in-place concrete.
 - m. Embedment of items provided by others.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 02260 - EXCAVATION SUPPORT AND PROTECTION
 2. Section 02300 - EARTHWORK
 3. Section 02369 - DRILLED MINI PILES
 4. Section 03370 - PENETRATING CONCRETE SEALER
 5. Section 03410 - PLANT-PRECAST STRUCTURAL CONCRETE
 6. Section 05100 - STRUCTURAL STEEL
 7. Section 05500 - MISCELLANEOUS METALS
 8. Section 07190 - WATER REPELLANTS

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Indicate amount of fly ash in the mix.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - 1. Indicate coordination requirements for reinforcement locations with requirements of structural steel, steel joints and steel deck.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the Commonwealth of Massachusetts detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
 - 2. Blockouts for Architectural Joint Systems: Indicate blockouts and coordination with architectural joint systems.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
- F. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.

13. Joint-filler strips.
 14. Repair materials.
- G. Floor surface flatness and levelness measurements to determine compliance with specified tolerances and requirements for applied finishes and materials, except as noted for slope to drains.
 - H. Field quality-control test and inspection reports.
 - I. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. **Testing and Inspection Services by the Authority:** Sampling and testing of concrete ingredients; design or acceptance of concrete mix proportions; concrete plant inspection; and field control will be by the Engineer at the expense of the Authority.
 1. The Contractor agrees to accept as indicative, the results of tests, including test results involving mix designs and field quality control of concrete mixtures. If, as a result of these tests, it is determined that the specified concrete properties are not being obtained, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the specified properties, at no additional expense to the Authority.
 2. The use of testing and inspection services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in compliance with the Contract Documents.
 3. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Engineer for final acceptance.
 4. Additional testing and inspection services requested by the Contractor because of changes in materials, sources, or proportions, or occasioned by failure of tests and inspection to meet specification requirements, shall be paid for by the Contractor. The costs for such additional testing and inspection services will be established by the Engineer.
 - a. Provide at no additional expense to the Authority all materials, labor, and services for sampling and testing required by the Engineer, including but not limited to:
 - b. Transportation of sample materials from source to the Authority's Materials Testing Laboratory, 170 Freeport Street, Dorchester, Massachusetts.
 - c. Preparation, handling, storage and transportation of concrete test specimens as directed by the Engineer.
 - d. Suitable containers for the storage, curing and transportation of concrete test specimens in accordance with ASTM C 31.
 - e. Suitable storage for a supply of test cylinder molds, test equipment and other items required for sampling and testing.
- C. When additional sets of test cylinders beyond the mandatory seven and twenty-eight day tests are required by the Contractor to verify early form removal or other reasons for his benefit, the Authority shall be reimbursed for the cost of fabricating and testing these additional test cylinders. The Contractor has the option of obtaining additional test services from an independent testing laboratory agency approved by the Engineer. Copies of test data from these additional tests shall be submitted to the Engineer for review and approval.

- D. The minimum number of test cylinders to be made for each class of concrete and for each placement will be four for each 100 cubic yards or less and minimum of four extra cylinders for each additional 50 cubic yards or fraction thereof. When additional sets of test cylinders are required beyond the normal seven and twenty-eight day tests, each set will consist of a minimum of two test cylinders.
- E. Independent Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- G. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel".
- H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete".
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
- I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- J. Preinstallation Conference: Conduct conference at Project site to address the following:
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: Shall be American-made Portland Cement, free from water soluble salts or alkalis which will cause efflorescence on exposed surfaces. Portland Cement shall be Type II, ASTM C 150. Use only one brand of cement for each type of cement throughout project. Contractor shall be responsible for whatever steps are necessary to insure that no visual variations in color will result in exposed concrete and shall place on order and secure in advance a sufficient quantity of this (these) cement(s) to complete concrete work specified herein.
 - 1. Fly Ash: ASTM C 618, Type F 15-35%
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120, 25-50%
- B. Normal Weight Fine Aggregate: Shall be washed, inert, natural sand conforming to ASTM C 33 and following additional requirements:

<u>Sieve</u>	<u>Percent Passing</u>
#4	- 95-100 (typical)
#16	- 50-85
#50	- 5-30
#100	9- 0-10
Fineness Modulus	2.80 (Plus/Minus 0.20)
Organic	Plate 2 maximum
Silt	2.0 percent maximum
Mortar Strength	100 percent minimum compression ratio
Soundness	15 percent maximum loss, magnesium sulfate, five cycles

- C. Normal Weight Coarse Aggregate: Shall be well graded crushed stone or washed gravel conforming to ASTM C 33 and the following additional requirements:

Designated Size (inches)	3	2	1-1/2	1	3/4	1/2	3/8
F.M. (+/-0.20)	7.95	7.45	7.20	6.95	6.70	6.10	4.50
Organic	Plate 1 maximum						
Silt	1.0 percent maximum						
Soundness	5 percent maximum loss, magnesium sulfate, five cycles						

- D. Maximum designated sizes for normal weight coarse aggregate to be used in concrete sections shall be as noted below, except that sizes shall also be chosen in conjunction with required clearances.
1. One and one-half inches for sections over ten inches in thickness.
 2. One inch for sections more than eight and up to ten inches in thickness.
 3. Three-quarter inch for sections more than three and up to eight inches in thickness.
- E. Concrete Fill for Steel Stair and Landing Pans: Composed of 1:2:2 mix with three-eighths inch maximum size normal weight aggregate and shall be placed with a 0 inches to 1 inch slump.
- F. Water: From approved source, potable, clean and free from oils, acids, alkali, organic matter and other deleterious material and complying with the requirements of ASTM C 94.
- G. Admixtures:
1. Water-reducing agent:
 - a. "WRDA" - W.R. Grace & Co.
 - b. "PDA25" - Protex Industries, Inc.
 - c. "Pozzolith 344H" - Master Builder's Co.
 - d. Note: Water-reducing agent shall be by same manufacturer as air-entraining agent.
 2. Air-entraining agent:
 - a. "DAREX AEA" - W.R. Grace & Co.
 - b. "PROTEX AEA" - Protex Industries
 - c. "MB-VR" or "MB-AE" - Master Builder's Co.
 3. Superplasticizer: High-range water-reducer conforming to ASTM C 494, Type F or Type G.
 4. Admixtures retarding setting of cement in concrete shall not be used without written approval of Engineer.
 5. Admixtures causing accelerated setting of cement in concrete shall not be used without written approval of Engineer.

2.2 CONCRETE MIXTURES

- A. The Contractor shall recommend, on the basis of trial mixes and strength curves specified below, design mixes for each type and strength of concrete. The Testing Agency will verify that the proposed mix designs conform to all specification requirements.
- B. Sufficient materials for concrete mix design shall be furnished by Contractor not less than five weeks before use. Duplicate small samples plainly and neatly labeled with source, where proposed to be used, date, and name of collector shall be provided and presented to Testing Agency for permanent reference.
- C. Mixes shall be designed in accordance with "Method 1" of ACI 301, and the requirements of this Section. All concrete is normal weight unless specifically designated otherwise; air-dry weight not to exceed 150 lbs. per cubic foot.
- D. All structural concrete shall have a minimum 28 day compressive strength of 4,000 psi.

- E. Exterior concrete shall contain air-entraining admixture when tested to ASTM C 231 at the point of discharge from the truck mixer:

<u>Aggregate Size</u>	<u>Air Content, %</u>
1-1/2 in.	4.5 - 7.5
3/4 in.	5.0 - 8.0
3/8 in.	6.0 - 9.0

- F. Concrete shall have the following slump when tested to ASTM C 143 at the point of discharge from the truck mixer:

<u>Condition</u>	<u>Slump, inches</u>
With Water-Reducing Agent	4-1/2 - 7
Without Water-Reducing Agent	2 - 5

- G. Concrete slabs, including slabs on grade, shall have a mid-range water reducer and have a maximum slump of 6 inches.
- H. The approved superplasticizer shall be used in all concrete walls, including slabs on grade.
- I. Design mix of concrete to be used in work shall correspond to following test strengths (TABLE A) obtained in laboratory trial mixtures.

TABLE A

Minimum Strength of Lab Trial Mixes (psi)

Design Strength	Trial Mix Strength	
	7-days	28-days
4000	3400	5200
5000	4200	6200

- J. Any deviation from approved mix design, which Contractor deems desirable under certain project conditions, will not be allowed without written approval of Engineer. Cost of any additional testing by Testing Agency associated therewith shall be paid for by Contractor.

2.3 FORM MATERIALS

- A. Construct formwork to shapes, lines, and dimensions required, plumb and straight, secured and braced sufficiently rigid to prevent deformation under load, and sufficiently tight to prevent leakage, all in conformance with ACI Standard 347, "Recommended Practice for Concrete Formwork".
- B. Formwork for exposed concrete shall be medium-density plastic overlaid plywood, 5/8" minimum thickness; for concealed concrete shall be "Plyform" plywood, 5/8" minimum thickness.
- C. Chamfer Strips: Half-inch, 45 degree poplar wood strips, nailed six inches on center, and installed in inside corners of all forms, unless otherwise directed by Engineer.
- D. Form Ties and Spreaders: Richmond Tyscrus by Richmond Screw Anchor Co.; Superior-ties by Superior Concrete Accessories, Ind.; or Sure-Grip Ties by Dayton Sure-Grip and Shore Co. Wire ties

shall not be used. Ties for foundation walls shall be snap-ties or type specified above with removal cones and shall incorporate water seal washer. Ties shall be arranged in a symmetrical manner.

- E. Form Release Agent: Non-staining and non-emulsifiable type, or equal approved by Engineer. Form release agent shall be biodegradable and shall not impart any stain to concrete nor interfere with adherence of any material to be applied to concrete surfaces.

2.4 REINFORCEMENT AND ACCESSORIES

- A. Reinforcing Steel Bars: Shall be newly rolled billet steel conforming to ASTM A 615 Grade 60. Bars shall be bent cold.
- B. Welded Wire Fabric: Shall conform to ASTM A 185.
- C. All structural steel reinforcement and embedded items shall be epoxy coated in accordance with ASTM A 775.
- D. Reinforcement Accessories: Shall conform to Product Standard PS7-766, National Bureau of Standards, Department of Commerce, Class C, as produced by Superior Concrete Accessories, Inc.; Dayton Sure-Grip Co.; or R.K.L. Building Specialties Co., Inc. Reinforcement accessories shall include spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening reinforcement. All reinforcement accessories shall be epoxy coated. Tie wire shall be epoxy coated wire of sufficient strength for intended purpose, but not less than No. 18 gage. Metal supports shall be of such type as not to penetrate surface of formwork and show through surface of concrete. Accessories touching interior formed surfaces exposed to view shall have not less than 1/8 inch of plastic between metal and concrete surface. Plastic tips shall extend not less than 1/2 inch up on metal legs. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.

2.5 MISCELLANEOUS MATERIALS

- A. Grout: Ready-to-use aggregate product requiring only addition of water at job site such as "Embeco Pre-mixed Grout" by Master Builder's; "Vibro-Foil Ready-Mixed" by W.R. Grace & Co.; or "Ferrolith G" by Sonneborn Building Products, Inc. Grout shall be easily workable and shall have no drying shrinkage at any age. Compressive strength of grout (2" x 2" cubes) shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.
- B. Waterstops: Extruded virgin PVC containing no scrap or reclaimed material or pigment. Provide cross section as indicated, uniform along the length of the waterstop and symmetrical transversely so that the thickness at any given distance from either edge of the waterstop will be uniform. The finished waterstop shall meet the requirements specified below for the average of five samples tested in each case. Report standard deviations of values in addition to averages. Condition and test samples in atmosphere of 73 (plus or minus 3) degrees F and 50 (plus or minus 10) percent relative humidity, except where other test conditions are specified.
 1. Tensile strength, per ASTM D 638. Die IV-: 2000 psi. minimum.
 2. Ultimate elongation, per ASTM D 638. Die IV: 350 percent, minimum.
 3. Tear resistance, per ASTM D 624. Die B: 350 pounds per inch of thickness, minimum

4. Stiffness in flexure, samples reduced to 1/8-inch thickness, per ASTM D 747. 1/4 inch span: 600 psi. minimum.
 5. Low temperature brittleness samples reduced to 1/8-inch thickness, per ASTM D 746: no cracking, chipping, or sign of failure at minus 35 degrees F.
 6. Accelerated Extraction, samples reduced to 1/8-inch thickness, per Corps of Engineers CRDC-572: tensile strength, per ASTM D 412. Die C 1750 psi. minimum; ultimate elongation, per ASTM D 412. Die C: 300 percent, minimum.
 7. Effect of Alkali, samples reduced to 1/8-inch thickness, per Corps of Engineers CRDC-572: Change in weight. 7 days: minus 0.10 to plus 0.25 percent; Change in weight. 30 days minus 0.10 to plus 0.25 percent; Change in hardness. 7 days. per ASTM D 2240. Shore A-2: plus or minus 5 points; Change in thickness. 30 days: plus or minus 1.0 percent.
 8. Tensile strength of samples taken across site-made and factory-made splices, per ASTM D 638 Die I \1000 psi. minimum
- C. Vapor Barrier: 6 mil polyethylene, unless specifically specified elsewhere.
- D. Membrane Curing Compound: ASTM C 309, Type 1. Product used shall be shown to be compatible with the later application of coatings. Curing compound shall not be used on any floor slab scheduled to receive an adhered floor finish.
- E. Membrane Curing Compound for Architectural Concrete: Liquid membrane curing compound complying with AASHTO M148, Type 1D, except Type 2 if required to control temperature of mass concrete and hot weather concrete.
- F. Sheet Curing Materials: Waterproof paper (regular or white), polyethylene film (clear or opaque white), and white burlap-polyethylene sheet complying with AASHTO M171.
- G. Chemical Hardener: All exposed concrete floor slabs shall be hardened with three applications of fluosilicate chemical hardener followed by two applications of clear acrylic concrete sealer by Sonneborn Division, ChemRex Inc. "Lapidolith"; or equal products by W.R. Meadows Co. and Concrete Service Material Company or other manufacturers.
- H. Penetrating Sealer: Monomeric alkyalkoxy silane sealer which has demonstrated penetrability into dry low permeability concrete to a minimum of 1/4 inch. Sealer shall have 20 to 25 percent solids when used on walls, and 40 to 50 percent solids when used on floors.
- I. Epoxy Membrane Curing Compound/Concrete Sealer: The two component, epoxy resin system shall act as a dual purpose material: A membrane compound for curing alone, plus a penetrating sealer. It shall provide protection for concrete exposed to de-icing salts, commercial acids and alkalis, gasoline, diesel fuel, and oil, and exposure to freeze/thaw cycles and to vehicular traffic. The epoxy resin compound shall be furnished in two components for combining immediately prior to use in accordance with the manufacturer's written instructions as specified herein. The components of the epoxy resin system shall conform to the following requirements.
1. Component A: Poly (2 hydroxypropylene, P'p, isopropylidenephenolate) condensed with 1 chlorepropoxirane such that the ox content is 4% in aralkyl and hydroxylated solvents. Component B: The amido amine condensate of the Diels Alder adduct of polyunsaturated acids dissolved in suitable solvents. Ratio of components (A to B): 1:1 by volume.
 2. Properties of Mixed Material:

- a. Viscosity: 75 to 125 cP's at 75°F.
 - b. Pot Life: 8 hours minimum at 75°F.
 - c. Minimum Solids Content: 40 to 44% by weight.
 - d. Recoat Time: 24 hours maximum.
 - e. Dry Film Thickness: 2 to 3 mils per coat.
 - f. Color: Clear, White tint, gray tint.
3. Properties of Cured Material:
- a. The cured system shall exhibit no evidence of a mine blushing or sweating which may inhibit bond of subsequent coats.
 - b. When tested according to ASTM D 968, specimens of coating cured for 14 days at 75°F shall exhibit an abrasion coefficient of at least 30 liters per mil.
 - c. When tested according to ASTM D 522, a 2 mil dry film thickness specimen cured for 14 days at 75° shall exceed 12% elongation when tested on the 1/4 inch mandrel.
 - d. Specimens cured for 14 days at 75°F and immersed for 48 hours shall exhibit less than 1% water absorption by weight.
 - e. Water Retentivity shall not exceed 0.055 grams per square centimeter when tested according to ASTM C 156.
- J. Grout Bags: (Not Used)

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine all work prepared by others to receive work of this Section. Commencement of work will be construed as complete acceptance of preparatory work by others.
 - 1. Hold Point-A pre-placement inspection shall be performed by the Contractor prior to placing concrete to assure that placement prerequisites have been accomplished.

3.2 HANDLING, STORAGE, AND PROTECTION OF MATERIALS

- A. Handle and store materials separately in such manner as to prevent intrusion of foreign matter, segregation, or deterioration. Do not use foreign materials or those containing ice. Remove improper and rejected materials immediately from point of use. Cover materials, including steel reinforcement and accessories, during construction period. Stockpile concrete constituents properly to assure uniformity throughout project.

3.3 ERECTION OF FORMWORK, SHORING AND RESHORING

- A. Set and maintain formwork to insure complete concrete work within tolerance limits listed in ACI 347 latest edition, "Recommended Practice for Concrete Formwork", and with following additional requirements:
 - 1. Maximum variations from plumb:
 - a. In surfaces of columns and walls:
 - 1) In any 10 feet of length: 1/4 inch

- 2) Maximum for entire length: 1/2 inch
 2. Maximum variations from established position in plan shown on the drawings:
 - a. Column: 1/2 inch
 - b. Walls: 3/4 inch
 3. Variations in cross-sectional dimensions of columns and beams and in thickness of slabs and walls.
 - a. Minus: 1/8 inch
 - b. Plus: 1/4 inch
- B. Before form materials can be re-used, surfaces that will be in contact with freshly cast concrete shall be thoroughly cleaned, damaged areas repaired and projecting nails withdrawn. Re-use of form material shall be subject to approval by Engineer.

3.4 PLACING OF REINFORCEMENT

- A. Reinforcement shall be placed in accordance with requirements of CRSI 93, "Recommended Practice for Placing Reinforcing Bars" and CRSI 93, "Recommended Practice for Placing Bar Supports" and with further requirements below.
- B. Reinforcement shall be accurately placed in accordance with Contract Documents and shall be firmly secured in position by wire ties, chairs, spacers, and hangers, each of type approved by Engineer.
- C. Bending, welding or cutting reinforcement in field in any manner other than as shown on Drawings, is prohibited, unless specific approval for each case is given by Engineer.
- D. Reinforcement shall be continuous through construction joints unless otherwise indicated on Drawings.
- E. Reinforcement shall be spliced only in accordance with requirements of Contract Documents or as otherwise specifically approved by Engineer. Splices of reinforcement at points of maximum stress shall generally be avoided. Welded wire fabric shall lap six inches or one space plus two inches whichever is larger, and shall be wired together.
- F. At time concrete is placed, reinforcement shall be free of excessive rust, scale, or other coatings that will destroy or reduce bond requirements. Reinforcement expected to be exposed to weather for a considerable length of time shall be painted with a heavy coat of cement grout. Protect stored materials so as not to bend or distort bars in any way. Bars that become damaged will be rejected.
- G. Hold Point - Before concrete is cast, check all reinforcement after it is placed to insure that reinforcement conforms to Contract Documents and approved Shop Drawings. The Engineer shall be notified at least 36 hours prior to concrete placement and given opportunity to inspect completed reinforcement and formwork before concrete placement. Prior approval of Shop Drawings shall in no way limit Engineer's right to demand modifications or additions to reinforcement or accessories.

3.5 DRILLING AND GROUTING REINFORCING STEEL

- A. (Not Used)

3.6 JOINTS

- A. Construction and control joints indicated on Drawings are mandatory and shall not be omitted.
- B. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subject to approval of Engineer.
- C. Waterstops:
 - 1. Protect waterstop from oil, dirt, concrete spatter, and damage, and leave clean to receive concrete forms. Exercise care during installation of waterstop to eliminate all possibilities that may cause leakage. Ensure reinforcing bars and slip dowels will not interfere with positioning of waterstop during Installation.
 - 2. Install waterstops in accordance with manufacturer's recommendations and as indicated. Hold waterstops rigidly in place by extending through slots in keyways, by spilt bulkheads, by tying to reinforcing bars, or by such other adequate methods as are necessary to insure proper support and embedment during the concreting process. Secure waterstop between the last rib and the end of the waterstop when tying to reinforcing rods. Tie waterstop to reinforcing bars every 12 inches.
 - 3. Install waterstop so that half of the ribs of the waterstop material are embedded in the concrete on each side of the joint. When installed in an expansion joint, exercise care in pouring so that the closed hollow center-bulb remains in the gap between the first and second pour, to allow for maximum elongation with minimum stress on the portion of the waterstop embedded in the concrete.
 - 4. Install expansion joint material and a sealant in the joint, as indicated, to prevent foreign matter from accumulating in the joint area. When a sealant is used place a separator between the sealant and the waterstop to insure that both the waterstop and sealant best perform their respective functions.
 - 5. Sweep horizontal joints prior to pour to insure that foreign matter does not interfere with direct contact between the waterstop and concrete.
 - 6. Systematically and thoroughly vibrate concrete around waterstop to avoid honeycombs and voids in the concrete and to insure complete contact of waterstop to concrete.
 - 7. For the second pour on horizontal sections, make a grout pour over the waterstop to prevent excessive movement of the waterstop and to provide positive insurance against honeycombing or voids. Use a thicker waterstop. 3/8 inch or 1/2 inch. for heavy pour or larger aggregate.
 - 8. Where using split-ribbed waterstop spread open the split leg of the waterstop and nail it to the bulkhead between the last two ribs. Upon completion of the first pour and removal of the bulkhead, join the split leg together every 12 inches with hog rings and position it for the second pour.
 - 9. PVC waterstop may be butt-spliced on the job with an electrical splicing iron or a hot air welding gun and vinyl welding rod in accordance with the manufacturer's instructions.
 - 10. Do not drive nails through center of waterstop. Do not lap waterstop, splice joints. Do not embed center bulb in concrete. Position it in the center of the joint to insure freedom of movement. Do not secure waterstop except between the last rib and the end of the waterstop when tying to the reinforcing rod to hold in place for the pour. Where using split-ribbed waterstop, do not nail split legs to bulkhead adjacent to bulb.

3.7 INSTALLATION OF EMBEDDED ITEMS

- A. Conform to requirements of ACI 318, paragraph 6.3, "Conduits and Pipes Embedded in Concrete", and as specified below.
- B. Install steel sleeves, embedded wall plates and similar items, furnished by other trades, at locations shown on the drawings.
- C. Anchor bolts for column baseplates shall be installed with templates provided. Vertical alignment and plan locations shall be maintained within one-sixteenth inches of the locations shown on the drawings.
 - 1. Inspection shall be performed by a surveyor licensed in the Commonwealth of Massachusetts. Certify compliance with shop drawings.

3.8 MIXING, CONSISTENCY, AND DELIVERY OF CONCRETE

- A. Concrete shall be ready-mixed, produced by plant acceptable to Engineer. Hand or site mixing shall not be done. Constituents, including admixtures except certain corrosion inhibitors and superplasticizers, shall be batched at central batch plant. Admixtures shall be premixed in solution form and dispensed as recommended by manufacturer.
- B. Central plant and rolling stock equipment and methods shall conform with Truck Mixer and Agitator Standard of Truck Mixer Manufacturer's Bureau of National Ready-Mixed Concrete Association, and Contract Documents. Consistency of concrete at time of deposit shall be as follows:

Portion of Structure	Slump	
	Recommended	Max. Range
Walls, columns	4"	3" - 5"
Slabs, beams	3"	2" - 4"

- C. Ready mixed concrete shall be transported to site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Discharge at site shall be within one and one-half hours after cement was first introduced into mix. Discard concrete not discharged within one and one-half hours and dispose of legally. Concrete with a temperature greater than 85 degrees F. shall not be placed. Central mixed concrete shall be plant mixed a minimum of five minutes. Agitation shall begin immediately after premixed concrete is placed in truck and shall continue without interruption until discharged. Transit mixed concrete shall be mixed at mixing speed for at least ten minutes immediately after charging truck followed by agitation without interruption until discharged. Concrete shall be furnished by a single plant unless accepted by the Engineer in writing.
- D. Retempering of concrete which has partially hardened, that is, mixing with or without additional cement, aggregates, or water, will not be permitted.

3.9 PLACING CONCRETE

- A. Remove water and foreign matter from forms and excavations and, except in freezing weather or as otherwise directed, thoroughly wet wood forms just prior to placing concrete. Place no concrete on frozen soil and provide adequate protection against frost action during freezing weather.

- B. To secure full bond at construction joints, surfaces of concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools such as chipping hammers or wire brushes, and recleaned by stream of water or compressed air. Well before new concrete is deposited, joints shall be saturated with water. After free or glistening water disappears joints shall be given thorough coating of neat cement slurry mixed to consistency of very heavy paste. Surface shall receive coating of approximately one-eighth inch thick; this shall be scrubbed in by means of stiff bristle brushes. New concrete shall be deposited before neat cement dries or changes color.
- C. Do not place concrete having slump outside of allowable slump range.
- D. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete. When concrete is conveyed by chutes, equipment shall be of such size and U-shaped design as to insure continuous flow in chute. Flat (coal) chutes shall not be employed. Chutes shall be of metal or metal lined and different portions shall have approximately same slope. Slope shall not be less than 25 degrees nor more than 45 degrees from horizontal and shall be such as to prevent segregation of ingredients. Discharge end of chute shall be provided with baffle plate or spout to prevent segregation. If discharge end of chute is more than five feet above surface of concrete in forms, spout shall be used, and lower and maintained as near surface of deposit as practicable. When operation is intermittent, chute shall discharge into hopper. Chute shall be thoroughly cleaned before and after each run and debris and any water used shall be discharged outside forms. Concrete shall not be allowed to flow horizontally over distances exceeding five feet.
- E. Concrete shall be placed in such manner as to prevent segregation, and accumulations of hardened concrete on forms or reinforcement above mass of concrete being placed. To achieve this end, suitable hoppers, spouts with restricted outlets and tremies shall be used as required.
- F. During and immediately after depositing, concrete shall be thoroughly compacted by means of internal type mechanical vibrators or other tools, or by spading to produce required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on only enough to produce homogeneity and optimum consolidation without permitting segregation of constituents or "pumping" of air. Vibrators used for normal weight concrete shall operate at speed at not less than 7,000 vpm and be of suitable capacity. Do not use vibrators to move concrete. Vibration shall be supplemented by proper wooden spade puddling to remove included bubbles and honeycomb adjacent to visible surfaces. At least one vibrator shall be on hand for every 10 cubic yards of concrete placed per hour, plus one spare. Vibrators shall be operable and on site prior to starting placement.
- G. Vertical lifts shall not exceed 18 inches. Vibrate completely through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone pockets, honeycomb, and segregation.
- H. Concrete shall be deposited continuously, and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within section. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Engineer shall be notified in any such case.
- I. Cold joints, particularly in exposed concrete, including "honeycomb", are unacceptable. If they occur in concrete surfaces exposed to view, Engineer will require that entire section in which blemish occurs be removed and replaced with new materials at Contractor's expense.

- J. When placing exposed concrete walls or columns, strike corners of forms rapidly and repeatedly from outside along full height while depositing concrete and vibrating.
- K. Chutes, hoppers, spouts, adjacent work, etc. shall be thoroughly cleaned before and after each run and water and debris shall be discharged outside form.

3.10 FINISHING OF UNFORMED CONCRETE SURFACES

- A. Smooth troweled finish: Shall be provided where concrete flatwork is to be exposed in the finished work or is to receive resilient flooring materials.
- B. Floated finish: Shall be provided where concrete flatwork is to receive waterproofing membranes or setting beds for finished materials.
- C. Floated finish: Shall be provided for top surfaces of walls, slabs and beams.
- D. Rough struck surface shall be provided at top of pedestals.
- E. Steel Broom Finish (with smooth edging): Shall be provided at exterior concrete walks, pavements and steps.
- F. Contractor, at his own expense, shall level depressed spots and grind high spots in concrete surfaces which are in excess of specified tolerances. Leveling materials proposed for providing proper surface shall be approved by Engineer.

3.11 REPAIRING OF UNFORMED CONCRETE SURFACES

- A. Tops of slabs and walls shall be repaired by using either same material as originally cast or by use of dry-pack material, as approved by Engineer. Areas affected shall be chipped back square and to depth of one inch minimum. Hole shall then be moistened with water for a minimum of two hours, followed by brush coat of 1/16 inch thick cement paste. Immediately plug hole with concrete, or with dry pack material consisting of 1:1.5 mixture of cement and concrete sand mixed slightly damp to touch. Hammer dry-pack into hole until dense, and excess paste appears on surface. Finish patch flush and to same texture as surrounding concrete. For large repairs employ 1-1-2 mixture of cement, concrete sand and pea gravel at same dry-pack consistency.

3.12 CURING, SEALING AND PROTECTION

- A. When concrete is placed at or below ambient air temperatures of 40 degrees F. or whenever in opinion of Engineer, such or lower temperatures are likely to occur within 48 hours after placement of concrete, cold weather concreting procedures, according to ACI 306 and as specified herein, shall be followed. To this end, entire area affected shall be protected by adequate housing or covering, and heating. No salt, chemicals or other foreign materials shall be used in the mix to lower freezing point of concrete.
- B. Protect concrete work against injury from heat, cold, and defacement of any nature during construction operations.

- C. Concrete shall be treated and protected immediately after concreting or cement finishing is completed, to provide continuous moist curing above 50 degrees F. for at least seven days, regardless of ambient air temperatures.
- D. Curing compounds will not be permitted for slab and beams.
- E. Keep a permanent temperature record showing date and outside temperature for concreting operations. Thermometer readings shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such periods shall likewise be recorded, in such manner as to show any effect temperatures may have had on construction. Copies of temperature record shall be distributed daily to Engineer.
- F. Epoxy Curing Compounds/Hardener:
1. Apply the first coat of epoxy to the plastic concrete as soon as the bleed water has totally disappeared. This application shall serve a dual function: a membrane curing compound which shall retain 95% or more of the mixing water in the concrete for a minimum of seven days; and the first coat of a two-coat system to seal and protect the concrete.
 2. After a minimum curing period of 30 days and before the structure is opened to general use, wash the concrete with cleaning and degreasing chemical solution applied in accordance with the manufacturer's instructions and as specified herein.
 3. Prepare the cleaning solution in accordance with the manufacturer's instructions. Dampen concrete surface with water. Apply the prepared solution over the area to be cleaned using a soft fibered but densely filled brush. Allow the solution to remain on the surface for 3 to 5 minutes. Reapply the cleaning solution and scrub vigorously. Rinse with fresh water applied at a pressure of 400-800 psi and a volume of water per minute 5 - 10 gallons. Protect all non-masonry surfaces.
 4. Allow concrete to dry a minimum of 24 hours and a maximum of 48 hours before application of the second coat of epoxy.
 5. Pour equal quantities of Components 'A' and 'B' into a clean container. Mix thoroughly with a low speed electric drill equipped with a steel paddle. Keep individual components and mixed compound covered when material is not being used.
 6. Application: Apply mixed epoxy compound in a uniform coat at the rate of approximately 200 sq. ft. per gallon. Mixed material may be sprayed with any equipment capable of spraying epoxy compounds, or it may be applied with a deep nap lamb's wool roller.
 7. Protect surface against vehicular and pedestrian traffic during curing period (24 hours at 75°F).
 8. Final Coat - Broom Finish and Wood Float Finish: Concrete is totally sealed against contaminants and resists the attack of de-icing chemicals. It may be applied at any time after the concrete has cured a minimum of 30 days and before the structure is opened to general use. Apply the epoxy compound by spray or roller at the rate of 275 to 325 sq. ft. per gallon being careful to avoid puddles or uneven application. The concrete shall exhibit a uniform gloss indicating it is totally sealed. Any areas that are dull or flat are not totally sealed. Any areas that are dull or flat are not totally sealed and shall be given a third coat.
 9. Final Coat - Steel Trowel Finish Concrete: Apply the second and final coat at any time after the concrete has cured a minimum of 30 days and before the structure is opened to general use. Apply mixed epoxy compound in a uniform coat at a rate not to exceed 200 sq. ft. per gallon. While the epoxy compound is still liquid, drop fine sand meeting the gradation requirements of ASTM C-109, vertically into the epoxy at a uniform rate of one lb. per sq. ft. Make sure entire

epoxy surface is thoroughly covered. After epoxy has hardened so that it cannot be dented with a screwdriver, remove excess sand.

- G. Concrete Sealer: Apply to concrete surfaces as indicated on the Contract Drawings and in the Contract Specifications. Apply in accordance with manufacturer's instructions and the following:
1. Application of the sealer shall not alter the surface texture and shall be compatible with the use of surface finish coatings and caulking. Surface shall dry to a tack-free condition in 4 hours or less.
 2. Preparation process shall not cause any undue damage to the concrete surface, remove or alter the existing surface finish, or expose the coarse aggregate of the concrete.
 3. Concrete sealer shall be used as supplied by the manufacturer and not altered in any way. Apply onto concrete surfaces at manufacturer's recommended rate of coverage.
 4. Prevent the concrete sealer from coming in contact with open joints that have not yet been filled with joint sealant, so as to prevent any loss of bond of the joint sealant.

3.13 REMOVAL OF FORMWORK, SHORING AND RESHORING

- A. Contractor shall be responsible for proper removal of formwork, shoring, and reshoring.
- B. Forms shall be removed only after concrete has attained sufficient strength to support its own weight, construction loads to be placed thereon and lateral loads, without damage to structure or excessive deflection.
- C. Forms and falsework shall not be removed unless the concrete has attained the minimum percentage compressive strength as listed in the following table:

<u>Structural Member</u>	<u>Minimum Percent of Design Strength (f'c)</u>
1. Invert Slabs; Slabs and Beams on Grade	25
2. Free Standing Walls, Columns and Piers	40
3. Retaining Walls	50
4. Soffits of Beams, Slabs and Girders Less Than 20 Foot Span	80
5. Stairs	80
6. Soffits of Beams, Slabs and Girders Greater Than 20 Foot Span	90
7. Cantilevered Beams, Slabs and Girders	90

- D. Acceptance for form removal will be based on field-cured concrete cylinders tested by the MBTA Lab.

3.14 REPAIRING AND FINISHING OF FORMED AND ARCHITECTURAL CONCRETE SURFACES

- A. In accordance with the provisions of ACI 301, Chapter 10, all concrete shall have "smooth form finish".

- B. Intent of this Specification is to require forms, mixtures of concrete, and workmanship so that concrete surfaces will require no patching, except for plugging of tie holes. However, where patching is acceptable to Engineer, procedure described below shall be followed.
- C. Defective concrete and honeycombed areas shall not be patched unless examined and approval is given by Engineer. If such approval is received by Contractor, areas involved shall be chipped down square and at least one inch deep to sound concrete by means of cold chisels or pneumatic chipping hammers. If honeycomb exists around reinforcement, chip to provide clear space at least three-quarter inch wide all around steel to afford proper ultimate bond thereto. For areas less than one and one-half inches deep, patch shall be made in same manner as described above for filling unformed concrete surfaces, care being exercised to use crumbly-dry (nontrowelable) mixtures and to avoid sagging. Thicker repairs shall require build-up in successive days, each layer being applied as described. To aid strength and bonding of multiple layer repairs, non-shrink, non-metallic aggregate shall be used as an additive as follows:

Materials	Volumes	Weights
Cement	1.0	1.0
Non-Metallic Aggregate	0.15	0.25
Sand	1.5	1.55

1. For very heavy (generally, formed) patches, pea gravel may be added to mixture and proportions modified as follows:

Materials	Volumes	Weights
Cement	1.0	1.0
Non-Metallic Aggregate	0.2	0.33
Sand	1.0	1.0
Pea Gravel	1.5	1.55

- D. After hardening, rub lightly as described above for form tie holes.
1. Mortar for patching shall be same mix as above except aggregate shall pass a No. 14 sieve.
 2. For all concrete to receive "smooth" finish, remove formwork fins and clean entire surface of grease, form oil, laitance, dust, and other foreign matter.
 3. "Smooth" finish shall consist of having all fins removed, joint marks smoothed off, blemishes removed, and surfaces left smooth and unmarred.
 4. Begin finishing operations as soon as practicable after removal of forms, continue with curing operations after finishing is completed. After concrete has been well cured, carefully inspect surfaces. Remove any fins, rough spots, streaks, hardened mortar or grout and other foreign material. Patch defects with finishing mortar as specified above, to satisfaction of Engineer.
- E. Patches which become crazed, cracked, or sound hollow upon tapping shall be removed and re-placed with new material at Contractor's expense.

3.15 CLEANING

- A. Concrete surfaces shall be cleaned of objectionable stains as determined by the Engineer. Materials containing acid in any form or methods which will damage "skin" of concrete surfaces shall not be employed, except where otherwise specified.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 03370

PENETRATING CONCRETE SEALER

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies furnishing and applying penetrating concrete sealer - anti-graffiti coating where shown on the Contract Drawings and as indicated herein.
- B. All exposed surfaces of headhouse foundations, ramp walls, retaining walls, mini-pile caps, canopy columns and caps shall be coated with penetrating sealer – anti-graffiti coating. Ramp and platform walk surfaces shall not be coated with anti-graffiti coating but shall be coated according to Section 07190 Water Repellents.
- C. Coating systems a low VOC system in conformance with Massachusetts DEP Air Pollution Control Regulations 310 CMR 7.25-7.60 sub-part 11b Architectural & Industrial Maintenance Coatings Emission Standards TABLE 310 CMR 7.25(11) VOC Emission Limitations for Architectural or Industrial Maintenance Coatings.

1.2 SUBMITTALS

- A. Submit material safety data sheets and certificates that the proposed products are chloride free.
- B. Submit manufacturer's product data indicating type, chemical make-up, application methods, and mixing ratios.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Anti-graffiti (AG) coatings suitable for repeated cleaning are of two generic types:
 - 1. Low gloss, low-build, two-component, aliphatic polyurethane coatings, clear versions only. (May use fluoro-polymer chemistry to enhance anti-graffiti performance.)
 - 2. Organo-silicate coatings based on silane/siloxane chemistry, clear versions only. (Fluoro-polymer chemistry may be incorporated to enhance anti-graffiti performance.)
- B. Products with adequate film hardness and gloss-retention for AG service include, in alphabetical order:
 - 1. *Polyurethane type:*
 - Carboline Carbothane® Clear coat AG (gloss and satin finish)
 - DuPont Imron® 2.8 FT-C clear coat
 - 2. *Organo-silicate type:*
 - Ameron PSX 700 clear
 - Carboline Carboxane® 2000 clear (gloss and satin finish)

2.2 CLEANING SOLUTIONS

- A. Cleaning solutions shall be as approved or recommended by the AG coating manufacturer to maximize cleaning effect without harming the AG coating.
- B. Cleaning solutions and procedures shall not damage the substrate beneath the AG coating except where this is approved by the MBTA Engineer (e.g., because the substrate will be newly coated.)
- C. Cleaning solutions shall meet MBTA requirements for personnel exposure, safe handling and disposal.

PART 3 - EXECUTION

3.1 PREPARATION OF CONCRETE SURFACES

- A. All substrates to be coated shall be clean, sound, and surface dry. Substrates shall be free of standing water, frost, dust, laitance, grease, oil, curing, compounds, waxes, impregnations, foreign particles, other coatings, and disintegrated materials.
- B. All projections, rough spots, etc., shall be dressed off. Entire surface to be coated shall be mechanically prepared, i.e. - sandblasted, high-pressure waterblasted, etc., to achieve above prescribed surface condition as approved by Engineer.
- C. Make substrate repairs in accordance with Section 03300 as required by Engineer to achieve a smooth, level surface.

3.2 APPLICATION

- A. Do not thin. Apply directly from container. Apply in well ventilated areas only, free from open flame. Vegetation, metal, and glass shall be protected from overspray. Keep materials covered when not being used.
- B. Apply coating to all exposed-to-view surfaces of concrete at all piers, foundations, retaining wall, abutments and all other concrete elements exposed to weather.
- C. Placement Procedure
 - 1. Penetrating sealer – anti-graffiti coating shall be applied only to approved, prepared surfaces with high-quality brushes, rollers or spray equipment.
 - 2. Coating shall be applied at ambient and substrate temperatures between 35 and 90 degrees F and shall follow manufactures recommendations.
 - 3. When applying the coating, never stop the application until the entire surface has been coated, if possible. If impossible always discontinue at an edge, corner, or joint. Never let a previously coated film dry, always coat into a wet film. Always coating at a 45 degree angle to an edge, corner, or joint.
 - 4. Horizontal Surfaces: apply a saturating coat to point of rejection. Residues and puddles shall be broomed out until they completely penetrate surface. Roll out or redistribute any excess sealer that does not penetrate after 10 minutes.
 - 5. Vertical Surfaces: apply a saturating coat from bottom up with enough material going on to produce an 8-inch rundown. On porous surfaces, a second coat shall be reapplied in same manner after first coat penetrates.

- D. Clean-up: all tools and overspray or drippings onto metal or glass or plastic shall be immediately cleaned using an approved solvent.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 03410

PLANT-PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section specifies furnishing and erecting precast concrete units in accordance with these specifications and the Contract Plans.
- B. The work under this section includes, but is not limited to furnishing and installing precast concrete platform panel units as indicated on the Drawings and as specified herein.
 - 1. Units shall be manufactured (cast) with the integration of modular tactile tiles as indicated on the Contract Plans, within these Contract Specifications and as approved by the Engineer.
 - 2. There shall be no recesses in the finished walking surface of the precast concrete platform units for any purpose other than for erection and installation. All recesses in the walking surface of panels shall be patched after installation at the site.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02369 - DRILLED MINIPILES
 - 2. Section 03254 - ELASTOMERIC BEARING ASSEMBLIES
 - 3. Section 03300 - CAST-IN-PLACE CONCRETE
 - 4. Section 05100 - STRUCTURAL STEEL
 - 5. Section 05500 - MISCELLANEOUS METAL
 - 6. Section 07920 - JOINT SEALANTS
 - 7. Section 09360 - MODULAR TACTILE SURFACES

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixes: Platform Panels - Concrete shall be Silca Fume Modified Concrete with 5,000 psi at 28 days, 3/4" maximum aggregate size and shall contain a minimum cementitious content of 685 lb/cy.
 - 1. Design mix submittal for platform panels.
- C. Shop Drawings: Detail fabrication and installation of precast structural concrete units. Indicate member locations, plans, elevations, dimensions (including self weight camber diagrams and calculations), shapes, cross sections, openings, embedded elements, bearings, and types of reinforcement, including special reinforcement.

1. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
 2. Indicate locations and details of anchorage devices to be embedded in other construction.
 3. Lifting locations.
 4. Details of architectural treatment, showing conformance with the requirements of the Contract Plans.
- D. Samples:
1. For each type of finish indicated on exposed surfaces of precast structural concrete units, in sets of 3, illustrating quality of finishes, colors, and textures; approximately 12 by 12 by 2 inches.
- E. Samples of bearing pads specified in section 03254.
- F. Welding Qualifications: Copies of qualifications for welding procedures and personnel.
- G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Concrete materials.
 2. Reinforcing materials.
 3. Admixtures.
 4. Modular tactile surface tiles as specified in section 09360.
- I. Inspection and test reports from independent testing agency.
- J. Modular Tactile surface Tiles:
1. Installation procedures
- K. The manufacturer of the precast concrete platform units shall provide a guarantee for no less than ten (10) years from date of installation against spalling, cracking or color fading of the product. Any such failures during the guarantee period shall be replaced with new platform units at no additional cost to the Authority. Plant installation of modular tactile surface tiles shall not be grounds for voiding the guarantee.
- L. Design Calculations
1. Statement of all assumptions made and copies of all references used in the calculations.
 2. All design calculations shall be performed by a Professional Engineer registered in the Commonwealth of Massachusetts.
 3. Lifting locations and verification of adequacy of member to be supported at lifting locations and in the orientation with which it shall be lifted and installed.
 4. Camber design for the actual self weight deflection such that when precast platform units are erected in finished location, platform surface shall be flat.

M. Cementations grout and process for filling lifting locations.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed precast structural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fabricator Qualifications: A firm that is experienced in manufacturing precast structural concrete units similar to those indicated for this Project and with a record of successful in-service performance. Plant certification is required by Precast Concrete Institute; plant subject to inspection by the Engineer.
- C. All calculations and Shop Drawings shall be signed and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.
- D. The date of manufacture, the production lot number, and the piece-mark shall be clearly marked on each precast unit. Location of markings shall be placed such that it will not be visible to direct view following construction/installation, and will not be covered by any overlay system.
- E. Modular tactile surfaces tile Installation: The precast concrete platform units shall be cast integrally with the tactile warning tiles. Each tactile warning tile shall be installed such that the top of the walking surface is flush with the main body (non domed surface) of the tactile warning tiles. The Precaster shall remove each tactile warning tile to ensure that the threaded insert is adequately embedded into the panel.
- F. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- G. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook-Precast and Prestressed Concrete".
- H. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and camber and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products".
- I. Precaster shall not begin fabrication of precast units until shop drawings have been approved.
- J. Inspection and Rejection: The quality of materials, process of manufacture, and finished units shall be subject to inspection by the Engineer prior to shipment. Precast units may be subject to rejection on account of failure to conform to this specification. Individual units may be rejected because of any of the following:
 - 1. Variations in the exposed face that substantially deviate from the approved architectural model as to color, texture, relief and reveals in accordance with precast concrete industry standards.
 - 2. Dimensions not conforming to the following tolerances for Platform Panel Units:
 - a. Position of panel connection devices within 1 inch, except for coil and loop imbeds which shall be within ¼ inch. All other panel dimensions within ¼ inch.

- b. Panel squareness as determined by the difference between the two diagonals shall not exceed $\frac{1}{2}$ inch.
 - c. Surface defects on smooth-formed surfaces measured over a length of 5 feet shall not exceed $\frac{1}{8}$ inch. Surface defects on textured-finished surfaces measured over a length of 5 feet shall not exceed $\frac{3}{8}$ inch.
3. Defects indicating honeycombed or open texture
 4. Defects which would affect the structural integrity of the unit including cracked or severely chipped panels.

K. The tolerances for fabrication shall not exceed the following criteria.

1. Panel length: $\frac{1}{8}$ inch,
2. Panel width: $\frac{1}{8}$ inch,
3. Panel squareness: no tolerance deviations,
4. Panel thickness: $\frac{1}{8}$ inch,
5. Draft on sides and ends of platform units: $\frac{1}{8}$ inch
6. Opening: cast within unit $\frac{1}{8}$ inch
7. Positioning of insert groups: $\frac{1}{8}$ inch
8. Reinforcement: $\frac{1}{4}$ inch
9. Flatness: $\frac{1}{8}$ inch
10. Positioning of Tactile Tiles on Platform Panel surface:
 - a. Alignment with edge of precast platform unit: $\frac{1}{8}$ inch
 - b. Gap between adjacent tiles: no tolerance deviations
 - c. Variation of gap width between adjacent tiles: no tolerance deviations

1.4 DELIVERY, STORAGE, AND HANDLING

- A. All units shall be handled, stored, and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported in firm blocking to protect the panel connection devices and the exposed exterior finish.
 1. All precast elements shall be stored elevated from the ground and protected to prevent all mud, wet cement, epoxy and like substances which may affix themselves to the units. The units shall be supported during storage to prevent excessive bending stress. For storage exceeding 30 days in duration, all materials shall be stored in or beneath a trailer or covered with a colored tarpaulin to prevent long-term exposure.
- B. Deliver precast structural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site or other location agreed to by the Engineer to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
- C. Samples of precast concrete elements shall be kept at the plant to be used for comparison purposes during production, and then delivered to the site for comparison during installation.
- D. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

- E. The face and edges of tactile tile edge strips shall be covered with a protective strippable surface. The protective covering shall remain on the tiles until completion of panel erection or as directed by the Engineer. Any tactile tiles damaged for any reason prior to opening of station shall be replaced at no additional cost to the Authority.

1.5 SEQUENCING

- A. Furnish anchorage items to be embedded in other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, epoxy coated.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed, epoxy coated.
- C. Steel Bar Mats: ASTM A 184/A 184M, assembled with clips, as follows:
 - 1. Steel Reinforcement: ASTM A 615/A 615M, deformed bars, epoxy coated.
- D. Plain-Steel Wire: ASTM A 82, galvanized.
- E. Deformed-Steel Wire: ASTM A 496.
- F. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from galvanized steel wire into flat sheets.
- G. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- H. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice", PCI MNL 116.
- I. Finish: All reinforcing and reinforcing supports shall be epoxy coated, unless approved otherwise by the Engineer.
- J. Reinforcing Mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A82 and shall be welded into the finished mesh fabric in accordance with ASTM A185. Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of ASTM A123M.

2.2 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II cement mitigated with a pozzolan to prevent alkali-silica reactivity.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33.
- C. Water: Potable, free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Fly Ash Admixture: ASTM C 618, Class F only.
- F. Silica Fume: ASTM C 1240.
- G. Other Admixtures: ASTM C 494.
- H. Concrete Bonding Agent: ASTM C 881 Type II.

2.4 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
- C. Malleable Steel Castings: ASTM A 47.
- D. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.
- E. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.
- F. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.
- G. Coil Embeds/Loop Embeds-Shall be fabricated of cold drawn steel wire conforming to ASTM 510M, UNS G 10350 or ASTM A82. Loop imbeds shall be welded in accordance with ASTM A185. Both shall be galvanized in accordance with ASTM B633.
- H. Tie Strips - The tie strips shall be shop fabricated of a hot rolled steel conforming to the minimum requirements of ASTM A570, Grade 50 or equivalent. Galvanization shall conform to ASTM A123M.
- I. Finish: All steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
- J. Welding Electrodes: Comply with AWS standards.

2.5 MODULAR TACTILE SURFACES

- A. Modular tactile surface units shall conform to the requirements of Section 09360 – Modular Tactile Surfaces.

2.6 BEARING PADS

- A. Provide bearing pads for precast structural concrete platform units in accordance with Section 03254 – Elastomeric Bearing Pads.

2.7 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, Silica Fume, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application.

2.8 CONCRETE MIXES

- A. Prepare design mixes for each type of concrete required.
- B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.
- D. Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1 and ACI 234, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Platform Panels
 - a. Compressive Strength (28 Days): 5000 psi.
 - b. Maximum Water-Cementitious Materials Ratio: 0.40.
 - c. Slump: 6 inches \pm 1 inch.
 - d. Units shall be air-entrained. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content of 6 percent as follows, with a tolerance of plus or minus 1 percent:
 - e. Maximum chloride ion permeability of 1,200 coulombs at 56 days when testing in accordance with ASTM C 1202.
 - f. Maximum course aggregate size of $\frac{3}{4}$ ".
 - g. Minimum cement content of 685 lb/cy.
 - h. Fly Ash shall be added at a rate of 10-20% (dry weight) of the cement content.
 - i. Silica Fume shall be added at a rate of 6-8% (dry weight) of the cement content.
 - j. The water content of the Silica Fume additive shall be included in the water-cementitious ratio.
- E. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures in accordance with the approved mix design.
- F. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant. Submit proposed

revisions of mix design to the Engineer for approval prior to proceeding with its use for the fabrication of additional units.

2.9 FABRICATION

- A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances. Timber formwork is not acceptable for creating hollow cavities of abutment cap beams.
 - 1. Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.
 - 2. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.
 - 3. Unless forms for precast, prestressed concrete units are stripped before detensioning, design forms so stresses are not induced in precast concrete units because of deformation or movement of concrete during detensioning.
- B. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by Engineer.
- C. Form all cast-in openings according to Shop Drawings
- D. Reinforcement: Comply with recommendations in Concrete Reinforcing Steel Institute's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete, and touch-up epoxy coating system.
 - 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
 - 3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Prestress tendons for precast structural concrete units by either pretensioning or posttensioning methods. Comply with Precast Concrete Institute MNL 116.

1. Delay detensioning until concrete has reached at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as concrete.
 2. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- F. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.
- G. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.
- H. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.
- I. The units shall be fully supported until the concrete reaches a minimum compressive strength of 4000 psi. The units may be shipped after reaching a minimum compressive strength of 5000 psi. At the option of the Contractor, the units may be installed after the concrete reaches a minimum compressive strength of 5000 psi.
- J. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- K. Comply with ACI 305R recommendations for hot-weather concrete placement.
- L. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint casting date on each precast concrete unit on a surface that will not show in finished structure.
- M. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- N. Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.
- O. Finished surfaces of precast structural concrete as indicated for each type of unit, and as follows:
1. Walking Surface: Heavy Broom Finish
 2. Formed Surface, Commercial Finish: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces are to be true, well-defined surfaces.
- P. Recess prestressing tendons a minimum of 1/2 inch, fill recesses with grout, and apply a sack finish to vertical ends of precast concrete units.

2.10 SOURCE QUALITY CONTROL

- A. Contractor shall engage an independent testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
 2. Notification Point - Notify Engineer at least 3 days in advance of testing. Testing may be witnessed by the Engineer.
- B. Quality-Control Testing: Test and inspect precast concrete according to the more stringent of PCI MNL 116 requirements, or the following:
1. Compressive Strength - Acceptance of concrete panels with respect to compressive strength will be determined on the basis of production lots. A production lot is defined as a group of panels that will be represented by a single compressive strength sample and will consist of either 40 panels or a single day's production, whichever is less.
 2. During the production of the concrete panels, the manufacturer will randomly sample the concrete in accordance with ASTM C172. A single compressive strength sample, consisting of a minimum of four cylinders, will be randomly selected for every production lot.
 3. Compressive tests shall be made on a standard 150mm by 300mm test specimen prepared in accordance with ASTM C31. Compressive strength testing shall be conducted in accordance with ASTM C39.
 4. Air content will be performed in accordance with ASTM C231 or ASTM C173. Air content samples will be taken at the beginning of each day's production and at the same time as compressive samples are taken to insure compliance.
 5. The slump test will be performed in accordance with ASTM C143. The slump will be determined at the beginning of each day's production and at the same time as the compressive samples are taken.
 6. For every compressive strength sample, a minimum of two cylinders shall be cured in accordance with ASTM C31 and tested at 28 days. The average compressive strength of these cylinders, when tested in accordance with ASTM C39 will provide a compressive strength test result which will determine the compressive strength of the production lot.
 7. If the Contractor wishes to ship the panels prior to 28 days, a minimum of two additional cylinders will be cured in the same manner as the panels. The average compressive strength of these cylinders when tested in accordance with ASTM C39 will determine whether panels can be shipped.
 8. Acceptance of a production lot will be made if the compressive strength test result is greater than or equal to 5,000 psi. If the compressive strength test result is less than 5,000 psi, then the acceptance of the production lot will be based on its meeting the following acceptance criteria in their entirety:
 - a. Ninety percent of the compressive strength test results for the overall production shall exceed 5,200 psi.
 - b. The average of any six consecutive compressive strength test results shall exceed 5,300 psi.
 - c. No individual compressive strength test result shall fall below 4,600 psi.

- C. Strength of precast concrete units will be considered deficient if units fail to comply with PCI MNL 116 requirements, including the following:
1. Units fail to comply with compressive-strength test requirements.
 2. Reinforcement and prestressed tendons of units do not comply with fabrication requirements.
 3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
 4. Units are damaged during handling and erecting.
- D. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with PCI MNL 116 requirements, Contractor shall employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.
1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Engineer.
 2. Cores will be tested, after immersion in water, in a wet condition per ACI 301 if units will be wet under service conditions.
 3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
 4. Test results will be made in writing on the same day that tests are performed, with copies to Engineer, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.
1. Precast concrete units with dimensions larger than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.
- G. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, or are damaged during transport or installation are unacceptable. Replace unacceptable units with new precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast concrete units are placed.
- B. Install precast structural concrete.
 - 1. Station: Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.
- C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders using qualified welding procedures.
 - 1. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - 2. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.
 - 3. Repair damaged metal surfaces by cleaning and repriming damaged painted surfaces.
- D. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by Engineer.
- E. Erection Tolerances: Install precast concrete units level, plumb, square, and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Recommended Practice for Erection of Precast Concrete".
- F. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and joints as follows:
 - 1. Provide forms or other approved method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.
 - 2. Seal joints between concrete elements as shown on the Contract Plans.
- G. Recesses at lift locations in precast panels shall be roughened, cleaned, dampened and an approved bonding agent applied to the recess. It should then be solidly filled with precast concrete mix containing no course aggregate. Surfaces shall be finished to match adjacent precast concrete surface. Contractor shall obtain precast mix from the precast supplier.

3.3 FIELD QUALITY CONTROL

- A. Before commencing erection operations, check existing conditions and progress of the work and report in writing any variations, discrepancies, and conditions that prevent the proper and satisfactory erection of the platform units.
- B. All concrete work receiving or immediately adjacent to precast units shall have cured at least twenty one days or have reached design strength before the start of erection.
- C. Under no circumstances shall any unit be set in place until it has attained the specified minimum 28-day strength.
- D. All units shall be erected in proper sequence, level, square, true and plumb, and installed in place without forcing or any other means of inducing or imposing undue stresses or loads onto any part of the structure.
- E. Testing: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- F. Notification Point - Field welds and connections using high-strength bolts will be subject to tests and inspections. Notify the Engineer 24 hours in advance of high-strength bolting.
- G. Testing agency will report test results promptly and in writing to Contractor and Engineer.
- H. Remove and replace work that does not comply with specified requirements.
- I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.4 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.
 - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

3.5 FABRICATION OF PRODUCTION UNITS

- A. All precast concrete units shall be plant cast.
- B. All platform units shall have modular tactile surface tiles integrally cast with the precast platform units.
- C. Sufficient plant capacity shall be available to produce all units required for the Work within the scheduled time period.
- D. Precast concrete platform units shall come complete with required embedded steel and loose connection steel items, inserts, fasteners, reinforcement and associated accessories.

- E. Correct all errors (defects) in the fabrication of the units which prevent proper installation of the units.
- F. The platform units shall be cast in one placement. Ensure that allowance is made for the attachment of the modular tactile surface tiles, as specified in the Contract Drawings.
- G. Moist curing shall begin immediately after finishing with protection from wind and sun and shall continue for a minimum of 5-7 days. Initial curing, including heat and humidity to obtain adequate form stripping strengths, shall be carefully monitored and controlled relative to the setting curve of the concrete. The concrete shall have attained a compressive strength of 4,000 psi prior to removal of forms.
- H. Precast concrete units may be cured by an accelerated method such as steam treatment subject to approval of the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 04800

MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
1. Concrete masonry units.
 2. Mortar and grout.
 3. Reinforcing steel, masonry joint reinforcement, ties and anchors.
- B. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
1. Section 05500 MISCELLANEOUS METALS:
 - a. Lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
 2. Section 06100 ROUGH CARPENTRY:
 - a. Wood nailers and blocking built into masonry.
 3. Section 07600 FLASHING AND SHEET METAL:
 - a. Through-wall flashings and built-in flashings.
 4. Section 08111 STEEL DOORS AND FRAMES:
 - a. Doors with frames built into concrete masonry walls.
 5. Section 10440 SIGNS:
 - a. Anchors and inserts for signage.
 6. Section 14200, ELEVATORS:
 - a. Elevator rail bracket inserts.
 7. Division 16 - ELECTRICAL:
 - a. Access doors in masonry openings.
- C. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:
1. Section 03300 - CAST-IN-PLACE CONCRETE:

- a. Dovetail slots for masonry anchors.
- 2. Section 05100 - STRUCTURAL STEEL:
 - a. Anchor sections of adjustable masonry anchors for connecting to structural frame.
- D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 07920 - JOINT SEALANTS; sealing control and expansion joints in unit masonry.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- C. Samples for Verification: For each type and color of the following:
 - 1. Exposed concrete masonry units.
 - 2. Weep holes/vents.
 - 3. Accessories embedded in masonry.
- D. Qualification Data: For testing agency.
- E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.
 - 6. Joint reinforcement.
 - 7. Anchors, ties, and metal accessories.

- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
 - 2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.
- G. Tests Results: For each type of test including mortar, grout and prism tests, for approval by the Engineer.
- H. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- I. UL Certificate of Compliance for fire rated concrete masonry units.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Preconstruction Testing Service: The Contractor will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by the Contractor. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
 - 1. Prism Test: For each type of construction required, per ASTM C 1314; strength as specified.
- E. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings of 2 hours per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction. All fire rated Concrete Masonry Units shall meet the requirements of UL-618, Standards of Concrete Masonry Units. Concrete Masonry Units to be used for the construction of 2-Hour Fire Rated Walls shall be clearly marked by manufacturer. The manufacturer shall clearly mark all concrete masonry units in each cube with the appropriated UL designation of 2-Hour.
- F. Hold Point - Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 for mockups.
 - 1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.

3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Engineer in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Engineer in writing.
 - b. The standard for the work during construction shall be the same as demonstrated on approved panels.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.5 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMUs)

- A. Concrete Masonry Units: ASTM C 90, normal weight unless indicated otherwise manufactured to dimensions 3/8 inch less than nominal dimensions.
- B. Shapes: Provide standard shapes indicated and as required for building configuration. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. Where exposed to public view, provide Concrete Masonry Units with split face surfaces.
- D. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen. Available products include:
 - a. Addiment Incorporated; Block Plus W-10.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
 - c. Master Builders, Inc.; Rheopel.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Available Products:
 - a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
 - b. Davis Colors; True Tone Mortar Colors.
 - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- D. Aggregate for Mortar: ASTM C 144. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- E. Aggregate for Grout: ASTM C 404.
- F. Water: Potable.

2.3 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951.
 - 1. Hot-dip galvanized, carbon steel.
 - 2. Wire Size and Spacing: As required by Code.
 - 3. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Multiwythe Masonry:
 - 1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.

2.4 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 - 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
 - 4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.

5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 6. Stainless Steel bars: ASTM A 276 or ASTM A 666, Type 304.
- B. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.
- C. Partition Top Anchors: 0.097-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

2.5 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashings: Furnished under Section 07620.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Available Manufacturers:

- a. Diedrich Technologies, Inc.
- b. EaCo Chem, Inc.
- c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Limit cementitious materials in mortar to Portland cement [mortar cement] and lime.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 1. For masonry below grade or in contact with earth, use Type M, minimum strength 2,500 psi.
 2. For reinforced masonry, use Type S, minimum strength 1,800 psi.
 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N, minimum strength 75 psi.
- C. Pigmented Mortar: Use colored cement product. Pigments shall not exceed 10 percent of Portland cement by weight.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed. Do not use units cut to less than one-half size.
- E. Do not install concrete masonry units with more than 5 percent damage to the face. Do not install brick units which will show defects after installation.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- G. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 - 6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- I. Do not retemper mortar.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Prior to installation review bond pattern with Engineer.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping".

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and concrete masonry units as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches. Space reinforcement not more than 16 inches o.c.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.

3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants", but not less than 3/8 inch.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.8 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.9 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows, unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
 1. Use open head joints to form weep holes.
 2. Space weep holes 24 inches o.c., unless otherwise indicated.
- E. Install vents in head joints in exterior wythes at spacing indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.11 FIELD QUALITY CONTROL

- A. Inspectors: The Contractor shall engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: The Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof. Test types as determined by the independent testing and inspection agency.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork".
 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off the Site.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 05041

HOT-DIP GALVANIZING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies Hot-Dip Galvanizing for all miscellaneous steel, architecturally exposed steel, and structural steel that is exposed to view, the weather, moisture, or corrosive atmosphere. Such items shall include but are not limited to:
 - 1. Structural steel items specified in Section 05100 – Structural Steel
 - 2. Structural steel items specified in Section 05500 – Miscellaneous Metals
- B. Definition of Hot-Dip Galvanizing: The dipping of steel members and assemblies into an alloy of molten zinc and nickel for lasting long-term protection. The resultant nickel zinc alloys with the base metal.

1.2 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.
- B. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 05100 - STRUCTURAL STEEL
 - 2. Section 05500 - MISCELLANEOUS METALS
 - 3. Section 09910 - SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL

1.3 QUALITY ASSURANCE

- A. Reference Standard:
 - 1. American Hot-Dip Galvanizers Association, Inc., (AHDGA):
Publication entitled “Inspection Manual for Hot-Dip Galvanized Products.
 - 2. American Society for Testing and Materials (ASTM):
 - A 123 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A 143 – Safeguarding Against Embrittlement
 - A 384 – Safeguarding Against Warpage
 - A 385 – Providing High Quality Zinc Coatings
 - A 780 – Repair of Hot-Dip Galvanizing

1.4 SUBMITTALS

- A. Certification: Furnish Notarized Certificates of Compliance with ASTM Standards and Specifications herein listed. Each Certificate to be signed by the Galvanizer and shall list a detailed description of all material. Certification shall state that the galvanizing is in full conformance with these specifications.
- B. Visual Stamp: Mark all lots of material with a clearly visible tag indicating the name of the galvanizer, the weight of the nickel – the coating and the applicable ASTM Specification numbers.
- C. Product Data: Submit product literature and sample for organic zinc rich repair compounds to be used.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Packaging: Of a suitable type to prevent damage to the finished surface and to prevent shipping damage to the material.
- B. Handling and Storage: Handle and Store in such a manner as to minimize damage to the finished material.

PART 2 - PRODUCTS

3.1 STEEL MATERIALS

- A. Material for galvanizing shall be geometrically suitable for galvanizing as specified in ASTM A-384 and A-385.
- B. To be chemically suitable for galvanizing, steel shall contain carbon below 0.25%; phosphorous below 0.05%; manganese below 1.35%.

3.2 NICKEL-ZINC FOR GALVANIZING

- A. Conform to ASTM B-6, as specified in ASTM A123 only with the addition to the bath of a predetermined amount of nickel (not less than 0.05% by weight) to counter the affect of high silicon steel.

3.3 GALVANIZING

- A. Steel members, fabrications, and assemblies as identified in Section 1.1A shall be galvanized after fabrication in accordance with ASTM A123.
- B. Safeguard against embrittlement in conformance with ASTM A143.
- C. To safeguard against warpage or distortion of steel members, in conformance with ASTM A384, submit shop drawings of non-standard fabrications, all tubular fabrications, all fabrications involving materials of different thicknesses. Submit drawings to the galvanizer prior to fabrication to determine the suitability of the material for galvanizing.
 - 1. Note on shop drawings locations of “blow holes” so that they can be drilled prior to galvanizing.
- D. Weight of Coating: Weight of all zinc coating shall be 2.0 ounces per sq. ft. minimum.

- E. Galvanizing Application: Galvanize materials in accordance with specified standards and this Specification. Galvanizing shall provide an acceptable substrate for applied coatings. After pickling and prior to galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material.
- F. Galvanizing shall be performed under conditions so that “White Rust” is avoided.

PART 3 – EXECUTION

3.1 INSTALLATION OF STEEL MATERIALS

- A. Steel materials, fabrications, and assemblies are specified to be installed in various other sections under Section 05100 Structural steel and Section 05500 Miscellaneous Metals.

3.2 TOUCH-UP AND REPAIR

- A. Repair damaged and field welded galvanized surface in accordance with ASTM A780.
- B. Dry film thickness of the organic zinc rich repair compound shall not be less than 6 mils.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 05100
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
1. Structural steel for station canopy structures, roof structures, ramps, bridge, and other station elements.
 2. Sign and bench supports.
 3. Architecturally exposed structural steel.
 4. Steel sheeting for excavation support.
- B. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
1. Section 04800 - MASONRY: Anchor sections of adjustable masonry anchors for connecting to structural frame.
- C. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections
1. Section 03300 - CAST-IN-PLACE CONCRETE: Lintels, sleeves, anchors, inserts, embedded wall plates, loose leveling plates, and similar items.
- D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 03300 - CAST-IN-PLACE CONCRETE
 2. Section 03410 - PLANT-PRECAST STRUCTURAL CONCRETE
 3. Section 05041 - HOT-DIP GALVANIZING
 4. Section 03254 - ELASTOMERIC BEARING PADS
 5. Section 05500 - MISCELLANEOUS METAL
 6. Section 09910 - SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL
 7. Section 02910 - STATION STORAGE FACILITIES

1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges", that support design loads.
- B. Architectural Exposed Structural Steel: Structural steel that forms and prominent architectural feature in a building or structure or designated as architecturally exposed structural steel on the Contract Drawings.

1.3 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by the structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using the American Institute of Steel Construction's (AISC) "Manual of Steel Construction, Load and Resistance Factor Design", Volume 2, Part 9.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.
 - 3. Field connections shall be bolted. Field welding shall not be allowed. All welding of steel shall be performed in the shop prior to galvanizing.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
 - 4. Indicate type, size and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
 - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Certificates: Certificate from AWS indicating certification in type of welding required for each welder and welding operator.
- D. Welding Records and Data:
 - 1. Before welding, submit the procedure which will be used for qualifying welders and welding procedures. For procedures other than those pre-qualified in accordance with AWS D1.1, submit a copy of procedure qualification test records.
 - 2. Submit certified copy of qualification test records for each welder, welding operator, and tacker who will be employed in the work.
 - 3. Submit all NDE records (radiographs, ultrasonic, magnetic particle) and visual inspection reports upon completion or when otherwise requested by the Engineer.
- E. Qualification Data: For installer, fabricator, professional engineer, testing agency, welding inspectors, NDE inspectors and galvanizer. Submit prior to starting work.
- F. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is certified for: Steel Building Structures (STD); or Simple Steel Bridge Structures (SBD); or Major Steel Bridges (CBR) as applicable
- B. Galvanizer Qualifications: Engage the services of a qualified galvanizer who has demonstrated a minimum of five years experience in the successful application of galvanized coatings specified in this Section in the facility where the work is to be performed and who will apply the coatings within the same facility.
- C. Installer Qualifications: A qualified installer with previous experience in installing structural steel.
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"
 1. Welds shall be made only by welders, welding operators and track welders who have been previously qualified by tests as prescribed by AWS D1.5 and AWS D1.1 to perform the type of work required. Certification shall be provided by the fabricator for each welder, welding operator and track welder involved that has been thus qualified within the previous 12 months.
 2. The AWS D1.5 shall be used for all requirements not specifically covered herein.
 3. Welding of Fracture Critical Members shall be in accordance with the requirements of Section 1.14 of AREMA Chapter 15.
- E. Comply with applicable provisions of the following specifications and documents:
 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges"
 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2"
 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" and "Load and Resistance Factor Design Specification for Structural Steel Buildings"
 4. AISC's "Specification for the Design of Steel Hollow Structural Sections"
 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members" and "Specification for Load and Resistance Factor Design of Single-Angle Members"
 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts"

7. Welding fabrication for structures designed in accordance with AASHTO and AREMA shall be fabricated in accordance with the Bridge Welding Code, ANSI/AASHTO/AWS 1.5 including all interim revisions published by AASHTO as of the opening bid date.

F. Tests and Inspection

1. The Contractor will test and inspect high-strength bolted connections and welded connections and prepare test reports. Specialty tests shall be performed at no expense to the Authority by an independent testing laboratory approved by the Engineer. Costs of specialty tests shall be borne by the Contractor. Test reports shall be submitted to the Engineer for approval.
2. The Engineer reserves the right to inspect high-strength bolted connections and weld connections. Provide access to places where structural steel work is being fabricated or erected so that required inspection and testing can be accomplished at no change in Contract Price. At times, inspection may require moving or handling of steel to permit proper inspection. Notify Materials Testing Laboratory not less than 48 hours prior to start of fabrication.
3. The Engineer may inspect structural steel at the plant before shipment; however, the Engineer reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.
4. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements at the Contractor's expense. Perform additional tests, at no expense to the Authority, as may be necessary to reconfirm any non-compliance of the original work, and as may be necessary to show compliance of corrected work.
5. Specialty Tests: Nondestructive examination of welds in accordance with provisions of AWS D1.1 and ASTM Standards noted shall be made in accordance with the following schedule:
 - a. Radiographic Examination of Welds, per ASTM E94 and E142:
 1. Field, complete joint penetration groove welds:
 - a. 1 out of 5 (20 percent) with thickness equal to or less than 3/4 inch.
 - b. 100 percent with thickness greater than 3/4 inch.
 2. Shop, complete joint penetration groove welds:
 - a. 1 out of 10 (10 percent) with thickness equal to or less than 3/4 inch.
 - b. 1 out of 2 (50 percent) with thickness greater than 3/4 inch and equal to or less than 1-1/2 inches.
 - c. 100 percent for thickness greater than 1-1/2 inches.
 - b. Ultrasonic Examination, per ASTM E164: Complete joint penetration groove butt welds not accessible for radiographic examination shall be subjected to ultrasonic testing. The extent shall be the same as noted for radiographic examination. Ultrasonic examination shall be made 48 to 72 hours after welding at locations on weldments or welded joints subject to high restraint as indicated in order to check for lamellar tearing. The exact location of the areas to be inspected shall be determined with the Engineer at the time of fabrication. This examination shall be made according to the following schedule unless conditions of tearing require a greater number of tests, as directed:
 1. 1 out of 10 (10 percent) for thickness equal to or less than 3/4 inch.
 2. 1 out of 5 (20 percent) for thickness greater than 3/4 inch and equal to or less than 1-1/4 inches.
 3. 1 out of 2 (50 percent) for thickness greater than 1-1/4 inches.
 - c. Magnetic Particle Examination, per ASTM E709, field and shop:
 1. 1 out of 5 (20 percent) of complete joint penetration groove welds of tee and corner joints.

2. 1 out of 10 (10 percent) of partial joint penetration groove and fillet welds.
 - d. Penetrant Examination, per ASTM E165: Shall be used for detecting discontinuities that are open to the surface use as appropriate.
 - e. Specialty tests shall be performed at no expense to the Authority by an independent testing laboratory approved by the engineer. The independent testing laboratory shall maintain inspections for this work who possess certification as Certified Welding Inspectors in accordance with the provisions of AWS QCI Standard and Guide for Qualification and Certification of Welding Inspectors. Notify the Engineer not less than 48 hours prior to conducting special test. Costs of specialty test shall be borne by the contractor. Test reports shall be submitted to the Engineer for approval.
6. Visual Examination: All welds whether otherwise examined or not shall be visually examined and faulty joints shall be marked for correction.
 7. When any testing, examination or inspection reveals faulty welds, all joints of the same type shall be checked at no expense to the Authority until the integrity of the weld is assured before resuming examination.
 8. After faulty welds have been corrected or repaired, they shall each be re-examined at no expense to the Authority in the manner specified for the original joint.
 9. It is intended that inspections shall be performed to permit an orderly flow of completed material from the shop. Work with the Engineer to establish a schedule that will permit this.
 10. Test result information shall be forwarded to the Engineer immediately after test results are available stating the acceptance or rejection of fabricated pieces in order that the repairs and re-inspection may be made as soon as possible.
- G. Pre-Installation Conference: Contractor shall schedule a meeting to be attended by Contractor, Engineer, fabricator and galvanizer. Agenda shall include the following: Project schedule, source for each fabrication, coordination between fabricator and galvanizer and adjacent Work, finish of surfaces, application of coatings, submittals, and approvals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Channels, Angles, M-Shapes, S-Shapes, W-Shapes: ASTM A 572, Grade 50.
- B. Plate and Bar: ASTM A 572/A 572M, Grade 50.
- C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- E. Medium-Strength Steel Castings: ASTM A 27, Grade 65-35 carbon steel.
- F. High-Strength Steel Castings: ASTM A 148, Grade 80-50, carbon or alloy steel.
- G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers. Finish, mechanically deposited zinc coating, ASTM B 695, Class 50.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- D. Anchor Rods: ASTM F 1554, grade as applicable, hot-dip zinc coating, ASTM A 153, Class C.
- E. Threaded Rods: ASTM A 193, grade as applicable, hot-dip zinc coating, ASTM A 153, Class C.
- F. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- G. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: Coatings meeting requirements of ASTM A 780.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design".
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- F. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- G. Field Cutting: Field cutting of steel shall not be allowed. All cutting of steel shall be performed in the shop prior to galvanizing.
- H. Field Welding: Field connections shall be bolted. Field welding shall not be allowed. All welding of steel shall be performed in the shop prior to galvanizing.

2.5 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work. Complete welds in accordance with the Contract Drawings.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Insufficient welds shall be rejected and corrected until required profiles are met.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
5. No skip welds will be permitted for steel connections to be coated.

2.6 STEEL PRIMERS AND FINISHES

- A. Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthy materials per Section 05041 Hot Dip Galvanizing. Fill vent holes and grind smooth after galvanizing.
- B. Hot-Dip Galvanizing and Factory-Applied Primer for Steel: Factory-applied primer may be applied within 12 hours after galvanizing at the galvanizer's plant. Primer applied at the galvanizer's plant shall be applied in a controlled environment meeting applicable environmental regulations, as recommended by the primer coating manufacturer and in accordance with all requirements of SECTION 09910 SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL. Provide factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and Commonwealth of Massachusetts requirements. Primer shall have a minimum two year re-coat window for application of finish coat. Primer shall be of the same manufacturer of finish top coats to be applied in accordance with SECTION 09910 SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL. Coatings must meet or exceed the following performance criteria:
 1. Abrasion: ASTM D 4060, CS17 Wheel, 1,000 gram load.
 2. Adhesion: ASTM D 3359, Method B, 5 mm crosshatch.
 3. Humidity Resistance: ASTM D 4585.
 4. Salt Spray (Fog): ASTM B 117.
- C. Hot-Dip Galvanizing and Factory-Applied Urethane Primer and Finish for Steel: Provide factory-applied architectural coating over hot-dip galvanized steel matching approved samples and in accordance with SECTION 09910 SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements. Elevations shall be verified by a surveyor licensed in the Commonwealth of Massachusetts.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports only when permanent structural steel, connections, and bracing are in place, unless otherwise indicated. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges".
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-tighten or pretension anchor rods as applicable after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- D. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.

- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint indicated on the Drawings.
- B. Weld Connections: If directed by the Engineer will comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
 - a. Re-profile all steel surfaces (using needle guns or other profiling methods) that have been welded and ground smooth to assure proper adhesion of primers and topcoats.
 - 5. No welding within the tension zone of members will be permitted except for attachment of shear connectors, as called for on the contract plans.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts". When using bolted connections prime with "slip critical class B" primer as specified in this Section. All surfaces of bolted or bearing connections may be primed. When welding, hold back primer a minimum of 2 inches each side of weld.
- C. Welded Connections: Field welding is not allowed on the project. Field welds if allowed by written permission of the Engineer, the welding will be visually inspected according to AWS D1.1. In addition to visual inspection, specialty tests will be performed in accordance with AWS D1.1 and at the frequency stated in Article 1.5.F.5

- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- E. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of painted accessories, bearing plates, and structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 3 power-tool cleaning.
 - 2. Apply compatible primer paint and finish coats of same type as shop applied paint used on adjacent surfaces in accordance the requirements for repair in Section 09910 – SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 05500

MISCELLANEOUS METALS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. All Work in this Section; refer to Schedule in Par. 2.1 and as indicated on the Drawings.
- B. Work under this Section includes railings, supports, framing, gutters and downspouts, and other elements of the South Acton Station as indicated on the Contract Documents and specified herein.
- C. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections
 - 1. Section 03300 - CAST-IN-PLACE CONCRETE.
 - a. Lintels, sleeves, anchors, inserts, plates, and similar items.
- D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 05100 - STRUCTURAL STEEL; structural steel items.
 - 2. Section 05041 - HOT-DIP GALVANIZING
 - 3. Section 08111 - STEEL DOORS AND FRAMES
 - 4. Section 08510 - STEEL WINDOWS
 - 5. Section 08711 - DOOR HARDWARE
 - 6. Section 09910 - SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL

1.2 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

1.3 SUBMITTALS

- A. Product Data: For painted products.
- B. Samples: Two three by six inch samples of shop-applied finishes, in color selected by the Engineer.
- C. Fabrication Samples: Prior to commencing the primary work of this Section, provide samples of materials and workmanship with final finishes as indicated below.

1. Sample of a typical canopy eave section assembly, one foot in length, including an 8" length of canopy arm, attachment plates with 12" length of C8 fascia beam, C8 channel gutter, and 1/4 inch level fascia plate. Sample shall exhibit all welds and finishes as required in the same portion of the complete canopy.
 2. Sample of windscreen (12" x 12").
 3. Sample of snow guard with mounting pad and fasteners.
 4. Sample of canopy snow fence.
 5. Sample of protective screen (12" x 12") with frame on two sides.
- D. Shop Drawings: Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 2. Provide templates for anchors and bolts specified for installation under other Sections.
 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.
 4. Where fabrications are to receive sprayed-on fireproofing, include statement that primer is compatible with fireproofing proposed for use.
- E. Certificates: Welder and weld procedure qualifications.
- F. Qualifications for Inspection and Testing Agency and Contractor's professional engineer indicating registration in the Commonwealth of Massachusetts.
- G. Weld inspection reports.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel".
 2. AWS D1.2, "Structural Welding Code--Aluminum".
 3. AWS D1.3, "Structural Welding Code--Sheet Steel".
 4. AWS D1.6, "Structural Welding Code--Stainless Steel".
- B. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- C. Architectural Exposed Structural Steel: All steel exposed to view shall be designated as architecturally exposed structural steel to be fabricated in conformance with the requirements of the AISC Code of Standard Practice for Steel Buildings Section 10.

- D. Architectural Exposed Structural Steel: All steel exposed to view shall be designated as architecturally exposed structural steel to be fabricated in conformance with the requirements of the AISC Code of Standard Practice for Steel Buildings Section 10.
- E. Galvanizer Qualifications: Engage the services of a qualified galvanizer who has demonstrated a minimum of five years experience in the successful application of galvanized coatings specified in this Section in the facility where the work is to be performed and who will apply the coatings within the same facility.
- F. Pre-Installation Conference: Contractor shall schedule a meeting to be attended by Contractor, Engineer, fabricator, and galvanizer prior to starting Work. Agenda shall include the following: Project schedule, source for each fabrication, coordination between fabricator and galvanizer and adjacent Work, finish of surfaces, application of coatings, submittals, and approvals.
- G. Inspection. Except as otherwise specified, only visual inspection of welds, materials, workmanship, finished products, and installation is required.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 SCHEDULE

- A. Station Items

	ITEM	MATERIAL	COATING/FINISH
1.	Handrails	Steel	Galvanized
2.	Guard Fence, Railings, and Brackets	Steel	Galvanized and Painted
3.	Ladders and Stairs	Steel	Galvanized
4.	Metal Floor Plates	Steel	Galvanized
5.	Protective Posts and Bollards	Steel	Galvanized and Painted

	ITEM	MATERIAL	COATING/FINISH
6.	Bearing and Leveling Plates	Steel	Galvanized and Painted
7.	Plates and Angles	Steel	Galvanized and Painted
8.	Supports for Canopies	Steel	Galvanized and Painted
9.	Supports for Roofs	Steel	Galvanized and Painted
10.	Pipe Guards	Steel	Galvanized and Painted
11.	Sheet Metal	Steel	Galvanized and Painted
12.	Electrical Conduits	Steel	Galvanized and Painted
13.	Display Frame Systems, Poster Cases	Steel	Galvanized and Painted
14.	Supports, Frames, and Housing for VMS Signs	Steel	Galvanized and Painted
15.	Snow Guards and Snow Tabs	Steel	Galvanized and Painted
165.	Gutters	Steel	Galvanized and Painted
17.	Drain Pipes, and Downspouts	Steel	Galvanized
18.	Bench Supports	Steel	Galvanized and Painted
19.	End of Platform Gates	Steel	Galvanized and Painted
20.	Sign Frames	Steel	Galvanized and Painted
21.	Windscreen	Stainless Steel	Punched and Passivated
22.	Protective Screen	Stainless Steel	Passivated
23.	Protective Screen Frame	Stainless Steel	Passivated
24.	Area Drains, Trench Drains, and Drain Pipe	Steel	Galvanized
25.	Column Base Covers	Stainless Steel	Diamond Plate - Passivated
26.	Fenestration Frames	Steel	Galvanized and Painted
27.	Metal Access Panels	Stainless Steel	2D
28.	Elevator Shaft Cornices, Campanile, and Campanile Sign	Steel	Galvanized and Painted

	ITEM	MATERIAL	COATING/FINISH
	Supports		
29.	Round Campanile Sign Back-ground Panel	Stainless Steel	Punched and Passivated
30.	Campanile Sign 'T' Cutouts, Perimeter Angles, and Fastener Plates	Stainless Steel	2D Finish and Passivated
31.	Other Items as Shown on the Drawings	Steel	Galvanized and Painted

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316L
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- G. Protective Screen: ½" x 3" nominal opening welded wire of 0.1620" diameter stainless steel type 316L cut to size. For protective screen with frames, weld screen material to stainless steel screen frames as shown. For screen panels without frames, screen material shall be cut to sizes to fit openings and secured to structural frame as shown with ¾" diameter stainless steel washers and #8 stainless steel, self-drilling, self tapping screws with Neo-EPDM washers. Protective Screen Frame: 0.125" thickness stainless steel type 316L sheet, formed to angle shapes as shown in the drawings, corners mitered and welded. Provide predrilled holes to secure frames with protective screening within structurally framed openings as shown in drawings spaced at not less than 12" on center, minimum of 2 holes each length of frame except frame directly below preformed sheet metal roof decking. Protective screen frames shall be installed with #8 stainless steel, self-drilling, and self tapping screws with Neoprene-EPDM washers.
- H. Perforated Stainless Steel for Windscreens: 11 gauge stainless steel type 316L sheet with 3/16 in. round perforations, smooth and burr free, on staggered 5/16 in. centers with 2D finish brushed in the horizontal direction. Perforated Stainless Steel shall be treated (passivated) after fabrication in accordance with ASTM A380 to ensure the removal of contaminants that could corrode or stain windscreens.
- I. Perforated Stainless Steel for Campanile Sign Panel: 11 gauge stainless steel type 316L sheet with 3/4 in. square perforations, smooth and burr free, on 1 in. centers with 2D finish brushed in the horizontal

direction. Perforated Stainless Steel shall be treated (passivated) after fabrication in accordance with ASTM A380 to ensure the removal of contaminants that could corrode or stain the panel.

- J. Flat Sheet Stainless Steel for Campanile Sign Panel 'T' Cutouts: 11 gauge stainless steel type 316L, cut as shown in the drawings, smooth and burr free with 2D finish brushed in the vertical direction. Flat Sheet Stainless Steel shall be treated (passivated) after fabrication in accordance with ASTM A380 to ensure the removal of contaminants that could corrode or stain the material.
- K. Stainless Steel Angles, Plate and other Shaped or Formed Stainless Steel for Campanile Sign Panel: Stainless steel type 316L fabricated as shown in drawings. All welds ground smooth. Finished 2D and treated (passivated) after fabrication in accordance with ASTM A380 to ensure the removal of contaminants that could corrode or stain the material.

2.3 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use. Provide stainless-steel fasteners for fastening stainless steel and aluminum. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- C. Cast-in-Place Anchors in Concrete: Anchors shall be capable of sustaining, without failure, a load equal to four times the load imposed. Tests shall be as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488. Tests shall be conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Exterior Locations: Stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.
- E. Threaded Rods: Provide threaded rods of Type 316 stainless steel with stainless steel nuts, locknuts, and washers for the suspension of Variable Message Signs as shown in the drawings and in accordance with the Variable Message Sign Manufacturer's recommendations.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with The Society for Protective Coatings SSPC-Paint 20 or ASTM A780.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Self Closing Gravity Hinges: Provide and install self closing gravity hinges in conformance with ANSI BHMA A156.17 at end of platform gates as shown in drawings.
- F. Teflon Pad Type Bearings for Campanile Sign Panel Assembly: Provide and install teflon pad type bearings of a design appropriate for the campanile sign panel and as shown in the drawings. Bearings should provide for the rotation of the sign panel to allow it to turn with the wind without spinning. Bearings should be protected against contaminants and require no lubrication.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts if units are installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.11 METAL LADDERS

- A. Provide metal ladders complying with ANSI A14.3. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder. Provide

nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

2.12 METAL BOLLARDS

- A. Fabricate metal bollards per drawings.

2.13 PIPE GUARDS

- A. Fabricate pipe guards from 3/8-inch-thick by 12-inch wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

2.14 METAL FLOOR PLATE

- A. Fabricate from rolled-steel floor plate of minimum 1/4 inch galvanized steel unless thicker units are required for anticipated loadings.
- B. Include steel angle stiffeners, and fixed and removable sections as indicated.
- C. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.

2.15 METAL ACCESS PANELS

- A. General: Provide fabricated metal access panels for concrete masonry walls at locations shown per drawings.
- B. Basis of Design: Milcor #3202-430MS with masonry anchors or comparable approved product by one of the following manufacturers:
 - 1. JL Industries
 - 2. Karp Associates
 - 3. Acudor
- C. Material: 16 gauge stainless steel with 2D finish.
- D. Size: 24" x 24".

2.16 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Urethane Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush Off Blast Cleaning".

3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2 inches.
 4. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel", for shop painting.
 5. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages".
- B. Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 09900. Provide primer with a VOC content of 340 g/L (2.8 lb/gal.) or less per OTC ozone standards when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Provide Tnemec Series 394 Perimerprime or Ameron Series 68HS at 3.0 mils DFT or approved equal by DuPont or Carboline.
- C. Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials per Section 05041 Hot Dip Galvanizing. Fill vent holes and grind smooth after galvanizing.
- D. Hot-Dip Galvanizing And Factory-Applied Primer for Steel: Factory-applied primer may be applied within 12 hours after galvanizing at the galvanizer's plant. Primer applied at the galvanizer's plant shall be applied in a controlled environment meeting applicable environmental regulations, as recommended by the primer coating manufacturer and in accordance with all requirements of SECTION 09910 SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL. Provide factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and Commonwealth of Massachusetts requirements. Primer shall have a minimum two year re-coat window for application of finish coat. Primer shall be of the same manufacturer of finish top coats to be applied in accordance with SECTION 09910 SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL. Coatings must meet or exceed the following performance criteria:
1. Abrasion: ASTM D 4060, CS17 Wheel, 1,000 gram load.
 2. Adhesion: ASTM D 3359, Method B, 5 mm crosshatch.
 3. Humidity Resistance: ASTM D 4585.
 4. Salt Spray (Fog): ASTM B 117.
- E. Hot-Dip Galvanizing and Factory-Applied Urethane Primer and Finish for Steel: Provide factory-applied architectural coating over hot-dip galvanized steel matching approved samples and in accordance with SECTION 09910 SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL

2.17 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, 2D finish indicated, free of cross scratches. Run grain with long dimension of each piece, the same way for all similar pieces. When polishing is completed, passivate and rinse surfaces in accordance with ASTM A380. Remove embedded foreign matter and leave surfaces chemically clean. Remove all heat tint at welds and heat affected zones.

2.18 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturer's written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in this Section.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in this Section. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

- E. Provide and install support tabs welded to downspout and drain leaders no more than 6'-0" on center or less than 2 per pipe segment or individual downspout assembly or as otherwise shown in the drawings. This shall include corresponding tabs with attachment hardware welded or otherwise secured to the structure to which downspouts and leaders shall be attached.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780 and shop applied paint finish in accordance with the requirements for repair in Section 09910 – SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 06100

CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies carpentry items as indicated on the contract drawings and as specified herein, including, but not limited to, the following:
 - 1. Wood furring.
 - 2. Plywood sheathing and backing panels.
 - 3. Finish hardware installation.
 - 4. Treated Timber Edge Strip at the High Level Platforms
 - 5. Miscellaneous lumber: for benches, wood guard rail beams and posts, concealed wood nailers, furring, shimming, blocking, grounds, and panels required for proper installation of other work.
 - 6. Wood planks for benches.
 - 7. Tackboard surface for poster case.
- B. Coordinate all work of this section with the work of other trades. Take all necessary field measurements prior to starting fabrication or beginning shop drawings.
- C. The Contractor will coordinate all items included as work of this section that are to be built into work of other trades. Furnish all necessary templates and information required by those trades to properly locate such items.

1.2 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them include the following:
 - 1. ALSC: American Lumber Standard Committee
 - 2. AWPA: American Wood-Preservers Association
 - 3. DHI: Door and Hardware Institute
 - 4. NELMA: Northeastern Lumber Manufacturers Association
 - 5. NHLA: National Hardware Lumber Association
 - 6. NLGA: National Lumber Grades Authority

1.3 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.
- B. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 05500 - MISCELLANEOUS METALS
 - 2. Section 02451 - GUARD RAIL

1.4 SUBMITTALS

- A. Submit for each type of process and factory-fabricated product. Indicate component materials and dimensions, and include construction and application details.
 - 1. Include data for wood preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. For the following products, provide compliance documentation with applicable building and state codes:
 - 1. Preservative treated wood.
 - 2. Fire- retardant-treated wood.
 - 3. Power driven fasteners.
 - 4. Powder-actuated fasteners.
 - 5. Expansion anchors.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Handle and store materials in strict compliance with manufacturers' instructions and recommendations. Handle and store materials at Project site to prevent water damage, staining, or other physical damage.
- B. Delivery: Sequence deliveries to avoid delays but minimize on-site storage.
- C. Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

- A. Lumber: Provide lumber graded by DOC PS 20 standards and applicable rules of grading agencies. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, produce minimum dressed sizes for dry lumber.
 4. Provide dressed lumber sanded four sides (S4S) unless otherwise indicated.

A. TIMBER EDGE STRIP AND MISCELLANEOUS LUMBER

- A. General: Provide lumber for the timber edge strip at the high level platforms, for the wood guard rail posts and beams and for the support or attachment of other construction including nailers, blocking, furring, stripping, and similar members. Include all fasteners and other hardware.
- B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- C. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
1. Provide dressed lumber, S4S, unless otherwise indicated.
 2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.
 3. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- D. Lumber shall be free of splits, twists and warps.
- E. Fasteners:
1. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 2. Non-Corrosive Fasteners: Provide fasteners with a hot dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel, unless otherwise indicated.
 3. Nails, Wire, Brads and Staples: Complying with the requirements of ASTM F 1667 and FS FF N 105.
 4. Power Driven Fasteners: National Evaluation Report NER 272.
 5. Wood Screws: ANSI B18.6.1.
 6. Lag Bolts: ANSI B18.2.1.
 7. Bolts: ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers.
- F. Fire – Retardant Treated Materials:
1. General: Comply with performance requirements in AWWA C20 (Lumber) and

and AWPA C27 (Plywood).

- a. Use treatment that does not promote corrosion of metal fasteners.
 - b. Use exterior type for exterior locations and where indicated.
 - c. Use Interior Type A, High Temperature for enclosed roof framing and where indicated.
 - d. Use Interior Type A, unless otherwise indicated.
2. Identify fire-retardant-treated wood with appropriate classification marking of Underwriters Laboratory.
 - a. All lumber and plywood to have a flame spread rating of 25 or less when tested in accordance with ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials
 3. Application: Treat concealed miscellaneous carpentry, including but not limited to the following:
 - a. Concealed blocking at partition framing and window openings.
 - b. Plywood backing panels.
 4. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Dricon; a Division of Hickson Corporation.
 - b. Hoover Treated Wood Products.
 - c. Bestway of New England.

G. WOOD PLANKS

1. Wood species and Cuts: Provide lumber for benches as follows:
 - a. Provide fresh-cut untreated Ipe with the following properties:

Grade:	Select; all heart; no sap
Appearance:	Smooth with no splinters
Decay resistance:	25 years
Fire rating class:	NFPA - A
Bending strength (Fb):	25,400 psi
Shear Strength:	2,060 psi
Hardness:	3,680 lbs
Unit weight for design purposes:	69 pcf.
 - b. All hardwood material shall be free from “white rot” and other deformities. Members shall be cut without bark, wane or sapwood. Intermediate light-colored heartwood shall be permitted. Well-boxed and sound heart shall be permitted in members 10 inches by 10 inches and larger.
 - c. Members shall be straight-grained (maximum slope to grain of 1:10) and without knots or excessive bending or twisting.
 - d. Members shall be full-cut to actual (not nominal) dimensions with a tolerance of $\pm 3/16$ ” unless otherwise indicated.
 - e. Lumber shall have a maximum moisture content of 19%.

- f. Cutting and Drilling: Pre-drill and counter sink when using screws or bolts.
- g. End Sealing: Seal all ends after cutting with end sealer to reduce end checking.
- h. Fastening: Provide fasteners with hot-dipped zinc coating per ASTM A-153 or of AISI type 304 stainless steel, unless otherwise indicated.
- i. Finish: Apply a penetrating, pigmented, UV inhibiting sealer

H. TACKBOARD SURFACE

- A. Description: Burlap bonded with waterproof adhesive to structural fiberboard.
 - a. Thickness: ½ inch.
 - b. Treated for resistance to moisture, protection against termites, rot and fungus.
 - c. Mod. Of Rupture: 650-900 psi.
 - d. Mod. Of Elasticity: 69,000 psi.
 - e. Density: 24-26 lb/cf.
 - f. Hardness (Janka Ball): 200 lb.
 - g. Tensile Strength: 350-600.
 - h. Water Absorption by volume:
 - i. 2 hours immersion: 5%.
 - ii. 24 hours immersion: 15%.
 - i. Expansion from 50% to 90% relative humidity (max.): 0.25%.
 - j. Thermal Conductivity (k factor): 0.42.
 - k. R value: 1.11.
 - l. NRC: 0.20.
 - m. ASTM E 84 Fire Rating: Class III (or C).
- B. Products:
 - a. Burlap Panels by Homasote Company;
 - b. Bulletin Boards by AARCO Products Inc
 - c. Tackboards by ADP LEMCO INC
 - d. Or approved equal.

I. MISCELLANEOUS LUMBER

- 1. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - a. Blocking
 - b. Nailers
 - c. Cants
 - d. Furring
- 2. For items of dimension lumber size, provide Construction or No.2 grade lumber with 15 percent maximum moisture content and any of the following species:
 - a. Hem-fir (north); NLGA
 - b. Spruce-Pine-fir;NLGA
- 3. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

- a. Hem-fir or hem fir (North), Construction or 2 Common grade;NLGA.
 - b. Spruce-pine-fir (south) or spruce-pine fir, Construction or 2 common grade; NELMA or NLGA
4. For blocking not used for attachment of other construction, utility, stud, or No.3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with the attachment and purpose.
 5. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
 6. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
 7. Application: Provide kiln dried lumber in the following locations:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

PART 3 - EXECUTION

3.1 GENERAL

- A. Set carpentry to required levels and lines with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.
- B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items and trim.
- C. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 1. Fire block furred spaces of walls, at each floor level, at ceiling, and not more than 96 inches on-center (o.c.) with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 2. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- D. Sort and select lumber so that natural characteristics will not interfere with installation or fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

- a. NER-272 for power driven fasteners.
 - b. Table 2304.9.1, “Fastening Schedule”, in the International Building Code.
- G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood: Install 1-by-3 inch nominal-size furring vertically 24 inches o.c.

3.4 FIRE- RETARDANT-TREATED (FRT) MATERIALS INSTALLATION

- A. Cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating.
 - 1. Ripping, milling and surfacing of FRT lumber is not permitted.
 - 2. FRT Plywood can be cut in either direction without loss of fire protection

3.5 FINISH HARDWARE INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames DHI “Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames”.
 - 2. Wood Doors: DHI WDHS 3 “Recommended Locations for Architectural Hardware for Wood Flush Doors”.
- B. Install each door hardware item to comply with manufacturers written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

- 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Sections Joint Sealants.

3.6 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect carpentry from weather. If despite protection, carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07115

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies cold-applied, emulsified-asphalt dampproofing applied to the exterior of below-grade surfaces on concrete and masonry foundation and retaining walls.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- C. Qualification Data: For Installer and for Testing and Inspection Agency.
- D. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Emulsified-Asphalt Dampproofing, Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Euclid Chemical Company.
 - 2. Henry Company.
 - 3. Karnak Corporation.
 - 4. Meadows, W. R., Inc.
 - 5. Sonneborn, Div. of ChemRex, Inc.

2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- C. Protection Course, Polystyrene Type: Fan-folded, rigid, extruded-polystyrene board insulation; nominal thickness not less than 3/16 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with manufacturer's requirements for surface smoothness and other conditions affecting performance of work. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer. Concrete shall be allowed to cure for a minimum of 5 days after form removal prior to dampproofing application.
- C. Patch holes with mortar and allow to properly cure prior to dampproofing application.

3.3 APPLICATION

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indi-

cated.

2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
 3. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 4. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 5. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced", by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.
- B. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.
- C. On Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.
- D. On Backs of Concrete and Masonry Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft.

3.4 INSTALLATION OF PROTECTION COURSE

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

3.5 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
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END OF SECTION

SECTION 07190

WATER REPELLENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies water-repellent coatings for the following surfaces:
 - 1. Concrete vertical surfaces along walkways, curbs, head house walk surfaces, pedestrian bridge walk way surfaces, ramps and landings including edges of slabs
 - 2. Concrete horizontal surfaces at head house walkway surfaces, stairs, ramps, landings and platform walk surfaces including exposed undersides of ramp slabs/overhangs.

- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 07920 - JOINT SEALANTS; Joint sealers.
 - 2. Section 03300 - CAST-IN-PLACE CONCRETE

1.2 PERFORMANCE REQUIREMENTS

- A. Performance Testing: Provide water repellents that comply with test-performance requirements indicated, as evidenced by reports of tests performed by manufacturer by a qualified independent testing agency on manufacturer's standard products applied to substrates simulating those on Project using same application methods to be used for Project.

- B. Absorption: Minimum 90 percent reduction of absorption after 24 hours in comparison of treated and untreated specimens.
 - 1. Concrete Unit Masonry: ASTM C 140.
 - 2. Hardened Concrete: ASTM C 642.

- C. Permeability: Minimum 80 percent water-vapor transmission in comparison of treated and untreated specimens, per ASTM D 1653.

- D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E 514.

- E. Durability: Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G 154.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1. Include manufacturer's printed statement of VOC content.
 2. Include manufacturer's standard colors.
- B. Samples: For each type and color of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.
- C. Manufacturer Certificates: Signed by manufacturers certifying that water repellents comply with requirements.
- D. Qualifications: Installer certification from product manufacturer.
- E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Test Application: Apply a finish sample for each type of water repellent and substrate required. Duplicate finish of approved sample.
1. Locate each test application as directed by Engineer.
 2. Size: 10 square feet.
 3. Final approval by Engineer of color and water-repellent application will be from test applications.

1.5 PROJECT CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
1. Ambient temperature is above 40 deg F.
 2. Concrete surfaces and mortar have cured for more than 28 days.
 3. Concrete or brick masonry walls are not treated prior to 30 days after building close-in.
 4. Rain or snow is not predicted within 24 hours.
 5. Application proceeds more than 24 hours after surfaces have been wet.
 6. Substrate is not frozen, or surface temperature is above 40 deg F.
 7. Windy conditions do not exist that may cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace materials that fail to maintain water repellency specified in Part 1 "Performance Requirements" Article within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blends with 3.3 lb/gal. or less of VOCs.
 - 1. Available Products:
 - a. Anti-Hydro International, Inc.; Aridox 40 VOC.
 - b. Hydrozo, a division of ChemRex; Enviroseal 7 or Hydrozo 100.
 - c. Pecora Corporation; 910W.
 - d. ProSoCo, Inc.; SL 100 Water Repeller.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to water-repellent manufacturer's written instructions, to ensure that surface is dry enough.
 - 1. Cast-in-Place Concrete Section 03300: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.
 - 2. Clay Brick Masonry: Clean clay brick masonry per ASTM D 5703.
- B. Test for pH level, according to water-repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.
- C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.
- D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment to achieve application rate recommended by manufacturer. Prepare a test area to determine proper application rate as recommended by manufacturer. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated. Thoroughly mix prior to application.
 - 1. Precast Concrete: At Contractor's option, first application of water repellent on precast concrete units may be completed before installing units. Mask sealant-bond surfaces to prevent water repellent from migrating onto joint surfaces.

3.3 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
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END OF SECTION

SECTION 07411

PREFORMED METAL CANOPY SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies fabricating, furnishing and installing a leak-tight preformed (corrugated) metal canopy roof system as indicated on the Contract Drawings and as specified herein, including, but not limited to, the following:
 - 1. Mechanically attached preformed metal canopy panel system at the platform, pedestrian bridge, and head house structures (stair/lobby buildings), including fasteners trim and closure pieces, with panels and connections fabricated for the design loads specified and spans and details shown in the Drawings.
 - 2. All necessary fasteners and connections (except for structural steel indicated on the Drawings), sealers, sealants, flashings and counter-flashings as required to make the systems leak tight.

1.2 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.
- B. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 05041 - HOT DIP GALVANIZING.
 - 2. Section 05500 - MISCELLANEOUS METALS
 - 3. Section 05100 - STRUCTURAL STEEL
 - 4. Section 07421 - METAL WALL PANELS
 - 5. Section 07920 - SEALANTS AND CAULKING
 - 6. Section 09910 - SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL.

1.3 STANDARDS

- A. The following standards form a part of these Specifications.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- C. American Iron and Steel Institute (AISI):
 - 1. Specification for the Design of Cold-Formed Steel Structural Members.
- D. American Institute of Steel Construction (AISC):
 - 1. Code of Standard Practice.

- E. American Society of Civil Engineers (ASCE):
 - 1. ASCE-7, Minimum Design Loads for Buildings and Other Structures.
- F. Federal Specifications (FS).
- G. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - 1. Architectural Sheet Metal Manual.

1.4 SYSTEM PERFORMANCE

- A. Design Wind Pressure: Canopy system shall safely withstand Design Wind Pressure of 35 psf, and all loads prescribed by codes and authorities having jurisdiction. Loads shall be resisted in both positive and negative directions.
- B. Design Live and Dead Load, including unbalanced roof snow load and drift loads: Canopy system shall safely withstand structural loading calculated in accordance with applicable building code, and as follows:
 - 1. Canopy system shall support a 250 lb. concentrated load distributed over a 4 inch square at the center of a panel at the maximum span used on the project without buckling the rib, permanent deflection or other perceptible damage.
- C. Canopy system shall be designed for a maximum deflection under positive loading of L/180.
- D. Air infiltration of the canopy system shall be limited to 0.06 CFM/ft² at a positive pressure differential of 1.57 psf when tested in accordance with ASTM E 283.
- E. There shall be no water penetration through the canopy system when the canopy system is tested per ASTM E 331 at a positive pressure differential of 6.24 psf or 20% of the design wind pressure whichever is greater. The test pressure need not exceed 12 psf.
- F. Thermal Movement: Canopy system shall permit thermal movement resulting from an ambient temperature range of 120°F without leaking water.

1.5 QUALITY ASSURANCE

- A. Subdivision of Work: Assign the complete canopy system to one manufacturer and one installer, including, but not limited to, panels, fasteners, ridge vents, caps, trims, and counter-trims.
- B. Source: Provide canopy systems that are the products of one manufacturer. Provide secondary materials that are acceptable to the manufacturer of the canopy system.
 - 1. Manufacturers Qualifications: The manufacturer shall have had a minimum of ten (10) years experience in the successful completion of projects employing similar materials, applications, and performance requirements.
- C. Engineering: Provide the services of a Professional Engineer, registered in the Commonwealth of Massachusetts, to design, seal and certify that the work of this section meets or exceeds the performance requirements specified in this section.
- D. Installer: The installer shall have a minimum of ten (10) years experience in the successful completion of projects of the type required by this Section, and shall be acceptable to the

manufacturer of the canopy system. The manufacturer shall certify that the installer is acceptable to the manufacturer.

- E. Pre-installation Conference: A pre-installation conference shall be held to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
- F. Field Leakage Test: Authority may employ an independent testing agency to make in-place field tests for water leakage and other performance criteria. Test will generally include a prolonged water spray test similar to AAMA 501.3, except water shall be applied for two minutes per lineal foot of joint being tested. Any uncontrolled leakage will be considered a failure.
 - 1. Modify installation techniques as necessary to eliminate leaks. Make watertight all leaking areas.
 - 2. At no additional cost to the Authority, provide all retesting and remedial work necessary because of failures found by testing.
 - 3. Do not eliminate leaks through the application of sealants

1.6 WARRANTY

- A. Canopy System Warranty: Provide manufacturer's standard written warranty signed by manufacturer, installer and Contractor, agreeing to repair or replace work which exhibits defects in materials or workmanship. "Defects" is defined to include, but is not limited to, leakage of water, abnormal aging or deterioration, and failure to meet performance requirements.
 - 1. Warranty Period: Twenty-five (25) years from date of Final Acceptance.

1.7 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Manufacturer's Qualifications: Submit a list of five (5) similar completed projects with addresses of the project location, architect, and owner.
- C. Installer's Qualifications and Experience:
 - 1. Submit a list of five (5) similar completed projects with metal roofing and canopy systems, with addresses of the project location, architect, and owner.
 - 2. Certification that the installer is acceptable to the manufacturer.
- D. Submit product data, test reports, and certifications in accordance with quality assurance and system performance requirements specified herein.
- E. Submit panel shop drawings consisting of design and erection drawings, finish specifications, and other data necessary to clearly describe the design, materials, sizes, layouts, construction details, and erection. Submit small-scale layouts of panels and gutters and large-scale details of edge conditions, joints, fastener and sealant placement, flashings, penetrations, and special details. Distinction must be made between factory and field assembled work.
 - 1. A Professional Engineer, registered in the Commonwealth of Massachusetts, shall sign and seal the shop drawings.

2. Do not begin fabrication without approved shop drawings.
- F. Submit structural design calculations, in accordance with the AISI Specification for the Design of Cold-Formed Steel Structural Members, for the canopy system. Show how the design load and other performance requirements have been satisfied.
1. A Professional Engineer, registered in the Commonwealth of Massachusetts, shall seal and certify the calculations.
- G. Samples: Submit samples for initial selection, showing complete range of colors, textures and finishes available for each material exposed in the finish work. Base on the colors, textures and finishes selected by the Engineer, submit representative samples of each material exposed in the finish work, including the following, showing the range of color and finish variations expected:
1. Panel: Full panel width by 12 inches long.
 2. Ridge vent: Full cross section by 12 inches long.
 3. Fasteners: Two (2) of each type with statement of intended use.
 4. Closure: One (1) metal closure and one (1) foam closure as required.
 5. Sealants: One (1) sample of each type with statement of intended use.
 6. Expanded metal sheet infill: One (1) 12-inch x 12-inch panel with perimeter welded plates.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver to the site, preformed metal canopy system materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect against all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage. All unacceptable materials shall be replaced at no additional cost to the Authority.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide canopy system products of one of the following manufacturers that meet or exceed the specified requirements, or provide an Engineer-approved equal:
1. Centria.
 2. Metecno-Morin.
 3. Berridge.

2.2 CANOPY SYSTEM PRODUCT

- A. Preformed (corrugated), prefinished, galvanized steel canopy panels:
1. Dimensions:
 - a. 36 inches of coverage width.
 - b. Rib crests 7.2" on center and 1.5" deep.

2. Material: Zinc coated (galvanized) steel conforming to ASTM A 653 SQ Grade 37 with G90 coating. Material shall be minimum 18 gauge with smooth surface texture. Finish coating shall be Kynar or Hynar based material.
- B. Flashing and Trim: Fabricated in the same material, gauge, finish and color as the metal panels.
- C. Finish: Galvanized per Section 05041 and with factory applied paint finish by the panel manufacturer.
1. All panels shall be painted on both interior and exterior surfaces with a 3 coat Kynar 500 or Hylar 5000 based polyvinylidene fluoride coating system. System shall consist of 0.8 mil urethane primer, 0.8 mil color coat and 0.8 mil clear top coat. The total dry film thickness of paint shall be 2.4 mils on both the interior and exterior surfaces of all roof panels.
 2. Provide custom mixed colors matching Design Engineer's samples of 'Aged Copper' for the exterior side and 'Parchment White' for the interior side.
 3. All exterior painted panels and flashings shall receive a factory applied plastic strippable coating for protection during shipping and handling.
- D. Accessories:
1. Canopy system fasteners shall be #14 minimum diameter, self-tapping, with hex head.
 - a. Exposed fasteners shall be 300 series stainless steel with 5/8" bonded neoprene and stainless steel washers coated to match the exterior panel color.
 - b. Concealed fasteners shall be 300 series stainless steel.
 2. Closures shall be metal and/or foam as required. Foam shall be a pre-cut profile closure of closed cell foam. Metal closures shall be fabricated from the same material, gauge, finish, and color as the exterior metal panel. Metal ridge cap, ridge vent, flashing/drip edge, and end closures shall be fabricated in accordance with the manufacturer's recommendations.
 3. Sealants:
 - a. Hidden sealant at all side laps, end laps, and flashing details shall be gun grade non-curing butyl or polymeric non-skinning butyl tape to ensure weather tightness.
 - b. Exposed sealant – provide Joint Sealant JS-2 as specified in Section 07920 – Sealants and Caulking.
 4. Flashings, not including those associated with gutters, shall be factory-formed from the same type and gage of material as the roofing panels.
 5. Lap Sealing: Vapor seal of the panels shall be created by applying manufacturer's recommended sealant at the side and end lap of metal roofing panels.

2.3 CANOPY SYSTEM FABRICATION

- A. Canopy system components shall be fabricated in the factory for field assembly to the greatest extent possible. Avoid field cutting. Touch-up and repair factory applied finish damaged by field cutting.

PART 3 - EXECUTION

3.1 INSPECTING SUBSTRATE

- A. Verify conditions as satisfactory to receive work.

- B. Do not begin installation until all unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions.

3.2 CANOPY SYSTEM INSTALLATION

- A. Strictly comply with the manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.
 - 1. Remove all protective materials and labels from the canopy components as they are installed.
 - 2. Install work to be truly straight and square.
 - 3. Provide work as indicated on approved shop drawings.
 - 4. Install work with uniform, tight, interlocking joints.
 - 5. Provide trims, sealers, fillers and gaskets as necessary to make assembly weathertight and watertight.
 - 6. Comply with the requirements of Section 07920 – Sealants and Caulking, including testing and compatibility.
 - 7. Comply with SMACNA Architectural Sheet Metal Manual for installation of flashings and sheet metal work.
 - 8. Metal filings caused by cutting and drilling shall be immediately removed from finished surfaces to prevent rusting and staining.
- B. Coordinate work with other trades as required to ensure proper flashing and seals with adjoining construction.

3.3 TOUCH-UP AND REPAIR

- A. Touchup with air dry coating material per Section 05041 - Hot Dip Galvanizing. Touch up factory applied finish with paint of the same manufacture and color of prefinished paint coating.
- B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which the Engineer determines cannot be satisfactorily repaired.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07421

METAL WALL PANEL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies fabricating, furnishing and installing a leak-tight preformed (corrugated) metal wall panel system as indicated on the contract drawings and as specified herein, including, but not limited to, the following:
 - 1. Mechanically attached preformed metal wall panels at the head house structures (stair/lobby buildings), including fasteners trim and closure pieces, with panels and connections fabricated for the design loads specified and spans and details shown in the Drawings.
 - 2. All necessary fasteners and connections (except for structural steel indicated on the Drawings), sealers, sealants, flashings and counter-flashings as required to make the panel systems leak tight.

1.2 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.
- B. Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 04800 - MASONRY
 - 2. Section 05041 – HOT DIP GALVANIZING.
 - 3. Section 05500 – MISCELLANEOUS METALS
 - 4. Section 05100 – STRUCTURAL STEEL
 - 5. Section 07411 – PREFORMED METAL CANOPY SYSTEM
 - 6. Section 07600 – FLASHING AND SHEET METAL
 - 7. Section 07920 – SEALANTS AND CAULKING
 - 8. Section 09910 - SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL.

1.3 STANDARDS

- A. The following standards form a part of these Specifications.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 3. ASTM A 653/A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

4. ASTM A 755/A 755M - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 5. ASTM C 920 - Specification for Elastomeric Joint Sealants.
 6. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
 7. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 8. ASTM E 283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
- C. American Iron and Steel Institute (AISI):
1. Specification for the Design of Cold-Formed Steel Structural Members.
- D. American Institute of Steel Construction (AISC):
1. Code of Standard Practice.
- E. American Society of Civil Engineers (ASCE):
1. ASCE-7, Minimum Design Loads for Buildings and Other Structures.
- F. Federal Specifications (FS).
- G. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
1. Architectural Sheet Metal Manual.
- H. American Architectural Manufacturer's Association (AAMA):
1. AAMA 501.1 - Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
 2. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

1.4 SYSTEM PERFORMANCE

- A. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E 72:
1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 2. Limits of Deflection: Metal wall panel assembly shall withstand scheduled wind pressure with the following allowable deflection:
 - a. Maximum allowable deflection limited to L/180 deflection of panel perimeter normal to plane of wall with no evidence of failure.

- B. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Wall system shall permit thermal movement resulting from an ambient temperature range of 120°F without leaking water.
- C. Air Infiltration: Maximum 0.06 cfm/sq. ft. (0.3 L/s per sq. m) per ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa), using minimum 10-by-10 foot (3050-by-3050 mm) test panel that includes side joints.
- D. Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 6.24 lbf/sq. ft. (299 Pa), using minimum 10-by-10 foot (3050-by-3050 mm) test panel that includes side joints.

1.5 QUALITY ASSURANCE

- A. Subdivision of Work: Assign the complete wall panel system to one manufacturer and one installer, including, but not limited to, panels, fasteners, caps, trims and counter-trims and all other related accessories for a complete assembly.
- B. Source: Provide canopy systems that are the products of one manufacturer. Provide secondary materials that are acceptable to the manufacturer of the wall panel system.
 - 1. Manufacturers Qualifications: The manufacturer shall have had a minimum of ten (10) years experience in the successful completion of projects employing similar materials, applications, and performance requirements.
- C. Engineering: Provide the services of a Professional Engineer, registered in the Commonwealth of Massachusetts, to design, seal and certify that the work of this section meets or exceeds the performance requirements specified in this section.
- D. Installer: The installer shall have a minimum of ten (10) years experience in the successful completion of projects of the type required by this Section, and shall be acceptable to the manufacturer of the wall panel system. The manufacturer shall certify that the installer is acceptable to the manufacturer.
- E. Pre-installation Conference: A pre-installation conference shall be held to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
- F. Field Leakage Test: Authority may employ an independent testing agency to make in-place field tests for water leakage and other performance criteria. Test will generally include a prolonged water spray test similar to AAMA 501.3, except water shall be applied for two minutes per lineal foot of joint being tested. Any uncontrolled leakage will be considered a failure.
 - 1. Modify installation techniques as necessary to eliminate leaks. Make watertight all leaking areas.
 - 2. At no additional cost to the Authority, provide all retesting and remedial work necessary because of failures found by testing.
 - 3. Do not eliminate leaks through the application of sealants

1.6 WARRANTY

- A. Wall Panel System Warranty: Provide manufacturer's standard written warranty signed by manufacturer, installer and Contractor, agreeing to repair or replace work which exhibits defects in materials or workmanship. "Defects" is defined to include, but is not limited to, leakage of water, abnormal aging or deterioration, and failure to meet performance requirements.
 - 1. Warranty Period: Twenty-five (25) years from date of Final Acceptance.

1.7 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Manufacturer's Qualifications: Submit a list of five (5) similar completed projects with addresses of the project location, architect, and owner.
- C. Installer's Qualifications and Experience:
 - 1. Submit a list of five (5) similar completed projects with metal roofing and canopy systems, with addresses of the project location, architect, and owner.
 - 2. Certification that the installer is acceptable to the manufacturer.
- D. Submit product data, test reports, and certifications in accordance with quality assurance and system performance requirements specified herein.
- E. Submit panel shop drawings consisting of design and erection drawings, finish specifications, and other data necessary to clearly describe the design, materials, sizes, layouts, construction details, and erection. Submit small-scale layouts of panels and large-scale details of edge conditions, joints, fastener and sealant placement, flashings, penetrations, special details, extrusions and other required trim needed for a complete installation. Distinction must be made between factory and field assembled work.
 - 1. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.
 - 2. Indicate details of fastening, including clip spacing, supported by load span tables that include an evaluation of clip and panel side joint interaction.
 - 3. A Professional Engineer, registered in the Commonwealth of Massachusetts, shall sign and seal the shop drawings.
 - 4. Do not begin fabrication without approved shop drawings.
- F. Submit structural design calculations, in accordance with the AISI Specification for the Design of Cold-Formed Steel Structural Members, for the canopy system. Show how the design load and other performance requirements have been satisfied.
 - 1. A Professional Engineer, registered in the Commonwealth of Massachusetts, shall seal and certify the calculations.
- G. Samples: Submit samples for initial selection, showing complete range of colors, textures and finishes available for each material exposed in the finish work. Base on the colors, textures and

finishes selected by the Engineer, submit representative samples of each material exposed in the finish work, including the following, showing the range of color and finish variations expected:

1. Panel: Full panel width by 12 inches long.
2. Fasteners: Two (2) of each type with statement of intended use.
3. Closure: One (1) metal closure and one (1) foam closure as required.
4. Sealants: One (1) sample of each type with statement of intended use.
5. Expanded metal sheet infill: One (1) 12-inch x 12-inch panel with perimeter welded plates.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver to the site, metal panel system materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect against all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage. All unacceptable materials shall be replaced at no additional cost to the Authority.

PART 2 - PRODUCTS

2.1 METAL WALL PANEL SYSTEM PRODUCT

- A. Preformed, prefinished, galvanized steel wall panels:
 1. Basis of Design: CENTRIA, Concept Series Metal Wall Panels (CS-210) or comparable approved product by one of the following manufacturers:
 - a. CENTRIA Architectural Systems; Moon Township, PA
 - b. Morin Corporation: Bristol, CT^
 - c. Berridge Manufacturing Company; Houston, TX
 2. Material: Zinc coated (galvanized) steel conforming to ASTM A 653 SQ Grade 37 with G90 coating. Material shall be minimum 18 gauge with smooth surface texture. Finish coating shall be Kynar or Hynar based material.
- B. Flashing and Trim: Fabricated in the same material, gauge, finish and color as the metal panels.
- C. Finish: Galvanized per Section 05041 and with factory applied paint finish by the panel manufacturer.
 1. All panels shall be painted on both interior and exterior surfaces with a 3 coat Kynar 500 or Hylar 5000 based polyvinylidene fluoride coating system. System shall consist of 0.8 mil urethane primer, 0.8 mil color coat and 0.8 mil clear top coat. The total dry film thickness of paint shall be 2.4 mils on both the interior and exterior surfaces of all roof panels.
 2. Provide custom mixed colors matching Design Engineer's samples of colors (up to 3 separate colors) for the exterior side and 'Parchment White' for the interior side.

3. All exterior painted panels and flashings shall receive a factory applied plastic strippable coating for protection during shipping and handling.

D. Accessories:

1. Canopy system fasteners shall be #14 minimum diameter, self-tapping, with hex head.
 - a. Exposed fasteners shall be 300 series stainless steel with 5/8" bonded neoprene and stainless steel washers coated to match the exterior panel color.
 - b. Concealed fasteners shall be 300 series stainless steel.
2. Closures shall be metal and/or foam as required. Foam shall be a pre-cut profile closure of closed cell foam. Metal closures shall be fabricated from the same material, gauge, finish, and color as the exterior metal panel. Flashing/drip edge, end closures and other accessories shall be fabricated in colors to match, and in accordance with the manufacturer's recommendations.
3. Sealants:
 - a. Hidden sealant at all side laps, end laps, and flashing details shall be gun grade non-curing butyl or polymeric non-skinning butyl tape to ensure weather tightness.
 - b. Exposed sealant – provide Joint Sealant JS-2 as specified in Section 07920 – Sealants and Caulking.
4. Flashing, shall be factory-formed from the same type and gage of material as the wall panels.
5. Lap Sealing: Vapor seal of the panels shall be created by applying manufacturer's recommended sealant at the side and end lap of metal roofing panels.

2.2 METAL WALL PANEL SYSTEM FABRICATION

- A. Wall panel system components shall be fabricated in the factory for field assembly to the greatest extent possible. Avoid field cutting. Touch-up and repair factory applied finish damaged by field cutting.

PART 3 - EXECUTION

3.1 INSPECTING SUBSTRATE

- A. Verify conditions as satisfactory to receive work.
- B. Do not begin installation until all unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions.

3.2 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement and isolation of dissimilar materials as needed.
- B. Attach panels to metal framing and masonry wall construction using recommended clips, screws, fasteners, sealants, adhesives, and other materials indicated on approved shop drawings.

1. Fasteners for Steel Wall Panels: Stainless-steel.
 2. Fasten metal wall panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer. Install clips to supports with self-tapping fasteners.
 3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
 4. Dissimilar Materials: Where elements of metal wall panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.
- C. Joint Sealers: Install joint sealants where indicated on approved shop drawings.

3.3 ACCESSORY INSTALLATION

- A. General: Install metal wall panel accessories with positive anchorage to building and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install related flashings and sheet metal trim per requirements of Section 07600 – Flashing and Sheet Metal.
 2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, lap strips, flashings, sealants, fillers, closure strips, and similar items.
 3. Comply with performance requirements and manufacturer's written installation instructions.
 4. Provide concealed fasteners except where noted on approved shop drawings.
 5. Set units true to line and level as indicated.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

3.5 TOUCH-UP AND REPAIR

- A. Touchup with air dry coating material per Section 05041 - Hot Dip Galvanizing. Touch up factory applied finish with paint of the same manufacture and color of prefinished paint coating.
- B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which the Engineer determines cannot be satisfactorily repaired.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07540

THERMOPLASTIC SINGLE PLY ROOFING

PART 1 – GENERAL

1.1 DESCRIPTION

Furnish and install a mechanically fastened flexible sheet roofing system including all related accessories as indicated on the drawings, specifications and contract documents.

1.2 QUALITY CONTROL

- A. The Roofing System shall only be applied by approved, trained roofing contractors certified by the approved manufacturer.
- B. All roofing and roof accessories shall be installed in compliance with the approved manufacturer's current specifications and details.
- C. This guide specification is an application guide and shall be used in conjunction with the approved manufacturer's current details, architectural plans, specifications and the approved manufacturer's components listing.
- D. Deviations from accepted manufacturer's specifications and details must be approved in writing by the manufacturer.

1.3 CONDITIONS

- A. New construction: The general contractor shall be responsible for providing proper surfaces to receive roofing and flashings. The Roofing System shall not be applied during periods of precipitation. Contact Flex Technical Services Department for recommendations when the ambient temperature is less than 32°F.
- B. The structural load bearing capacity of the roof deck shall be determined by the design engineer prior to start of work.
- C. Protection:
 - 1. Provide protection and avoid heavy traffic on completed work.
 - 2. Protect surrounding work from damage by roofing operations.

1.4 GUARANTEE

- A. The roofing contractor shall furnish to the Authority, the manufacturer's standard fifteen (15) year guarantee of water tightness.

- B. The roofing contractor shall complete and submit to the approved manufacturer requested documents signed by a company officer prior to job start for project approval. The approved manufacturer reserves the right to inspect the installed roofing system to assure quality workmanship and conformity to its standard details and specifications.
- C. The Contractor will bear responsibility for any deviations from the approved manufacturer's current specifications or details without prior written approval.

1.5 PRODUCT CAUTIONS & STORAGE

- A. All materials shall be delivered to the job site in the original new, dry unopened packaging clearly indicating product type and manufacturer's name.
- B. Seam sealer is flammable and care shall be taken in the handling and storage of this material.
- C. The roofing system must not come in contact with the following list of non-compatible substances:
 - 1. Asphalt
 - 2. Coal Tar Pitch
 - 3. Fats & Oils- Animal/Vegetable
 - 4. Gasoline, Diesel, and Jet Fuel
 - 5. Any Petroleum Based Product

PART 2 – MATERIALS (POLYESTER REINFORCED)

2.1 MATERIALS

- A. The Membrane shall be fiberglass reinforced flexible sheet roofing and have the below listed minimum physical properties:

PROPERTY	TEST PROCEDURE	PHYSICAL PROPERTIES
Color		White or Gray
Thickness	ASTM D751	.060"
Breaking Strength	ASTM D751/D638	>230 lbs.
Elongation	ASTM D751/D638	100%
Shore "A" Hardness	ASTM D2240	83
Heat Aging	ASTM D3045	90% of Original
Cold Resistance	ASTM D2136	- 40°F
Water Vapor Permeability	ASTM E96	3.5g/m2/day
Wt. Change after Immersion	ASTM D570	1.5% max

Linear Dimensional Change	ASTM D1204	.5% or less
Accelerated Weathering (Xenon Arc)	ASTM D2565 (No Change)	After 10M hrs.
Underwriters Laboratories	Class A	
Factory Mutual	Class 1-90	
Polyvinyl chloride sheet roofing	ASTM D4434	

- B. Flashing material shall be the approved manufacturer's flashing membrane or coated material as specified the manufacturer's standard details.
- C. When coated metal is required it shall be nailed or screwed to wolmanized pressure treated wood or with appropriate screw fasteners to perimeter steel cornice.
- D. All seams shall be made by the use of the hot-air welding tool.
- E. All seams shall be checked, voids repaired and flexible seam sealer applied to all end laps and non-factory edges, daily as work is completed.
- F. Separation layer is required over all substrates and shall be:
 - 1. Reinforced laminated paper.
 - 2. Aluminum foil as a facing on insulation.
 - 3. Or as approved in writing by the approved manufacturer.

2.2 OTHER MATERIALS

- A. Tapered Polyisocyanurate Roof Insulation for the purpose of roof work shall be acceptable to the manufacturer of the roof membrane system. Insulation shall be compatible with the deck design, provide required thermal insulation value, and have the structural capacity to span steel deck flutes; minimum thickness is one inch (1"). The insulation shall be tapered toward roof scupper drains as shown on drawings and be mechanically fastened to the deck in a Factory Mutual (F.M.) approved manner with all joints staggered.
 - 1. Tapered Polyisocyanurate Roof Insulation
 - a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy-duty glass fiber mat facers.
 - 1. Taper Thickness: Minimum 1 in. at low points.
 - 2. Tapered Slope: 1/4 in. per foot.
 - 3. Average R-Value: Minimum 10.0.
 - b. Source
 - 1. E'NRG'Y-2 by NRG Barriers, Inc.
 - 2. Ultra Gard Gold II by Schuller Roofing Systems
 - 3. GAFTEMP Isotherm R by GAF
 - 4. Approved Equivalent

- c. Insulation board shall meet the following requirements
 - 1. FM listed under Roofing Systems
 - 2. Federal Specification HH-I-1972, Class 1
- B. Fasteners shall be: (Note: Check the approved components listing for specific types)
 - 1. Metal Deck: F.M. approved self-tapping screws per approved components listing
- C. Approved caulking shall be as named on the accepted manufacturer's approved components listing.
- D. Fastener plates shall be 2" round F.M. approved discs as supplied by the accepted manufacturer.

PART 3- EXECUTION

3.1 PREPARATION

- A. The roof deck must be clean and free of foreign material (i.e. oil, water, sharp edges, etc.)
- B. Decking shall be laid in a level course and properly secured to eliminate any bridging of the insulation.
- C. Insulation shall be secured to the deck in a Factory Mutual approved method.

3.2 ROLL PLACEMENT AND SEAMING

- A. Rolls may be placed in any direction starting from the bottom and working to the top of the slope.
- B. All seams shall be a 2" minimum finished width for the length of the sheet and a 4" minimum finished width for end laps.
- C. All seams shall be made by the use of the hot-air welding tool.
- D. All seams shall be checked with a needle probe and voids repaired with the hot-air welding tool.
- E. All end laps and non-factory edges will receive flexible seam sealer, as required.
- F. Fastener assemblies shall be placed 12" on center, not to exceed 15" on center, in the field of the roof and 6" on center for all Factory Mutual defined perimeters.
- G. The field membrane must be terminated at all walls, curbs, pipes, expansion joints, and at all roof penetrations and projections.

3.3 FLASHINGS

- A. Install all flashings in conjunction with architectural plans and the approved manufacturer's standard details. Flashing material shall be coated metal or the same membrane being used throughout.

PART 4 – MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, equipment, and materials to fabricate and install the following.
 - 1. Edge strip and flashing.
 - 2. Fascia and trim.
 - 3. Counterflashings over bituminous base flashing.
 - 4. Counterflashings for roof accessories.
 - 5. Base flashing coverings.
 - 6. Fascia and edge metal.
 - 7. Lead flashing for bituminous membranes.
 - 8. Other components.
 - 9. Counterflashings at roof mounted equipment and vent stacks

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specification Sections, Apply to this Section.

B. RELATED SECTIONS

Section 04800 - Masonry
Section 07411 – Preformed Metal Canopy System
Section 07421 – Metal Wall Panel System
Section 07540 – Thermoplastic Single Ply Roofing
Section 08510 – Steel Windows

1.3 REFERENCES

ASTM A-446	Specification for steel sheet
ASTM B-209	Specification for aluminum sheet
ASTM B-221	Specification for aluminum extruded shape
FS QQ-L-201	Specification for Lead Sheet
ASTM A792	Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
ASTM B32	Solder Metal
ASTM B209	Aluminum and Alloy Sheet and Plate
ASTM B486	Paste Solder
ASTM D226	Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D486	Asphalt Roof Cement, Asbestos-free

FS O-F-506	Flux, Soldering, Paste and Liquid
FM	Loss Prevention Data Sheet
NRCA	National Roofing Contractors Association - Roofing Manual
SMACNA	Architectural Sheet Metal Manual

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 - Submittals.
- B. Product Data: Provide manufacturer's specification data sheets for each product in accordance with Section 01300.
- C. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.
- D. Submit two samples, 12 x 12 inch in size illustrating typical external corner, internal corner, valley, junction to vertical dissimilar surface, material and finish.
- E. Shop Drawings
 - 1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
 - 2. Shop drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.
 - 3. Indicate type, gauge and finish of metal.
- F. Certification
 - 1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.
 - 2. Submit roof manufacturer's certification that material furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
 - 3. Submit certification that metal and fastening system furnished is Tested and Approved by Factory Mutual for 1-90 Wind Up-Lift Requirements.
- G. Manufacturer's Product Data
 - 1. Metal material characteristics and installation recommendations.
 - 2. Submit color chart prior to material ordering and/or fabrication so that color selections can be made by the Engineer.

1.5 QUALITY CONTROL

- A. Reference Standards

1. Comply with details and recommendations of SMACNA Manual for workmanship, methods of joining, anchorage, provisions for expansion, etc.
2. Factory Mutual Loss Prevention Data Sheet 1-49 windstorm resistance 1-90.

B. Contractor's Warranty

1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.6 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal flashing work with 5 years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.
- B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

PART 2 - PRODUCTS

2.1 APPROVED EQUIVALENT

- A. Contractor must submit any product not specified a minimum ten days before the bid date to Architect in order for product to be considered for approval. The Architect will notify Contractor, in writing, of decision to accept or reject request.

2.2 MATERIALS

- A. Miscellaneous Metals and Flashings:
1. All installed metal to be fabricated in the same material, gauge, finish and color as adjacent preformed (corrugated) metal canopy panels and/or metal wall panels: zinc coated (galvanized) steel conforming to ASTM A 653 SQ Grade 37 with G90 coating. Material shall be minimum 18 gauge with smooth surface texture.

2.3 RELATED MATERIALS

- A. Metal Primer: Zinc chromate type.
- B. Plastic Cement: ASTM D 4586.

- C. Sealant: Specified in Section 07900 or on drawings.
- D. Lead: Meets Federal Specification QQ-L-201, Grade B, four pounds per square foot.
- E. Solder: ANSI/ASTM B32; 95/05 type.
- F. Flux: FS O-F-506.
- G. Underlayment: ASTM D2178, No15 asphalt saturated roofing felt.
- H. Slip Sheet: Rosin sized building paper.
- I. Fasteners:
 - 1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
 - 2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.
- J. Termination Bars:
 - 1. Shall be aluminum unless otherwise recommended by membrane manufacturers.
 - 2. Material shall be .125" x 1" (minimum) aluminum conforming to ASTM B-221, mill finish. Bar shall have caulk cup as required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.

3.2 GENERAL

- A. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction.
- B. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual I-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.
- C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.
- D. Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures.

3.3 INSPECTION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.
- B. Verify membrane termination and base flashings are in place, sealed, and secure.
- C. Beginning of installation means acceptance of existing conditions.
- D. Field measure site conditions prior to fabricating work.

3.4 SHOP FABRICATED SHEET METAL

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with respective roof, roof panel, and wall panel manufacturer recommendations.
- B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- C. Hem exposed edges.
- D. Angle bottom edges of exposed vertical surfaces to form drip.
- E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.
- F. Joints for fascia system, cap flashing, and surface-mount counterflashing shall be formed with a 1/4" opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.
- G. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.

3.5 FLASHING MEMBRANE INSTALLATION

A. METAL EDGE DETAIL

- 1. See details for scuppers. For manufactured edge metal, scuppers shall be factory fabricated.
- 2. Accessories: Joint covers, corners, supports, self-adhering strip flashing at joining, fastenings and other accessories shall be included.
- 3. Install continuous cleat fastened at 6" O.C.
- 4. Install new metal edge hooked to continuous cleat.
- 5. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.

B. COPING CAP/ SURFACE MOUNTED COUNTERFLASHING

1. Copings shall be provided with factory fabricated welded watertight coping accessories such as miters, transitions, end caps, etc. and finished to match coping system.
2. Accessories: Joint covers, corners, supports, strip flashing at joinings, fastening, and other accessories shall be included.
3. Install continuous cleat fastened at 6" O.C.
4. Install new coping cap hooked to continuous cleat.

C. HATCH

1. Counterflashing shall be provided with watertight accessories such as miters, transitions, end caps, etc. and finished to match.
2. Accessories: Joint covers, corners, fasteners, strip flashing at joinings, fastening, and other accessories shall be included.
3. Install pre-manufactured expansion joint cover. Fasten sides 8" O.C. with fasteners and neoprene washers.
4. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

PART 4 – MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07840

FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A.** Work Included: This Section specifies the following.
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
 - 2. Fire-resistive joint systems for floor, wall, and head-of-wall joints.

- B.** Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 07920 - JOINT SEALANTS: Standard joint sealers.
 - 2. Division 16 – ELECTRICAL: Cable and conduit penetrations.

1.2 PERFORMANCE REQUIREMENTS

- A.** General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

- B.** F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated, as determined per ASTM E 814.

- C.** For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1.3 SUBMITTALS

- A.** Product Data: For each type of product indicated.

- B.** Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated. Submit documentation, including

illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

- D. Qualification Data: For Installer and Inspection and Testing Agency.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Either a firm that has been approved by FM Global according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestop tests are performed by a qualified testing and inspecting agency.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in Part 1 "Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory".

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and

inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been inspected by the building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, the following:
 1. Hilti, Inc.
 2. BioFireShield; RectorSeal Corporation.
 3. 3M; Fire Protection Products Division.
 4. Or approved equal.

2.2 FIRESTOPPING MATERIALS

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

- B.** Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the Through-Penetration Firestop System Schedule at the end of Part 3. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill", "void" or "cavity" materials.
- C.** Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with requirements in this Section. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated

2.3 MIXING

- A.** For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A.** Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A.** Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B.** Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C.** Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would

otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A.** General: Install through-penetration firestop systems to comply with requirements in this Section and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B.** Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C.** Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A.** Inspecting Agency: Engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B.** Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C.** Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

- A.** Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B.** Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

CONCRETE FLOORS		UL-CLASSIFIED SYSTEMS			CONCRETE OR BLOCK WALLS		UL-CLASSIFIED SYSTEMS		
TYPE OF PENETRANT	F-RATING HR	HILTI	3M	BIO-FIRE	TYPE OF PENETRANT	F-RATING	HILTI	3M	BIO-FIRE
CIRCULAR BLANK OPENINGS	1	FA 0006, CAJ 0070	CAJ 0009	CAJ 0056	CIRCULAR BLANK OPENINGS	1	CAJ 0055, CAJ 0070	CAJ 0009	CAJ 0056
	2	FA 0006, CAJ 0070	CAJ 0009	CAJ 0056		2	CAJ 0055, CAJ 0070	CAJ 0009	CAJ 0056
	3	CAJ 0055	CAJ 0009	CAJ 0056		3	CAJ 0055	CAJ 0009	CAJ 0056
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278, FA 1017	CAJ 1058	CAJ 1264	SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278,	CAJ 1058	CAJ 1264
	2	CAJ 1226, CAJ 1278, FA 1017	CAJ 1058	CAJ 1264		2	CAJ 1226, CAJ 1278,	CAJ 1058	CAJ 1264
	3	CAJ 1226, CAJ 1278, FA 1017	CAJ 1058	CAJ 1264		3	CAJ 1226, CAJ 1278,	CAJ 1058	CAJ 1264
	4	CAJ 8095, CBJ 1034	CAJ 1044	N/A		4	CAJ 8095, CBJ 1034, WJ 1042	CAJ 1044	WJ 1064
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, CAJ 2168, FA 2054, FA 2067	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131	SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, WJ 2108, WJ 2121	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131
	2	CAJ 2109, CAJ 2168, FA 2054, FA 2067	CAJ 2189, CAJ 2117	CAJ 2131		2	CAJ 2109, WJ 2108, WJ 2121	CAJ 2189, CAJ 2117, CAJ 2027	CAJ2131
	3	CAJ 2109, CAJ 2168, FA 2054,	CAJ 2005, CAJ 2117	CAJ 2152		3	CAJ 2109, CAJ 2168, WJ 2091	CAJ 2005, CAJ 2117, CAJ 2027	CAJ2152
	4	N/A*	N/A*	N/A		4	WJ 2091	N/A*	N/A

SINGLE OR BUNDLED CABLES	1	FA 3007, CAJ 3095,	CAJ 3021	CAJ 3103	SINGLE OR BUNDLED CABLES	1	CAJ 3095, WJ 3060 WJ 3074	CAJ 3021	WJ 3071
	2	FA 3007, CAJ 3095,	CAJ 3021	CAJ 3103		2	CAJ 3095, WJ 3060 WJ 3074	CAJ 3021	WJ 3071
	3	FA 3007, CAJ 3095,	CAJ 3030	CAJ 3103		3	CAJ 3095, WJ 3050	CAJ 3030	CAJ 3103
	4	N/A*	N/A*	N/A		4	WJ 3050	N/A*	N/A
CABLE TRAY	1	CAJ 4034, CAJ 4054, CAJ 4017	CAJ 4003	CAJ 4048	CABLE TRAY	1	CAJ 4034, CAJ 4054, WJ 4016,	CAJ 4003	CAJ 4048
	2	CAJ 4034, CAJ 4054, CAJ 4017	CAJ 4003	CAJ 4048		2	CAJ 4034, CAJ 4054, WJ 4016,	CAJ 4003	CAJ 4048
	3	CAJ 4034, CAJ 4017	CAJ 4003	CAJ 4048		3	CAJ 4034, WJ 8007	CAJ 4003	CAJ 4048
	4	N/A*	N/A*	N/A		4	WJ 8007	N/A*	N/A
SINGLE INSULATED PIPES	1	FA 5016, FA 5017 CAJ 5090, CAJ 5091,	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082	SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, WJ 5042	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	2	FA 5016, FA 5017 CAJ 5090, CAJ 5091,	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082		2	CAJ 5090, CAJ 5091, WJ 5042	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	3	FA5016, CAJ 5061, CAJ 5090,	CAJ 5024, CAJ 5017	CAJ 5006		3	CAJ 5090, CAJ 5091,	CAJ 5024, CAJ 5017	CAJ 5006
	4	CBJ 5006	N/A*	N/A		4	WJ 5028, CBJ 5006	N/A*	N/A
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026	ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026
	2	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026		2	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026
	3	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	N/A		3	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	N/A

NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	CAJ 7036	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, WJ 7029, WJ 7022	CAJ 7003, CAJ 7021	CAJ 7036
	2	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	N/A		2	CAJ 7046, WJ 7029, WJ 7022	CAJ 7003, CAJ 7021	CAJ 7036
	3	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	N/A		3	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	N/A
MIXED PENETRANTS	1	CAJ 8056, CAJ 8095, CAJ 8099	CAJ 8001, CAJ 8013	CAJ 8051	MIXED PENETRANTS	1	CAJ 8096, CAJ 8099 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8051
	2	CAJ 8056, CAJ 8095, CAJ 8099	CAJ 8001, CAJ 8013	CAJ 8051		2	CAJ 8096, CAJ 8099 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8051
	3	CAJ 8056, CAJ 8095, CAJ 8099	CAJ 8001, CAJ 8013	CAJ 8051		3	CAJ 8099 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8051
	4	CAJ 8095	N/A*	N/A		4	WJ 8007	N/A*	N/A

WOOD FLOORS		UL-CLASSIFIED SYSTEMS			GYPSUM WALLBOARD ASSEMBLIES		UL-CLASSIFIED SYSTEMS		
TYPE OF PENETRANT	F-RATING	HILTI	3M	BIO-FIRE	TYPE OF PENETRANT	F-RATING	HILTI	3M	BIO-FIRE
METAL PIPES OR CONDUIT	1	FC 1009, FC 1059	FC 1002	FC 1031	METAL PIPES OR CONDUIT	1	WL 1054, WL 1164	WL 1146	WL 1115
	2	FC 1009, FC 1059	FC 1002	FC 1031		2	WL 1054, WL 1164	WL 1010, WL 1146	WL 1115
4	FC 1009, FC 1059	FC 1002	FC 1031	4		WL 1110	WL 1001		
NON-METALLIC PIPE OR CONDUIT	1	FC 2025, FC 2126	FC 2024	FC 2059	NON-METALLIC PIPE OR CONDUIT	1	WL 2078, WL 2075, WL 2128	WL 2088, WL 2002	WL 2133
	2	FC 2025, FC 2126	FC 2024	FC 2059		2	WL 2078, WL 2075, WL 2128	WL 2088, WL 2002	WL 2133
	4	FC 2025, FC 2126	FC 2024	FC 2059		4	WL 2184, WL 2245	N/A*	
SINGLE OR BUNDLED CABLES	1	FC 3012, FC 3044	FC 3017	FC 3050	SINGLE OR BUNDLED CABLES	1	WL 3065	WL 3032, WL	WL 3153

								3030	
						2	WL 3065	WL 3032, WL 3030	WL 3153
						4	WL 3139	N/A*	
	2	FC 3012	FC 3017	N/A					
					CABLE TRAY	1	WL 4011, WL 4019	WL 4004	WL 4032
						2	WL 4011, WL 4019	WL 4004	WL 4032
						4	WL 8014	N/A*	
INSULATED PIPES	1	FC 5004, FC 5036, FC 5037	FC 5014	FC 5025	INSULATED PIPES	1	WL 5029, WL 5096	WL 5040, WL 5001, WL 5032	WL 5062
						2	WL 5029, WL 5096	WL 5040, WL 5001, WL 5032	WL 5062
	2	FC 5004	N/A*	FC 5025		4	WL 5073	N/A*	
						4	WL 5073		

NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	FC 7013	FC 7001		NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	WL 7040, WL 7042	WL 7008	WL 7037
						2	WL 7040, WL 7042	WL 7008, WL 7013, WL 7016	WL 7037
						4			
MIXED PENETRANTS	1	FC 8014, FC 8026	FC 8013	N/A	MIXED PENETRANTS	1	WL 8004, WL 8013	WL 8010	WL 8017
						2	WL 8004, WL 8013	WL 8010, WL 8002	WL 8017
	2	N/A*	N/A*	N/A		4	WL 8014	N/A*	
						4	WL 8014		

* No UL-Classified system is available as of August 2003. Engineer Judgement Drawing Required

NOTES:

1. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected.

2. If jobsite conditions do not match any UL-classified systems in the schedules above, contact firestop manufacturer for alternative systems or Engineer Judgement Drawings.
3. Coordinate work with other trades to assure that penetration opening sizes are appropriate for penetrant locations, and vice versa.
4. For 3-hour rated gypsum walls, contact the firestop manufacturer for a UL-classified system or engineer judgement drawing.
5. The Contractor shall verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07911

COMPRESSION SEALS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishings and installing preformed compression seals for concrete placements.
- B. Expansion Joint material at the pedestrian bridge shall be included under this item.

1.2 SUBMITTALS

- A. Manufacturer's Literature. Submit literature describing products, including the following:
 - 1. Requirements for joint and surface preparation, temperature and humidity, and other items required for successful completion of the work.
 - 2. Installation instructions including allowable temperature ranges at time of joint construction.
 - 3. Catalog cuts

1.3 PROJECT CONDITIONS

- A. Environmental Requirements. Install expansion joint systems within the temperature ranges in the environmental conditions call for the manufacturer's specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The joints are detailed on the contract plans and as specified below.
 - 1. The joint material shall be an impermeable closed cell, cross linked, ethylene vinyl acetate, low density polyethylene copolymer, nitrogen blown resilient, nonextrudable foam which is ultraviolet light, weather and wear resistant, and which is beige in color.
 - 2. Conform to the following properties:
 - a. Tensile Elongation (ASTM D3575; Suffix: T) 255%±20%
 - b. Tensile Strength (ASTM D3575; Suffix: T) 115 psi
 - c. Tear Resistance (ASTM D624) 21.5 lbsf/in
 - d. Density (ASTM D3575; Suffix W, Method A) 2.7 - 3.2 lbs/cf
 - e. Water Absorption (ASTM D3575; Suffix: L) 0.02 lbs/sf
 - f. Thermal Stability (ASTM D3575; Suffix S) -5.9% max
 - 3. Be bonded in place by a two component, 100% solids, modified epoxy adhesive. Installation of the joint system shall be in strict accordance with the manufacturer's published directions.
 - a. The two component, 100% solids, modified epoxy adhesive shall meet the following minimum requirements:
 - 1. Tensile Strength (ASTM D638) 3500 psi (min.)
 - 2. Compressive Strength (ASTM D695) 7000 psi (min.)

- 3. Shore D Hardness 75 (min.)
 - 4. Elongation at Break (ASTM D638; modified) 3 - 5%
 - 5. Water Absorption (by wgt.) 0.25%
- b. Damaged open containers shall not be used.
 - c. Soiled or damaged joint material shall not be used without written consent and instructions from the Engineer.
 - d. All work shall be warranted against defects in materials and workmanship for a period of five (5) years from the date of installation. Please contact manufacturer for warranty criteria.
 - e. Brush blast all concrete surfaces in direct contact with joint seal. Blow dirt or debris from the joint openings and joint surfaces with oil free compressed air.
 - f. The Manufacturer's published installation procedures shall be followed at all times.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean out joints to receive compression seals in a manner that leaves joint walls clean and joints free of debris and moisture.
- B. Patch interfaces, edges, and corners of joints as required to provide smooth, straight, and parallel sides to proper width and depth as required for proper installation of compression seals.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 07920
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following:
 - 1. Joint sealants and fillers for interior and exterior applications.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 03410 - PLANT-PRECAST STRUCTURAL CONCRETE
 - 2. Section 04800 - MASONRY: Masonry control and expansion joint fillers and gaskets.
 - 3. Section 08111 – STEEL DOORS AND FRAMES
 - 4. Section 08510 – STEEL WINDOWS
 - 5. Section 08801 - GLASS AND GLAZING: Glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Qualification Data: For Installer.
- D. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in Part 1 "Quality Assurance" Article.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Field Test Report Log: For each elastomeric sealant application.
- G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 4. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Engineer.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of nonelastomeric sealant and joint substrate indicated.
 3. Notify Engineer seven days in advance of dates and times when test joints will be erected.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

4. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than or greater than those allowed by joint-sealant manufacturer for applications indicated.
 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
 5. When substrates have not cured sufficiently.

1.6 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.

2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations.

2.2 JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Single-Component Neutral-Curing Silicone Sealant:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. Tremco; Spectrem 1.
 - d. Pecora Corporation; 864.

2. Extent of Use: Joints in exterior vertical and soffit surfaces including sheet metal roofing, sheet metal siding, metal flashing, perimeter of door and window frames.

E. Multicomponent Pourable Urethane Sealant:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik Findley; Chem-Calk 550.
 - b. Meadows, W. R., Inc.; POURTHANE.
 - c. Pecora Corporation; Urexpan NR-200.
 - d. Tremco; THC-901.
2. Extent of Use: Joints in exterior horizontal surfaces including joints between precast concrete segments and other adjacent materials.

2.3 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin). O (open-cell material). B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry and unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel and glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove excess material.
 - 4. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
 - 4. Install in uniform continuous ribbons without gaps or air pockets.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 REPAIR AND CLEANING

- A. Remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

- B. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 08111

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Standard hollow-metal steel doors.
 - 2. Standard hollow-metal steel frames.
- B. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections
 - 1. Section 04800 - MASONRY:
 - a. Hollow metal frames in masonry openings.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 04800 – MASONRY; building anchors into and grouting steel frames in masonry construction.
 - 2. Section 07920 – JOINT SEALANTS; caulking perimeter of door frames.
 - 3. Section 08711 – DOOR HARDWARE; door hardware for steel doors.
 - 4. Section 09900 – PAINTING; field painting steel doors and frames.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.
- B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details.
 - 3. Frame details for each frame type, including dimensioned profiles.
 - 4. Details and locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, accessories, joints, and connections.
- C. Qualification Data: For Installer.
- D. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- C. Fire-Rated Door, Sidelight and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not use nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.6 COORDINATION

- A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Ceco Door Products; an ASSA ABLOY Group Company.
 - 3. CURRIES Company; an ASSA ABLOY Group Company.
 - 4. Mesker Door Inc.
 - 5. Pioneer Industries, Inc.
 - 6. Republic Builders Products Company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.
- D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.
- G. Grout: Comply with ASTM C 476, 3,000 psi with a slump of 4 inches for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.
- H. Glazing: Comply with requirements in Section 08801 – GLASS AND GLAZING.
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.
 4. Tolerances: Comply with Steel Door Institute, SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.
- C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:
1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 3. Lock Face, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
 2. Frames for Level 3 Steel Doors: 0.067-inch-thick steel sheet.

- C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
 - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
 - 2. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.
- D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
 - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- F. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- G. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
- H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- I. Astragals shall be provided as part of a fire-rated labeled assembly and door silencers as part of the frame.

2.5 FABRICATION

- A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

- B. Standard Steel Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
 4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 5. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
 6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 7. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches in height.
 - 2) Three anchors per jamb from 60 to 90 inches in height.
 - 3) Four anchors per jamb from 90 to 120 inches in height.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.
 8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08711 - DOOR HARDWARE.
1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
 2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.6 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish standard steel door and frames after assembly.
- B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.
 - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Standard Steel Frames: Install standard steel frames for doors, sidelights, transoms, borrowed lights and other openings, of size and profile indicated. Comply with SDI 105.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Apply bituminous coating to backs of frames that are filled with mortar, and grout.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Section 04800 - MASONRY,
 4. Concrete Walls: Solidly fill space between frames and concrete with grout. Install grout in lifts and take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
 6. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

- a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
- 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable to the Engineer.
- B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 08510
STEEL WINDOWS
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Fixed steel windows with factory applied finish.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 05100 – STRUCTURAL STEEL; structural steel frame.
 - 2. Section 05500 – MISCELLANEOUS METALS; miscellaneous supports and protective screening.
 - 3. Section 07421 – METAL WALL PANEL SYSTEM
 - 4. Section 07920 – JOINT SEALANTS; perimeter sealant and caulking.
 - 5. Section 08801 – GLASS AND GLAZING; glazed lites.
 - 6. Section 09900 – PAINTING; factory applied paint finish and field touch up.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, samples, test reports, manufacturer's warranty, and manufacturer's certificate of compliance.
- B. Shop Drawings: In addition to requirements below, provide a schedule of window frames using same reference numbers for details and openings as those on Drawings:
 - 1. Elevations of each window opening unit.
 - 2. Details of windows, including vertical and horizontal edge details.
 - 3. Frame details for each frame type, including dimensioned profiles.
 - 4. Details and locations of reinforcement.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, accessories, joints, and connections.
 - 7. Details of glazing frames and stops showing glazing.
- C. Qualification Data: For Installer.
- D. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

- E. Samples:
 - 1. Typical window – 6” long section with glazing beads.
 - 2. Sample of muntin, showing welded intersections and glazing beads.
 - 3. Color sample of finish.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain standard steel window frames through one source from a single manufacturer.
- C. Installation of windows shall be done by experienced window installers approved by the manufacturer.
- D. Allowable tolerances: Size dimensions + 1/16 inch.
- E. Source quality control:
 - 1. Air infiltration test
 - a. Products must be independently lab tested and meet or exceed ASTM E283.
 - b. Maximum air infiltration 0.30 CFM/ SQFT with differential pressure across window unit of 1.57 / 6.24 PSF
 - 2. Water penetration test
 - a. Products must be independently lab tested and meet or exceed ASTM E331.
 - b. No water penetration for 15 minutes when window is subjected to a rate of flow of 5 gal./hr/sq.ft with differential pressure across window unit of 4.50 PSF
 - c. When weeps are required on fixed windows, ASTM E547 cyclic testing standard with differential pressure across window unit of 4.50 PSF shall be standard.
 - 3. Field Testing
 - a. Field testing criteria (when applicable) shall be in accordance with AAMA 502-08.
 - 4. Structural test
 - a. Meets or exceeds ASTM E330
 - 5. Forced entry test
 - a. Meets or exceeds ASTM F588
 - b. Grade 40 @ 300 pounds
 - 6. Quality of factory applied paint finish system shall meet or exceed the following ASTM designations: ASTM D714- Paint Blistering Test, ASTM D4585 – Humidity Test, ASTM B117 – Salt Spray (Fog) Test, ASTM D1654 – Painted Products in Corrosive Environments, ASTM G85 – Cyclic Fog/Dry Test (Prohesion), ASTM D5894 – Salt Fog/UV Painted Metal, ASTM D4541 – Pull off Strength of Coating Test.
 - 7. Upon request, the window manufacturer shall provide a test report from a qualified independent U.S. testing laboratory regularly engaged in testing windows to verify that his products conform to these test requirements.

8. Pre-installation Conference: Prior to start of installation attend and conduct a Project site visit to ensure to compliance with requirements in Division 1.
9. Provide 10 year warranty against defect in material and manufacture.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver window frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic. Provide additional protection to prevent damage to finish.
- B. Store window frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on window frames become wet, remove cartons immediately. Provide minimum 1/4-inch space between each frame to permit air circulation.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

1.6 COORDINATION

- A. Coordinate installation of anchorages for standard steel window frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Hope's Windows, Inc. – Jamestown 175 Series Fixed Steel Windows – true divided lite muntins, or equivalent architect approved product by:
 2. Blis Nor-Am
 3. A & S Window Associates
 4. Optimum Window Manufacturing
 5. Torrance Steel Window Co.

2.2 MATERIALS

- A. Windows shall be manufactured from solid hot rolled steel shapes.
 - 1. Sections made from steel with flanges rolled integrally at the mill.
 - 2. Perimeter frames and ventilator sections shall have glazing rebates providing an unobstructed glazing surface of at least 3/4".
 - 3. Glazing rebate surfaces must be perpendicular to the web or stem of the section. Applied glazing rebate extensions and rebate surfaces that are tapered will not be acceptable.
 - 4. Combined weight of frame and ventilator sections shall be a minimum of 4.20 pounds per lineal foot. Frame section alone shall not weigh less than 1.80 pounds per lineal foot. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Muntins:
 - 1. True Divided Lite muntins:
 - a. Muntins shall be manufactured from steel, size to be determined by design.
 - b. Glazing rebate surfaces must be perpendicular to the stem of this section. Rebate surfaces that are tapered will not be acceptable.
 - c. 1-3/4" tee shall weigh 1.62 pounds per lineal foot

- C. Glazing beads shall be extruded aluminum Alloy 6063-T5 with a minimum thickness of .062 inches.

- D. All screws for hardware, trim, covers, anchoring, weather bars, water dams, screens, etc. shall be stainless steel.

- E. Paint (per Section 09900 – PAINTING)
 - 1. Pre-treatment.
 - 2. Primer - E-Coat (Electrodeposited epoxy primer).
 - 3. Intermediate powder primer.
 - 4. Finish coat – Factory applied acrylic polyurethane.

2.3 FABRICATION

- A. Fabricate steel windows in accordance with approved shop drawings.

- B. Prior to fabrication, all hot rolled steel sections shall be cleaned by shot blasting.

- C. Corners of frame and ventilator shall be mitered or coped then solidly welded. Exposed and contact surfaces shall be finished smooth flush with the adjacent surfaces. All interior and exterior rail bar and muntin joints shall be face welded and ground smooth.

- D. Muntins:

1. True Divided Lite muntins shall be coped and welded to the perimeter frame. Muntin intersections shall be slotted, cross notched and welded. All interior and exterior muntin joints shall be face welded and ground smooth.

E. Glazing

1. All windows shall be designed for inside glazing.
2. Provide replaceable continuous snap-in glazing beads to suit the glass as specified.
3. Glazing beads shall be cut and shop fitted to each glass lite prior to shipment.

2.4 STEEL FINISHES

A. Provide documentation of compliance with the following criteria for factory applied paint finish:

1. ASTM D714-02 Paint Blistering Test
2. ASTM D4585 Humidity Test
3. ASTM B117-03 Salt Spray (Fog) Test
4. ASTM D1654-05 Painted Products in Corrosive Environment
5. ASTM G85 Cyclic Fog/ Dry Test (Prohesion)
6. ASTM D5894-96 Salt Fog/ UV Painted Metal
7. ASTM D4541 Pull Off Strength of Coating Test

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Window openings shall conform to details, dimensions and tolerances shown on the window manufacturers approved shop drawings.
- B. Conditions which may adversely affect the window installation must be corrected before installation commences.

3.2 INSTALLATION

- A. Windows specified under this section shall be installed by experienced personnel.
- B. Install windows in openings in strict accordance with approved shop drawings.
 1. Set units plumb, level and true to line, without warp or rack of frames.
 2. Anchor units securely to surrounding construction with approved fasteners.
 3. The exterior joints between the windows, trim and mullions shall be properly sealed watertight with an approved sealant and neatly pointed.

- C. Attach ventilator hardware, as required, and adjust ventilators to operate smoothly free from twist and to be weather tight when closed.
- D. Attach loose muntin grids per approved shop drawings, if applicable.
- E. Glazing: Comply with installation requirements in Section 08801 – GLASS AND GLAZING and with window frame manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

- A. Repair any abraded areas of the factory finish.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 08711
DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Commercial door hardware.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 08111 – STEEL DOORS AND FRAMES; astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.

1.2 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared by or under the supervision of supplier, detailing the Engineer's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- E. Qualification Data: For firms and persons specified in Part 1 "Quality Assurance" Article.
 1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
- F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- G. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor and Engineer about door hardware and keying.
 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- E. Regulatory Requirements: Comply with provisions of the following:
 1. Where indicated to comply with accessibility requirements, comply with Massachusetts Architectural Access Board and the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:

- a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
 - 3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
2. NFPA 101: Comply with the following for means of egress doors:
- a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.
 - c. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
 - d. Thresholds: Not more than 1/2 inch high.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- 1. Test Pressure: Test at atmospheric pressure.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
- 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2. Preliminary key system schematic diagram.
 - 3. Requirements for key control system.
 - 4. Address for delivery of keys.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver keys to manufacturer of key control system.

1.5 COORDINATION

- A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Section 03300 - CAST-IN-PLACE CONCRETE.
- B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.6 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Authority of other rights the Authority may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
- D. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the Authority’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Scheduled and acceptable manufacturers must provide all the functions and features of the specified product or it will not be approved.

Item	Scheduled Manufacturer	Acceptable Manufacturers
Hinges	Ives (IVE)	McKinney, Hager

Locksets & Deadlocks	Schlage (SCH)	Sargent, Best
Cylinders & Keying	Schlage (SCH)	Campus Standard
Flush Bolts & Coordinators	Ives (IVE)	Rockwood, Burns
Stops & Holders	Ives (IVE)	Rockwood, Burns
Overhead Stops	Glynn-Johnson (GLY)	Sargent, Rixson
Silencers	Ives (IVE)	Rockwood, Burns
Thresholds & Weather-strip	National Guard (NGP)	Pemko, Reese

- B. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- C. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Engineer's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish non-corrosive screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.
4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges

1. The following is a guide for hinge type required for this specification:
 - a. 1 3/4" thick doors – all widths:
All Hinges: heavy weight, ball bearing, stainless steel, 5" high
2. Provide 3 hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. All Hinges: Stainless steel pins
 - b. All Hinges: Non-removable pins
4. The width of hinges shall be 4 1/2" or as required for clearance.

C. Flush Bolts

1. Automatic and manual flush bolts shall have forged bronze faceplates with extruded brass levers and with wrought brass guides and strikes. Doors up to 7'-6" in height shall have 12" steel or brass rods. Manual flush bolts for doors over 7'-6" in height shall be increased by 6" for each additional 6" of door height. Provide dust-proof strikes where scheduled.

D. Coordinators

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head.
2. Finish of the coordinator to be prime coat to receive the same finish paint as the door frame.
3. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

E. Mortise Locks

1. Mortise locks shall be certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and shall be manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case.
2. Locks are to have a standard 2 3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
3. Lever trim shall be stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning. Lever design shall be Schlage 17A or similar.
4. Locks meeting this specification: Schlage L9000 series, Sargent 8200 series, Best 35H series.

F. Door Stops and Holders

1. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements:
 - a. Wall stops shall be used wherever possible.
 - b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
 - c. At any opening where a wall or floor stop cannot be used, a heavy duty overhead stop must be used.

G. Thresholds and Weatherstrip: Furnish as scheduled and per architectural details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available.

H. Silencers: "Push-in" type silencers for each hollow metal or wood frame, 3 for each single frame, 2 for each pair frame. Omit where gasketing is scheduled.

2.3 FINISHES

- A. With the exception of all items listed below, the finish of all hardware shall be US26D - satin chrome or US32D - satin stainless steel.
- B. Exceptions are as follows:
 - 1. Coordinators - prime painted.
 - 2. Thresholds - mill finish aluminum.
 - 3. Weatherstrip & Sweeps - clear anodized aluminum.
 - 4. Silencers - grey.

2.4 KEYING

- A. All locks and cylinders shall be construction master keyed and master keyed per the Authority's instructions, to existing key system.
- B. All locks and cylinders, except cylinders for keypad locks will be interchangeable core type.
- C. Provide 3 keys per lock, 6 construction master keys, and a total of 6 master keys for each group.
- D. All master keys shall be delivered directly to the Authority by the hardware supplier, who shall obtain a receipt for delivery of same.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07920 - JOINT SEALANTS.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
- B. Six-Month Adjustment: Six months after date of Substantial Completion, Installer shall perform the following:
 - 1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 - 2. Consult with and instruct the Authority's personnel on recommended maintenance procedures.
 - 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.

- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 08801

GLASS AND GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Glass and glazing for the following products and applications:
 - a. Tempered safety laminated glass panels at station signage.
 - b. Tempered safety laminated glass panels at the pedestrain overpass steel frame windows.
 - c. Tempered safety laminated glass panels at the headhouse and elevator shafts steel frame windows.
 - d. Tempered safety laminated glass panels for lites for elevator cab walls and doors.
- B. Related Work:
 - 1. Section 08510 – STEEL WINDOWS
 - 2. Section 14241 – ELECTRIC TRACTION ELEVATORS

1.2 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Deterioration of Coated Glass: Defects developed from normal uses that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide tempered laminated safety glass lites in the thickness designations indicated for various size panels, but not less than thicknesses and in strengths (heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: As required by Code.
 - b. Specified Design Snow Loads for Sloped Glazing: As required by Code.

- c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds minimum.
 - d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
 - 1) Load Duration: 30 days minimum.
 - e. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For laminated-glass lites.
 - f. Minimum Glass Thickness for Exterior Lites:
 - 1) Not less than 6 mm for tempered safety laminated glass panels at station signage.
 - 2) Not less than 10 mm for tempered safety laminated glass panels at the pedestrain overpass and access ramps.
 - 3) Not less than 14 mm for tempered safety laminated glass for elevator cabs, elevator doors, and elevator shaft windows.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
- 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
 - 1. Each color of tinted float glass.
 - 2. Each type of laminated glass with colored or translucent interlayer.
 - 3. For each color (except black) of exposed glazing sealant indicated.
- C. Glazing Schedule: Use same designations indicated on Drawings in preparing a schedule listing glass types and thicknesses for each size and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For installers, in accordance with Par. 1.5A.

- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: For each of the following types of glazing products:
 - 1. Tempered safety laminated glass.
 - 2. Glazing sealants.
 - 3. Glazing gaskets.
- H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer with a minimum of three years experience who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, laminated glass and insulating glass.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in Part 1 "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- E. Hold Point - Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- F. Safety Glazing Products: Comply with testing requirements in 16 CFR 120 and, for wired glass, ANSI Z97.1.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001 "Sloped Glazing Guidelines."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Glass Products: Manufacturer's standard form, made out to the Authority and signed by glass manufacturer agreeing to replace glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to the Authority and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in Part 1 "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Engineer from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. Tremco; Spectrem 1 (Basic).

2.2 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.

2.3 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.4 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze panels indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 09360

MODULAR TACTILE SURFACES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies modular tactile surface tiles at station platforms and accessible ramps.
 - 1. This Section includes Specifications for furnishing and installing composite wet set replaceable tactile warning surface (TWS) Units, in an in-line truncated dome pattern, embedded in all precast concrete platform panels, curb ramps and walking surfaces at the locations and to the dimensions shown on the Drawings, in accordance with the Contract Documents and as directed by the Engineer.
 - 2. It is the responsibility of the Contractor to provide coordination between modular tactile surface manufacturer and precast platform panel precaster to ensure compatibility of the two systems.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 03300 - CAST-IN-PLACE CONCRETE
 - 2. Section 03410 – PLANT-PRECAST STRUCTURAL CONCRETE
 - 3. Section 07920 - JOINT SELANTS

1.2 SUBMITTALS

- A. Shop Drawings: Include complete layout and fabrication details, composite structure, dimensions of tiled areas, and affected adjacent areas. Provide large scale plan details of the tiles at the curves, including fastener locations. Shop Drawings shall also show all pertinent characteristics of the composite wet set replaceable tactile warning surface unit, including profile, sound on cane contact amplification feature and installation methods.
- B. Product Data: Manufacturer's catalog cuts, material specifications, installation and maintenance instructions, and other data pertinent to the work of this Section.
- C. Samples: One full-size sample of the type, size, pattern, and color of tile required, and five twelve inch by twelve inch samples for MBTA records. Samples shall be properly labeled and shall contain the following information: Name of Project, Submitted by, Date of Submittal, Manufacturer's Name, and Catalog No.
- D. Material Certification: Manufacturer's certification that all products meet specified requirements, as verified by a certified independent testing agency. Submit certified test reports for all tests shown in Article 2.02 B, indicating for each test whether or not the tile passes or fails the passing criteria. Test report shall be current and shall not predate the notice to proceed date of this contract by more than two years. All test reports submitted shall be representative of the tactile warning surface product delivered to the Project, and shall be no more than three (3) years old from the time of the submittal.
- E. Installer Certification: Manufacturer's approval of installer if other than manufacturer, and detailed work history with the product proposed for installation.

- F. Extra Materials: After completion of the work, furnish a minimum of ten percent of the total amount of tile furnished, from the same manufactured lot as materials furnished for work of this Section, in sealed, protective packaging marked with Contract number, lot number and identification contents. Store in a location designated by the Engineer.

1.3 QUALITY ASSURANCE

- A. Manufacturer: A company specializing in the manufacture of modular tactile surface tiles as used in transit systems for guidance of the sight impaired. Provide composite wet set replaceable tactile Warning Surface Units as produced by a single manufacturer.
- B. Installation: Composite wet set replaceable tactile Warning Surface Units shall be installed at the precast concrete platform panel precast shop at the time of casting. Accessible ramps shall have the TWS installed in the field.
 - 1. All composite wet set replaceable tactile Warning Surface Units shall be cast integrally with precast concrete platform panel flush with the finished surface of the platform panel under the supervision of a manufacturer-approved installer with documented experience in work similar to that of this Section.
 - 2. The manufacturer-approved installation supervisor must be approved by the Engineer before installation of the tile may begin.
 - 3. All anchorages of composite wet set replaceable tactile Warning Surface Units shall be fully embedded into precast concrete, cast in place concrete or bituminous concrete as noted.
 - 4. Composite wet set replaceable tactile Warning Surface Units shall be suspended as part of the casting process to ensure that full bond of anchorages occurs. Composite wet set replaceable tactile Warning Surface Units shall not be “pressed” into wet concrete.
- C. First Time Suppliers and Installers: For first time installers and suppliers of tactile tile to the MBTA, a meeting with representatives of the Engineer, Contractor, Surface Preparation subcontractor, Manufacturer, and Installer in attendance is mandatory. The agenda shall include the review and clarification of the specification, installation procedures, quality control, inspection and acceptance criteria and installation schedules. In no case will installation be allowed to commence until this meeting is held.
- D. Hold Point - Mock-Up: After approval of materials, erect an eight foot long tile mock-up using specified materials, at a location acceptable to the Engineer.
 - 1. Assign the same construction crew to both the mock-up and the permanent work.
 - 2. If not approved, remove and replace mock-up at no additional cost to the Authority. Repeat procedure until approval is granted.
 - 3. Approved mock-up shall serve as the quality standard for appearance, tolerances, and workmanship.
 - 4. Approved mock-up may be incorporated in the permanent work, with the following certification.
 - 5. Protect and maintain approved mock-up in accepted condition throughout the construction period. When no longer required, remove and dispose of off site, if not incorporated into the permanent work.

- E. Tactile warning surface product shall meet or exceed the following test criteria using the most current test methods:
1. Water Absorption: Not to exceed 0.20%, when tested in accordance with ASTM-D570.
 2. Slip Resistance: 0.80 minimum combined wet/dry static coefficient of friction when tested in accordance with ASTM C 1028.
 3. Compressive Strength: 25,000 psi minimum, when tested in accordance with ASTM D695.
 4. Tensile Strength: 10,000 psi minimum, when tested in accordance with ASTM D638.
 5. Flexural Strength: 25,000 psi minimum, when tested in accordance with ASTM D790.
 6. Chemical Stain Resistance: No reaction to 1% hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, and antifreeze, when tested in accordance with ASTM D543 or D1308.
 7. Abrasion Resistance: 300 minimum, when tested in accordance with ASTM C501.
 8. Flame Spread: 25 maximum, when tested in accordance with ASTM E84.
 9. Accelerated Weathering of Tactile Warning Surface when tested by ASTM-G155 or ASTM G151 shall exhibit the following result: $\Delta E < 5.0$ at 2,000 hours minimum exposure.
 10. AASHTO-H20 Load Bearing Test: No Damage at 16,000 # loading.
 11. Salt and Spray Performance of Tactile Warning Surface: No deterioration or other defects after 200 hours of exposure, when tested in accordance with ASTM-B117.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Composite wet set replaceable tactile Warning Surface Units shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings.
- B. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from all damage and pilferage

1.5 WARRANTY

- A. In addition to the requirements of the General Conditions, furnish a warranty jointly executed by the tile manufacturer, the installer, and the precast concrete Precaster. The Precaster shall acknowledge, and certify that the warranty of precast concrete platform panels will not be altered on the basis of incorporation of the composite wet set replaceable tactile warning surface installation during the time of casting.
- B. Composite wet set replaceable tactile Warning Surface Units shall be guaranteed in writing for a period of five (5) years from date of Contract's final completion. The guarantee includes defective work, breakage, deformation, and loosening of tactile warning surface material. The TWS manufacturer shall also warrant and certify that the reverse profile of the TWS Unit will not change in any way for a minimum of 10 years to insure full TWS Product interchangeability

PART 2 - PRODUCTS

2.1 GENERAL

- A. The modular tactile surface shall differ from adjoining surfaces in resiliency or sound-on-cane contact as set forth in the following accessibility guidelines. These references are intended to establish quality and performance characteristics and meet the legal definition of the law.
1. 28 CFR Part 36 – Appendix A: Standards for Accessible Design ADA Accessibility Guidelines for Buildings and Facilities (latest edition).
 2. Massachusetts Architectural Access Board Rules and regulations (521 CMR) (latest edition).
 3. Accessibility Handbook for Transit Facilities – USDOT (FTA-MA-06-0200-92-1) (DOT-VNTSC-FTA-92-4) (July 1992).
 4. Commuter Rail Design Standards Manual – VOL 1, SEC 1: Track and Roadway, MBTA Railroad Operations (Rev No. 1 19 April 1996).
 5. Massachusetts State Building Code (Current Edition).
 6. In case of conflict between codes, standards, regulations, specifications, general notes and/or manufacturer's requirements, use the more stringent provisions.

2.2 MODULAR TACTILE SURFACE TILE

- A. Accessibility Requirements: The modular tactile tile surface system shall differ from adjoining surfaces in resiliency or sound-on-cane contact as set forth by the latest requirements of the Americans with Disabilities (ADA) and the Massachusetts Architectural Access Board (AAB). Such reference is intended to establish quality and performance characteristics and meet the legal definition of the law.
- B. Modular Tile: Provide fiberglass polymer platform edge surfaces with 24 in. x 48 in. sheets, as indicated on Drawings.
- C. Modular Tactile Surface at Curb Ramps: 24 inches wide, 1-1/2 inches thick polymer-concrete-filled fiberglass tile, maximum slope of 8 percent, in contrasting color with curb. Unit shall be flush with roadway and be able to withstand AASHTO H-20 truck loading.
- D. Composition: Composite wet set replaceable tactile Warning Surface Units shall be manufactured using a matte finish exterior grade homogeneous (uniform throughout thickness of product) glass and carbon reinforced polyester based SMC composite material. Truncated domes must contain fiberglass reinforcement within the truncated dome for superior structural integrity and impact resistance. A matte finish will be required on the tactile warning surface for superior slip resistance performance to that offered to that offered by a gloss finish. Use of tactile warning surface products employing coatings or featuring layers of material with differing composition, performance, or color properties is expressly prohibited under this Section.
- E. Color: Color shall be homogeneous throughout the composite wet set replaceable tactile Warning Surface Units and shall be Federal Yellow per Federal Standard 595B Table IV, Color No. 33538.
- F. Domes: Square grid pattern of raised truncated domes of 0.2 inches nominal height, base diameter of 0.9 inches, and top diameter of 0.45 inches. The Federal Code of Regulations permits a truncated dome spacing range of 1.6"-2.4." For superior wheelchair, walker and shopping cart mobility,

truncated domes shall have a center-to-center (horizontally and vertically) spacing of 2.35 inches, measured between the most adjacent domes on square grid.

- G. Configuration: Composite wet set replaceable tactile warning surface unit sizes shall be as indicated on the Contract Drawings. Replaceable tactile Warning Surface Units shall feature a minimum of four (4) embedded corrosion resistant 1.50-inch zinc inserts with ½-inch diameter Stainless Steel fasteners, Fasteners must be covered with a structural water tight cap. Fasteners must be located BETWEEN the truncated domes (in the field) for maximum protection of the fastener integrity. Fasteners are NOT to be located in the truncated dome.
 - 1. The field area shall consist of a non-slip textured surface with a minimum static coefficient of friction of 0.80, wet and dry.
 - 2. At a minimum, tactile warning surface product thickness shall measure 3/8” (nominal) exclusive of the perimeter 5/8” thick by 1” wide flange structure. The body if the TWS Unit must consist of a SOLID body for maximum strength and to eliminate the possibility of air entrapment and cracking. “Hollow back,” “honeycomb,” or “waffle tiles” are not acceptable for use on this Project.
- H. Cleaning materials used on site shall have code acceptable low VOC solvent content and low flammability.
- I. The Specifications of the concrete, sealants and related materials shall be in accordance with the Contract Documents and the guidelines set by their respective manufacturers.

PART 3 - EXECUTION

3.1 INSPECTION OF SURFACES

- A. Carefully inspect tactile supporting devices for conditions affecting application and performance of the work of this Section. Report defects in writing to Engineer. Do not proceed with tactile tile installation work until unsatisfactory conditions have been corrected.
- B. Beginning work shall constitute acceptance of its conditions and any defects in tactile tile installation work resulting from such accepted application shall be corrected without further expense to the Authority.

3.2 PREPARATION

- A. Coordinate tile installation, working with prior and subsequent work of other trades.
- B. During all concrete pouring and tactile warning surface product installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- C. The physical characteristics of the concrete shall be consistent with the Contract Specifications while maintaining a slump range of 4 - 7 to permit solid placement of the composite WET SET “*Replaceable*” tactile warning surface unit. An overly wet mix will cause the composite WET SET “*Replaceable*” tactile warning surface unit to float. Under these conditions suitable weights such as 2 concrete blocks or sandbags (25 pounds) shall be placed on each tactile warning surface unit.

- D. The concrete shall be poured and finished, true and smooth to the required dimensions and slope prior to tactile warning surface unit placement.

3.3 INSTALLATION (PLATFORMS)

- A. Install tile in accordance with manufacturer's recommendations and as indicated on the Drawings and as shown on approved shop drawings. Composite wet set replaceable tactile Warning Surface Units shall be installed at the precast concrete platform panel precast shop at the time of casting.
 - 1. All composite wet set replaceable tactile Warning Surface Units shall be cast integrally with precast concrete platform panel flush with the finished surface of the platform panel under the supervision of a manufacturer-approved installer with documented experience in work similar to that of this Section.
 - 2. All anchorages of composite wet set replaceable tactile Warning Surface Units shall be fully embedded into precast concrete.
 - 3. Composite wet set replaceable tactile Warning Surface Units shall be suspended as part of the casting process to ensure that full bond of anchorages occurs. Composite wet set replaceable tactile Warning Surface Units shall not be "pressed" into wet concrete.
- B. Hold Point - The tiles shall be dry-fit and approved by the Engineer, prior to installation to ensure proper installation.
- C. Minimize trimming by using whole tiles to the greatest extent possible. Any domes cut in trimming shall be beveled and polished.
- D. At the platform radius, tiles shall be installed with the platform edge tangent to the radius with the ends trimmed to provide a joint tangent to the curve and square to adjoining tiles. Domes cut in the trimming shall be beveled and polished to match the finish of the tile.
- E. The Installer shall leave a 1/8" nominal gap between successive Tactile Warning Surface Units. As part of the concrete finishing operation, the Installer shall apply 1/4" edge treatment around the perimeter of the Tactile Warning Surface Units to facilitate future replacement of the Tactile Warning Surface Unit. A Urethane Sealant such as Sikaflex 1a or BASF Sonneborn NP1 shall be applied to the edge treatment for a watertight Tactile Warning Surface Unit installation.
- F. When multiple tactile Warning Surface Units regardless of size are used, the truncated domes shall be aligned between the tactile Warning Surface Units and throughout the entire tactile warning surface installation.
- G. Tactile warning surface unit shall be installed so the body of tile is flush to the adjacent concrete surface or as the Drawings indicate to permit proper water drainage and eliminate tripping hazards between adjacent finishes.
- H. Apply sealant only at expansion joints in accordance with Section 07920 - JOINT SEALANTS.
- I. Fasteners, as required by the platform conditions, shall be used to fully fasten the tile to the platform to provide complete contact between the tile and the platform.

3.4 INSTALLATION (CURB RAMPS)

- A. Contractor will not be allowed to install Tactile Warning Surface Product until all submittals have been reviewed and approved by the Engineer.
- B. Tactile warning surface product shall be installed per manufacturer's instructions.
- C. To the maximum extent possible, the tactile Warning Surface Units shall be oriented such that the rows of in-line truncated domes are parallel with the direction of the ramp. When multiple tactile Warning Surface Units regardless of size are used, the truncated domes shall be aligned between the tactile Warning Surface Units and throughout the entire tactile warning surface installation.
- D. In accordance with the latest Draft Guidelines for Accessible Public Rights of Way Sections R221, R303.3.4, R304.2, tactile warning surface product shall be located so that the edge nearest the curb line is 6" minimum and 8" maximum from the curb line, This allows wheelchair users to gain momentum before traveling over the truncated domes and it provides visually impaired pedestrians additional time to react to the tactile warning surface or advanced warning before they reach the street.
- E. The tactile Warning Surface Units shall be tamped or vibrated into the fresh concrete to ensure that there are no voids or air pockets, and the field level of the tactile warning surface unit is flush to the adjacent concrete surface or as the Drawings indicate to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

3.5 CLEANING AND PROTECTION

- A. During construction and prior to opening the platform edge for public use, cover all tactile surfaces with an appropriate covering material, temporarily secured in place, to protect it from damage from construction activity. Remove covering when protection is no longer needed and dispose of it off-site in a manner conforming to all appropriate laws and regulations.
- B. Protect tactile warning surface unit against damage during construction period to comply with tactile warning surface unit manufacturer's Specifications.
- C. During and after the tactile warning surface unit installation and the concrete curing stage, it is imperative that there are no walking, leaning or external forces placed on the tactile warning surface unit to rock the tactile warning surface unit, causing a void between the underside of the tactile warning surface unit and the concrete substrate.
- D. Prohibit construction vehicle traffic from riding on newly tiled surfaces. Do not place or store construction equipment or tools directly on tiled surfaces.
- E. Provide snow removal as required using equipment that will not damage tile.
- F. If requested by the Project Manager, clean tactile Warning Surface Units not more than four (4) days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean tactile warning surface unit by method specified by tactile warning surface manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 09900

PAINING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Field painting of exposed interior items and surfaces.
 - 2. Field painting of exposed exterior items and surfaces.
 - 3. Surface preparation for painting.

- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 02577 - PAVEMENT MARKING: Traffic-marking paint.
 - 2. Section 05041 – HOT DIP GALVANIZING: Shop painting galvanized steel.
 - 3. Section 05100 - STRUCTURAL STEEL: Shop priming structural steel.
 - 4. Section 05500 - MISCELLANEOUS METAL: Shop priming ferrous metal.
 - 5. Section 08111- STEEL DOORS AND FRAMES: Shop Priming
 - 6. Section 09910 – SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL.

1.2 DEFINITIONS AND EXTENT

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

- B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Engineer will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include, but are not limited to the following factory-finished components:
 - a. Finished mechanical and electrical equipment.
 - b. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Pipe spaces.
 - c. Elevator shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 SUBMITTALS

- A. Product Data: For each paint system indicated, include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit two eight inch by 12 inch Samples for each type of finish coating for Engineer's review of color and texture only.

C. Qualification Data: For Applicator.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in Painting and Decorating Contractors of America PDCA P5. Duplicate finish of approved sample Submittals.
 1. Engineer will select one surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Small Areas and Items: Engineer will designate items or areas required.
 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Engineer will use the surface to evaluate coating systems of a similar nature.
 3. Final approval of colors will be from benchmark samples.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F and a maximum ambient temperature of 95 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.6 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- D. All shop-applied special coatings shall be done under environmental conditions strictly in accordance with the coating manufacturer's recommendations for ambient temperature, humidity, ventilation, surface preparation and other conditions.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Engineer about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats or tie-coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation to remove.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine pH of surfaces using pH indicating papers and distilled water and perform moisture vapor transmission testing for concrete floors in accordance with ASTM F 1869 and moisture tests on concrete walls in accordance with ASTM D 4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method. For masonry walls, use a moisture meter approved by the coating manufacturer. Follow the selected and approved coating manufacturers recommendations for acceptable pH values, moisture vapor transmission values (in lbs. of moisture per 24 hours per 1,000 SF), and moisture meter values (for masonry). If these values are not acceptable, do not paint surfaces until moisture levels are acceptable or additional surface preparation has been performed and the pH values measured are acceptable
 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or

mechanical cleaning methods that comply with The Society for Protective Coating's (SSPC) recommendations.

- a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3, or SSPC-SP 10/NACE No. 2 as specified in the Paint Schedule in this Section.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Treat existing painted surfaces with surface preparation methods recommended by coating manufacturer and in accordance with the coating schedule.
4. Galvanized Surfaces: All galvanized surfaces shall be shop painted in accordance with the requirements of Section 09910 – SHOP PAINTING OF HOT DIPPED GALVANIZED STEEL.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat.

- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
 2. Panelboards.
 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- G. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide finish for final coats to be selected from manufacturer's standard options.
- J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Engineer.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in Painting and Decorating Contractors of America PDCA P1.

3.6 PAINT SCHEDULE

- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.
- B. Paint Schedule:
 - 1. Masonry and Concrete to be Painted (where indicated) (Surface Preparation: as required in paragraph 3.2.C.2 of this Section and in accordance with manufacturer's recommendations):

One Coat	<ul style="list-style-type: none"> 1. Tnemec Series 156 Enviro-Crete 2. Liquid Plastics Acrylic 3. Dupont Tufcryn at 8.0 4. Amercoat Series 147
One Coat	<ul style="list-style-type: none"> 1. Tnemec Series 156 Enviro-Crete

2. Liquid Plastics Acrylic
 3. Dupont Tufcryl at 8.0
 4. Amercoat Series 147
2. Ferrous Metal, Fluoropolymer System: (Surface Preparation: SSPC-SP6)
 - One Coat
 1. Tnemec Series 90-1K97; use for touch up
 2. Dupont Ganicin Urethane Zinc Rich
 - One Coat
 1. Tnemec Series V73 Endura-Shield
 2. DuPont Imron HS
 - One Coat
 1. Tnemec Series 1070 Fluoronar with [1078 metallic] [1071 satin] [1072 semi-gloss] finish
 2. Dupont Fluoropolymer
 3. Ferrous Metal, Engineered Siloxane/ Polyester Urethane System: (Surface Preparation: SSPC-SP6)
 - One Coat
 1. Tnemec 901K97
 2. Ameron Series 68HS
 3. Dupont Urethane Zinc Rich Primer 80% zinc load
 - One Coat
 1. Tnemec V27 Typoxy at
 2. Ameron Amerlock 400 High Build Epoxy
 3. Dupont 25P High Solids Epoxy
 - One Coat
 1. Tnemec 290/291 Endurashield
 2. Ameron PSX-700 Engineered Siloxane Topcoat
 3. Dupont Imron High Solids Polyester Urethane
 4. Non-Ferrous Metal (except aluminum): (Surface Preparation: Sand with 60 grit scotch brite pads followed by SSPC-SP1)
 - One Coat
 1. Tnemec Series N69 Hi-Build Epoxoline II
 2. Ameron 400 Amerlock
 3. Dupont 25P High Solids
 - One Coat
 1. Tnemec Series V73 Endurashield
 2. Ameron Amercoat 450H Polyurethane
 3. Dupont High Solids Imron
 5. Galvanized Metal (not shop-finished under Sections 05100 or 05500): (Surface Preparation: SSPC-SP7 Brush-off Blast)
 - One Coat
 1. Tnemec Series V27 Typoxy
 2. Ameron Amerlock 400 Hi-Build Epoxy
 3. Dupont 25P High Solids
 - One Coat
 1. Tnemec Series V73 Endura-Shield
 2. Ameron Amercoat 450H Polyurethane
 3. Dupont Imron 2.8 Urethane

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 09910

SHOP PAINTING OF HOT-DIPPED GALVANIZED STEEL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies substrate surface preparation and shop applied paint systems for structural steel and miscellaneous steel elements which have been hot-dip galvanized and will be exposed to view.
- B. Definition: Paint shall be defined as liquid coating applied to the substrate surface by means of conventional air spray, airless spray, brush, or roller which dries or cures to a hard surface, and includes the words paint, primer, coating, and words of similar import.

1.2 QUALITY CONTROL

- A. Abbreviations:
 - 1. SSPC - Steel Structures Painting Council.
 - 2. NFPA - National Fire Protection Association.
 - 3. OSHA - Occupational Safety and Health Administration.
- B. Quality Control:
 - 1. Requirements of Regulatory Agencies: Provide and apply materials complying with environmental requirements of authority having jurisdiction.
 - 2. Pre-Construction Conference: A meeting shall be held with representatives of the Engineer, Design Engineer, Galvanizer, Fabricator and Painter to review conditions, application, inspection procedures and specification requirements herein.
 - 3. Tolerances:
 - a. Thickness: Apply coating of specified dry film thickness (DFT) where thickness shall be absolute minimum coverage at any point of measurement as determined by the paint manufacturer.
- C. Mock-Up Surfaces or Areas: A sample platform guard fence section shall be designated as control for color, texture, and application for the specified paint system. This item, once accepted by the Design Engineer, shall be used as criteria for acceptance for similar items, which shall match accepted mock-up.
- D. Certificates:
 - 1. Provide certificates listing materials used in coating system and certify compliance with standards designated.
 - 2. Provide certificates stating that materials provided comply with requirements of this Section.

3. Coatings shall be certified OTC/VOC compliant and conform to applicable regulations and EPA standards.

1.3 SUBMITTALS

- A. Color Selection:
 1. Color shall be selected from manufacturer's standard colors.
 2. Submit color chips to the Design Engineer, minimum 3 inches by 5 inches, in accordance with material or finish schedule for selection of colors of each item designated to be painted.
- B. Certificates: Submit notarized certificates complying with requirements of this Section.

1.4 APPLICATION CONDITIONS

- A. Environmental Requirements:
 1. Apply all intermediate and finish coatings under conditions within the following tolerances:
 - a. Air Temperature: Min. 50 deg. F to max. 90 deg. F.
 - b. Surface Temperature: Min. 50 deg. F to max. 100 deg. F.
 - c. Relative Humidity: Max. 65 percent.
 2. Maintain surface dry and free from dust, dirt, oil, grease, or other contaminants.
 3. Keep environment free of airborne dust and dirt until paint is dry.
 4. To ensure compliance with this Specification, monitor all temperature and humidity levels continuously with a recording hydrothermograph with printed record available for review by the Contractor at any time during the Project.
 5. Comply with all applicable federal, state, local, OSHA, EPA, and fire regulations for both spray and curing facilities.
 6. Provide spray booth with a filtered exhaust.
 7. Cure booth may be heated to accelerate paint dry time at applicators option, however strictly comply with paint manufacturer's instructions. Temperature shall not exceed 150°F. Use an indirect thermostat controlled gas-fired, forced hot-air blower; do not use infra-red type curing equipment.
 8. Protect spray and curing booth with sprinkler system complying with NFPA 15.
 9. Continuously monitor air in curing booth by a lower explosive limit (LEL) monitoring device connected to the ventilation system.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide thinners, driers, and other products manufactured, furnished, or approved by accepted manufacturers for use with their product.
- B. Handle, store, mix, and apply paint materials, primers, and metal conditioners in accordance with recommendations of accepted manufacturers.
- C. Should it appear that conflicts exist between such recommendations and the Specifications, obtain written clarification from the Design Engineer before proceeding with the work.

2.2 COLORS

- A. Color shall be as selected from manufacturer's standard colors by the Design Engineer.
- B. Provide finish coat color matching accepted color sample within industry tolerances and identified as specified.

2.3 PAINT MATERIALS

- A. Priming and Color Coating of Galvanized Steel Members:
 - 1. All steel that has been hot dipped galvanized after fabrication and is specified to be painted, shall receive a shop applied tie coat and finish color coat as indicated herein. Tie coat and finish color coat shall be by the same manufacturer.
 - a. Epoxy Intermediate Coat: Tie coat shall be epoxy polyamide formulated for compatibility with newly galvanized surfaces and be equal to Tnemec 27 FC TyPoxy, Dupont Colar 525TL, or Hempel Hempadur 4563. Dry film thickness shall be 2-3 mils.
 - b. Polyurethane Top Coat: Top coat applied over epoxy tie coat shall be Acrylic Polyurethane Enamel equal to Tnemec Series 74 Endura Shield III, Dupont Imron 333 or Hempel's 551U Urethane. Dry film thickness shall be 1.5 -2.5 mils.
 - 2. Scope of Work:
 - a. Epoxy Intermediate Coating and Polyurethane Color Coating: Miscellaneous metal items specified herein that shall have epoxy intermediate coating and polyurethane color coating shall include ornamental fences, steel signage frames, parking paybox frames, light poles, structural steel and miscellaneous metals of station canopies, platform guard fences, handrail support brackets, and bridge walkway members and railings, brick lintels and relieving angles exposed to view and other galvanized miscellaneous items noted on drawings to be painted.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. Unless factory prime coated at the galvanizer's plant in accordance with the requirements of SECTION 05100 STRUCTURAL STEEL and SECTION 05500 MISCELLANEOUS METALS with Urethane Primer of the same manufacturer of finish top coats, all hot dip galvanized material shall be cleaned in accordance with Steel Structure Painting Council Specification SSPC-SP-1, Solvent Wipe followed by SSPC-SP-7, Brush-off Blast Cleaning, or SSPC-SP-3 Power Tool Cleaning to produce minimum 1-1.5 mil profile. Following completion of cleaning procedures and prior to application of coating material the galvanized material shall be visually inspected to determine complete absence of contaminants and that proper tooth or profile exists for paint adhesion.
- B. The cleaning procedures shall be performed carefully so that the galvanized thickness does not fall below the required 3.4-3.9 mil zinc thickness.

3.2 INSPECTION

- A. Examine material upon which work specified in this Section is dependent for defects which may influence application or installation and performance.
- B. Do not place work in this Section upon previously placed incomplete, unsound, or defective work.

3.3 APPLICATION

- A. Coating materials, specified herein, shall be applied by the galvanizer or an approved steel fabricator in strict conformance to requirements as specified in this Section.
- B. Application: Intermediate tie coat shall be factory applied over cleaned galvanized members within 12 hours of surface preparation to prevent formation of unwelcome films. Top coatings shall be applied over intermediate coat in strict compliance with paint coat manufacturer's written recommendations.

3.4 QUALITY CONTROL

- A. Inspection:
 - 1. Measure representative areas for Dry Film Thickness.
 - 2. If thickness of coating does not comply with DFT requirements, apply additional applications of coating to attain specified DFT.
 - 3. Where characteristics of coating prohibit recoating, remove and replace unacceptable coating.
 - 4. Where application of coating exceeds DFT and is considered detrimental to quality of Project, remove and recoat to specified DFT.
 - 5. Where measurement DFT is impractical or impossible, determine the amount DFT.
 - 6. The manufacturer's stock and batch number will be compared with the assigned Paint Identification Number with the color sample submitted for finished surfaces, and with mock-up for finished surfaces in accordance with requirements of this Section.

3.5 FIELD REPAIR PROCEDURES

- A. Where factory or shop applied coatings have become damaged or abraded due to handling, transport, installation, welding or other circumstances, they shall be repaired by the field painting crew of the miscellaneous metal contractor.
- B. All damaged areas shall be thoroughly wire brushed. All dirt, oil, grease, oxidation or other contaminants shall be removed. Touch-up paint supplied by the galvanizer or steel fabricator, identical in color and composition to that used in the plant, shall be applied to all prepared surfaces to a dry film thickness of at least 3.0 mils.

PART 4 – MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 10200

LOUVERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
 - 1. Fixed extruded-aluminum louvers and frames.
- B. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections
 - 1. Section 05500 – MISCELLANEOUS METALS:
 - a. Exterior metal wall louvers in elevator shaft walls.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 05100 – STRUCTURAL STEEL
 - 2. Section 05500 – MISCELLANEOUS METALS
 - 3. Section 07920 – JOINT SEALANTS; sealants installed in perimeter joints between louver frames and adjoining construction.
 - 4. Division 15 – MECHANICAL; louvers that are a part of mechanical equipment.

1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers. Loads as required by Code.
- B. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions as required by code.

- C. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.
 - 1. For installed louvers indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Verification: For each type of metal finish required.
- D. Qualification Data: For professional engineer performing services required by paragraph 1.3.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2, "Structural Welding Code--Aluminum."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Louvers:
 - a. Airline Products Co.
 - b. Airolite Company (The).
 - c. Construction Specialties, Inc.
 - d. Greenheck.
 - e. Industrial Louvers, Inc.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.
- B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
- F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal Storm-Resistant Louvers:
1. Louver Depth: 4 inches.
 2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch.
 3. Frame and blades shall be designed to collect and drain water to the exterior sill.
 4. Performance Requirements:
 - a. Free Area: Minimum 40%.
 - b. Wind-Driven Rain Performance: Not less than 99 percent effectiveness class A rating when subjected to a rain fall rate of 3 inches per hour with a wind speed of 29 mph at a core area intake velocity of 900 fpm.
 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Bird screening.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
- D. Louver Screening for Aluminum Louvers: Bird screening, aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.6 BLANK-OFF PANELS

- A. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets.
1. Thickness: 1 inch.
 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
 3. Insulating Core: Rigid insulation board.

4. Seal perimeter joints between panel faces and louver frames with 1/8-by-1-inch PVC compression gaskets.
5. Panel Finish: Same finish applied to louvers.

2.7 ALUMINUM FINISHES

- A. High-Performance Organic-Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - a. Color and Gloss: As selected by Engineer from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Engineer, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 10422

FIBERGLASS SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies fiberglass signage as indicated on the Drawings and specified herein.
 - 1. System maps
 - 2. Line maps
 - 3. Mural Panels
 - 4. Directional Signage (includes but not limited to color ID bands & white directional bands).

- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 05500 - MISCELLANEOUS METALS; Frames and supports not integral with signage.
 - 2. Section 07920 – JOINT SEALANTS, for requirements for sealants installed at perimeter of sign panels.
 - 3. Section 10426 - TACTILE/BRAILLE SIGNAGE.
 - 4. Section 10440 - SIGNAGE

- C. Permits: Obtain permits required by Local Authorities for installation of signs.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide fiberglass sign manufacturer's certification stating that materials comply with performance requirements of this section.

- B. Submittal Schedule: Submit schedule for the production of shop drawings, sign schedule (types and quantities), material sample submissions, product certifications, and paper proofs for MBTA Design Department Review. Note: fabrication of sign panels shall not begin without MBTA Design Department approval of the submissions. Coordination of a schedule of submittal reviews by the MBTA Design Department is required.

- C. Shop Drawings: Provide large scale shop drawings for fabrication and installation of each sign type including mounting details. Provide large scale layouts of sign wording, spacing, type size and style of each sign panel for MBTA Design Department review and approval. Provide plans,

elevations, and details of anchorage, connections and accessory items. Provide installation templates for work installed by others.

- D. Templates: Submit full size templates or film positives for all messages and graphics for all Sign Types. Outline drawings of letterforms will not be accepted as templates.
- E. Sign Schedules: Submit complete Sign Schedule for each sign type with quantities shown. Use designations that cross reference with the signs shown in the Drawings.
- F. The MBTA Design Department will prepare digital artwork for each sign type. Electronic files for the artwork will be provided to the contractor by the MBTA.
- G. Samples for Approval: Within 30 business days from receipt of the MBTA Design Department digital artwork, submit one proof for each sign at 10% scale and one full size sign sample of a type to be determined by the MBTA. Sign sample submittal is in addition to quantities shown in the sign schedule. It will be a record project sample to be kept on file at the Engineer's office.
 - 1. For each typestyle specified submit full samples of all alphabets, including numbers and punctuation, on 11 inch by 17 inch photostats and samples of standard letter spacing and word spacing (at min. of 3/4 inch cap height) for approval prior to fabrication.
 - 2. Submit artwork of all symbols and logos to be used on 11 inch by 17 inch Photostats for approval prior to fabrication.
 - 3. Submit samples of colors on all substrates specified for each Sign Type.
 - 4. Submit one each full size proof for each type (i.e. different graphic content) of the following sign panels:

<u>Sign Type</u>	<u>Description</u>
RTL	System Maps: 100% scale of 48" x 48" paper proof in full color to show image and color quality.
MP	Mural Panels: 100% scale of 48" x 48" paper proof in full color (or black and white) to show image and color quality.
D	Directional Signage: 100% scale paper proofs in full color to show image and color quality.

- H. Fabrication of signs shall not begin without MBTA Design Department approval.

1.3 QUALITY ASSURANCE

- A. MBTA Reference Standard: Comply with the MBTA, Guidelines and Standards, Part V, Graphics, Revised Fall 1990 with 1995 Supplement. A copy can be viewed or supplied on request to the MBTA Design Department, 500 Arborway, Jamaica Plain, MA 617-222-5044.
- B. Reference Standards: The work shall conform to the codes and standards of the following agencies as further cited herein:

1. ADAAG: Americans with Disabilities Act Accessibility Guidelines
 2. ANSI: American National Standards Institute.
 3. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 as published in "Compilation of ASTM Standards in Building Codes".
 4. MAAB: Massachusetts Architectural Access Board.
- C. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.
- D. Accessibility: The ADAAG and the MAAB regulations are pertinent to the design and installation of items covered under the work of this Section. When guidelines conflict, the guideline giving greater access shall be applicable.
- E. The approved manufacturer shall have experience in the type of work required, shall have a reputation for doing satisfactory work on time; and shall have recently successfully completed similar work.
- F. The Contractor shall be responsible for the proper engineering of all items. The internal structure, dimensions and specifications for all items shall be indicated in the Contractor's shop drawings. Sign Contractor shall fabricate signs to withstand the abuses of the environment in which they will be installed.
- G. Coordination: The work in this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section before the installation of items herein specified. Cooperate with such trades to assure the steady progress of all work under this Contract.
- H. Quality Requirements for Fiberglass Signage, Maps and Mural Panels:
1. Digital Artwork: Final digital signage artwork to be provided by the MBTA Design Department to the contractor.
 2. Formats: Digital files produced from a graphic program such as Adobe InDesign, Adobe Illustrator, Adobe Photoshop with extensions: AI, EPS, or PDF. Formats are determined by the MBTA Design Department.
 3. Typography: All fonts embedded/outlined within artwork.
 4. Colors: Must match Pantone colors specified in digital files and on drawings.
 5. Resolution Input (quality from the MBTA): Vector files, resolution of 300 – 600 DPI To be matched by output (quality from Fabricator) resolution of 150- 300 LPI
 6. Fabricator must provide their capabilities/specs to the MBTA to show resolution output capability: line screens (LPI).
- I. Fiberglass Time Schedules and Required Proofs/Samples from the Fabricator to the MBTA Design Department:

1. Fiberglass Samples to show colors: provide three (3) 3" x 4" samples of each color (including black and white). Samples to be approved by the MBTA Design Department prior to production of all final paper proofs.
2. Paper Proofs are produced by the fabricator using only the MBTA Design Department digital files. All paper proofs shall be sent to the MBTA Design Department within 30 business days from MBTA submittal of digital artwork. Paper proofs of all signs, maps and murals to be 10%, as well as 100% scale (Sizes vary: 6, 12, 18 inches wide x 48 inches, 96 inches, or as required by the MBTA Design Department) paper proofs of selected signs, murals and maps requested by the MBTA Design Department. Approval of all proofs is required from the MBTA Design Department prior to final fabrication

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store work under this Section in a manner to prevent cracking or stress of components and to prevent mechanical damage or damage by the elements.
- B. Deliver work under this Section to Site in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.
- C. Delay installation of this work until near time of Substantial Completion.

1.5 PROJECT CONDITIONS

- A. Inspection of Site: The sign installer shall visit the site of the proposed work and fully acquaint himself with existing conditions to fully inform himself as to the facilities involved and the difficulties and restrictions attending the performance of the Contract

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Fiberglass Sign Manufacturers: Provide products of one of the following manufacturers if they meet or exceed the requirements of these specifications:
 1. KVO Industries
 2. Pannier Graphics
 3. Sign and Decal Corporation

2.2 MATERIALS

- A. Steel:
 1. Structural steel materials, details and workmanship shall conform to the requirements of Section 05100 – Structural Steel and Section 05500 – Miscellaneous Metals.

- B. Aluminum: Alloy 6063-T5, urethane finish.
- C. Plywood: APA Graded, Exterior Grade A-C Plywood and Marine Grade Plywood, as required.
- D. Fiberglass:
 - 1. Fiberglass embedded sign panels shall be constructed of low shrink, thermosetting polyester resins containing ultraviolet inhibitors, reinforced with a quantity of glass fibers that measures no less than 30 percent by weight, in conformity with industry standards of the Society of Plastics. All fiberglass signs shall exhibit the following physical properties:
 - a. Flexural Strength: 16,000 - 28,000 psi
 - b. Tensile Strength: 9,000 - 18,000 psi
 - c. Compressive Strength: 13,000 - 17,000 psi
 - d. Specific Gravity: 1.4 - 1.6
 - e. Chemical Resistance: will not be affected by mild soaps, detergents, alkalis, oils, carbon tetrachloride or weak acids.
 - f. Temperature Resistance: will remain strong and firm without warping, cracking or distorting at 200°F; below 32°F strength will increase a minimum of 50%.
 - g. Weather Resistance: shall retain surface integrity under all weather conditions of sunlight, rain, snow, sleet, hail and windblown sand or dirt.
 - 2. All copy and graphics will be totally embedded with smooth surfaces on both sides. Glass fibers will not be readily discernible on the face. The composition will consist of all white glass and R-70 clear resin so that when they are combined the color index of refraction assures total clarity of all color, copy and graphics.
 - 3. The signs will be resistant to any ill effects of temperature within the range of -65°F. to 350°F.
 - 4. The signs will be resistant to steam, aromatics, burning cigarettes, scratching, ink and paint. All markings, ink, or paints shall be readily removable with soap and water or solvents without harm.
 - 5. The manufacturer must show evidence of the material having been subjected to Desert Sunshine Exposure Tests (Emmaqua) for a minimum exposure of 1,000,000 Langleys without measurable color fading of graphics, discoloration of resin, or decomposition of assembly.
 - 6. Performance Requirements: All panels shall pass the following tests:
 - a. Military Specification P7788A for Surface Endurance Scratch Resistance, Thermal Shock, Humidity, and Impact.
 - b. Military Standard 202B (Method 101A) for Salt Spray.
 - c. Federal Specification Test Method Standard 141 (Method 6152) for Accelerated Weathering.
 - d. Acidity, Cleaning Compounds and Fluids:
 - 1) Two panels to be immersed in a 0.1 NaCl solution for 30 minutes.
 - 2) Two panels to be immersed in a 0.1 NaSu solution for 30 minutes.
 - 7. All signs shall be guaranteed for ten years in writing, against fade, chip, peel, yellowing or any type weathering.

E. Hardware:

1. Tamper resistant fasteners to be stainless steel, 3/8" diameter button head Phillips socket pinhead.
2. High strength bolts other than anchor bolts, nuts and washers shall conform to ASTM-A325.
3. Threaded studs shall be low carbon mild steel with a minimum yield strength of 50,000 PSI.
4. All hardware shall be galvanized per ASTM-A153 requirements.
5. Where mechanical fasteners and hardware are required, they shall be of adequate thickness, length and construction to properly secure the sign unit. Any visible portion of any mounting device shall be finished to match adjacent sign surface, unless otherwise specified.
6. Metal fasteners and hardware in contact with dissimilar metals shall have a protective coating or neoprene shields to prevent electrolytic action.

F. Adhesives:

1. Where adhesive mounting techniques are specified, the Contractor shall use adhesives specifically designed for compatibility with the base materials and the desired adhesive strength. All adhesives shall be tested on site. All adhesives shall be indicated in the shop drawings.
2. Surfaces on which signage is to be installed using adhesive shall be free of grease, oil, or any other residue.
3. Foam tape shall be 1/32" thick, high density open cell double coated polyurethane foam tape.
4. Very high bond (VHB) tape shall be double coated acrylic foam tape.
5. Provide necessary amounts of clear silicone sealant or grout for use in pin mounting.

J. Art and Imaging

- a. Supplier shall fabricate final signs as required from original artwork and as indicated in drawings. The images shown on the drawings are "for Position Only" and shall not be used for final artwork. Typographic specifications and color breaks are indicated on the drawings.
- b. All signage proofs shall be submitted to the MBTA Design Department for review and approval before it is reproduced in fiberglass.
- c. The quality of the screen image shall be of high resolution with no ragged edges or dots seen on either type or image.
- d. All color processes and black and white imaging processes shall be in perfect registration and in a resolution between 300 to 600 DPI input, or at 150 to 300 LPI output.
- e. The line screen (LPI) output from the fabricator shall match or exceed the original graphic dots per inch (DPI) resolution. Accordingly: Minimum 150 LPI for 300 DPI; and Minimum 300 LPI for 600 DPI.

K... Color Matching

1. Match all spot colors using the Pantone Matching System (PMS) or as per file designation in the digital files. Color samples and proofs are to be provided to the MBTA Design Department at no extra charge.
2. Mural Panels: Final digital artwork for the mural panels will be supplied from the MBTA Design Department to the contractor. The contractor shall be responsible for the fabrication of the artwork according to industry standards of quality and procedures.

2.3 FABRICATION

- A. Fabricate work to be truly straight, plumb, level and square with smooth flat surfaces and sharp corners, except where indicated otherwise.
- B. Precisely form work to sizes, shapes, and profiles indicated on approved shop drawings.
- C. Fabricate work with uniform joints that are not visible.

PART 3 - EXECUTION

3.1 INSPECTION

- A. The Installer shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.
- B. Notification Point - Work shall be subject to inspection and approval by the Engineer in the shop or field at any reasonable time. Provide at least 72 hours notice for Engineer's inspection of complete fabricated signs before delivery.

3.2 INSTALLATION/APPLICATION/ERECTION

- A. Strictly comply with approved shop drawings and manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.
- B. Install work plumb, level, in true plane and alignment. Provide signs and graphics where shown or scheduled using mounting methods indicated.
- C. Protect adjacent or adjoining surfaces and work from damage during installation in this Section.
- D. Work shall be designed and anchored so that work will not be distorted nor the fasteners overstressed from expansion and contraction of metal or other materials as applicable.

3.3 TOLERANCES

- A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Document and shall not be added to allowable tolerances indicated for other work:
 - 1. Allowable Variation from True Plumb, Level and Line: Plus or minus 1/16 inch from true position for signage smaller than 24 by 24 inches in size; plus or minus 1/8 inch from true position for signage 24 by 24 inches in size and larger.
 - 2. Allowable Variation from True Plane of Adjacent Surfaces: Plus or minus 1/16 inch.

3.4 CLEANING AND PROTECTION

- A. Adjust work to present the best possible appearance. Touch-up damaged finishes and repair damage to eliminate evidence of repair. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully repaired or cleaned.
- B. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.
- C. Manufacturer shall provide Authority with information on cleaning and maintenance recommendations for all signs.
- D. Names, stamps and decals of manufacturers, installers or maintainers of signs shall not be visible in the finished work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 10426

TACTILE/BRAILLE SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies tactile/braille signage as indicated on the Drawings and specified herein.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 05500 - MISCELLANEOUS METALS; Frames and supports not integral with signage.
 - 2. Section 10422 - FIBERGLASS SIGNAGE.
 - 3. Section 10440 - SIGNAGE
- C. Permits: Obtain permits required by Local Authorities for installation of signs.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide manufacturer's certification stating that materials comply with requirements.
- B. Shop Drawings: Provide large scale shop drawings for fabrication and installation of each sign type including mounting. Provide large scale layouts of sign wording, spacing, type size and style. Provide plans, elevations, and details of anchorage, connections and accessory items. Provide installation templates for work installed by others.
- C. Templates: Submit full size templates or film positives for all messages and graphics for all Sign Types. Outline drawings of letterforms will not be accepted as templates.
- D. Sign Schedules: Submit complete Sign Schedule for each sign. Use same designation as on the Drawings.
- E. Samples for Approval: Sample Submittals are in addition to quantities shown in sign schedule. They are record project samples to be kept on file at the Engineer's office.
 - 1. For each typestyle specified submit full samples of all alphabets, including numbers and punctuation, on 11 inch by 17 inch photostats and samples of standard letter spacing and word spacing (at min. of 3/4 inch cap height) for approval prior to fabrication.
 - 2. Submit artwork of all symbols and logos to be used on 11 inch by 17 inch Photostats for approval prior to fabrication.
 - 3. Submit samples of colors on all substrates specified for each Sign Type.

1.3 QUALITY ASSURANCE

- A. MBTA Reference Standard: Comply with the MBTA, Guidelines and Standards, Part V, Graphics, Revised Fall 1990 with 1995 Supplement. A copy can be viewed or supplied on request to the MBTA Design Department, 500 Arborway, Jamaica Plain, MA 617-222-5044.
- B. Reference Standards: The work shall conform to the codes and standards of the following agencies as further cited herein:
 - 1. ADAAG: Americans with Disabilities Act Accessibility Guidelines
 - 2. ANSI: American National Standards Institute.
 - 3. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 as published in "Compilation of ASTM Standards in Building Codes".
 - 4. MAAB: Massachusetts Architectural Access Board.
- C. Source: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.
- D. Accessibility: The ADAAG and the MAAB regulations are pertinent to the design and installation of items covered under the work of this Section. When guidelines conflict, the guideline giving greater access shall be applicable.
- E. The approved manufacturer shall have experience in the type of work required, shall have a reputation for doing satisfactory work on time; and shall have recently successfully completed similar work.
- F. The Contractor is responsible for the proper engineering of all items. The internal structure, dimensions and specifications for all items shall be indicated in the Contractor's shop drawings. Sign Contractor to engineer signs to proper level to withstand abuses of their environment.
- G. Coordination: The work in this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section before the installation of items herein specified. Cooperate with such trades to assure the steady progress of all work under this Contract.
- H. Hold Points - Mockups: Provide one full size mock-up in place of each type of signage.
 - 1. If Engineer determines mockups do not comply with requirements, provide new identification device until mockups are approved.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store work under this Section in a manner to prevent cracking or stress of components and to prevent mechanical damage or damage by the elements.

- B. Deliver work under this Section to Site in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.
- C. Delay installation of this work until near time of Substantial Completion.

1.5 PROJECT CONDITIONS

- A. Inspection of Site: The Contractor shall visit the site of the proposed work and fully acquaint himself with existing conditions and fully inform himself as to the facilities involved and the difficulties and restrictions attending the performance of the Contract, prior to submitting his price quotation.
- B. Substrates: Proceed with work of this Section only when substrate construction and penetration work have been completed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Tactile/Braille Sign Manufacturers: Provide products of one of the following manufacturers if they meet or exceed the requirements of these specifications:
 - 1. Andco Industries Corp.
 - 2. A.R.K. Ramos Manufacturing Company, Inc.
 - 3. ASI Sign Systems.
 - 4. Best Manufacturing Co.
 - 5. Gemini, Inc.
 - 6. Lake Shore Markers.
 - 7. Metal Arts, Division of L & H Manufacturing Co.
 - 8. OMC Industries, Inc.
 - 9. The Southwell Company.

2.2 MATERIALS

- A. Aluminum Frames: Alloy 6063-T5, urethane finish.
- B. Plastic Laminate: Provide high pressure laminate engraving stock, with face and core plies in contrasting colors, in finishes and color combinations as selected by Engineer from manufacturer's full range.
- C. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of

16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F, and of the following general types:

1. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light Transmittance of 92 percent, when tested according to the requirements of ASTM D 1003.
2. White Translucent Sheet: Where sheet material is indicated as "white," provide white translucent sheet of density required to produce uniform brightness and minimum halation effects.
3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected by Engineer

D. Hardware:

1. Tamper resistant fasteners to be stainless steel, 3/8" dia. button head Phillips socket pinhead.
2. High strength bolts other than anchor bolts, nuts and washers shall conform to ASTM-A325.
3. Threaded studs shall be low carbon mild steel with a minimum yield strength of 50,000 PSI.
4. All hardware shall be galvanized per ASTM-A153 requirements.
5. Where mechanical fasteners and hardware are required, they shall be of adequate thickness, length and construction to properly secure the sign unit. Any visible portion of any mounting device shall be finished to match adjacent sign surface, unless otherwise specified.
6. Metal fasteners and hardware in contact with dissimilar metals shall have a protective coating or neoprene shields to prevent electrolytic action.

E. Adhesives:

1. Where adhesive mounting techniques are specified, the Contractor shall use adhesives specifically designed for compatibility with the base materials and the desired adhesive strength. All adhesives shall be tested on site. All adhesives shall be indicated in the shop drawings.
2. Surfaces on which signage is to be installed using adhesive shall be free of grease, oil, or any other residue.
3. Foam tape shall be 1/32" thick, high density open cell double coated polyurethane foam tape.
4. Very high bond (VHB) tape shall be double coated acrylic foam tape.
5. Provide necessary amounts of clear silicone sealant or grout for use in pin mounting.

F. Silk Screening:

1. Screen printed text and symbols shall utilize photographically prepared screens and shall be printed in accordance with accepted industry standards. No hand-cut screens will be accepted. All screen printing shall be executed in such a manner that all edges and corners of letterforms are true and clean. Letterforms, color areas, or lines with rounded positive or negative corners, built-up edges, bleeding, spattering, etc. will not be accepted. All photoscreens shall be prepared from typesetter's reproduction of the text specified, or camera ready artwork. All artwork and typesetting shall be no less than 50% of actual specified size. All inks shall be applied evenly without pinholes, scratches, orange peeling, etc.
2. All silk screening processes shall be approved by the Engineer prior to fabrication.

G. Typeface:

1. All vinyl and painted copy shall be in the following typefaces to match the letterforms shown in the Detail Drawings:
 - a. Univers Bold
 - b. Century Old Style Reg.
 - c. Century Old Style Italic
 - d. Garamond
 - e. Celestia Antique Italic
 - f. Sabon Bold
 - g. Sabon Roman
 - h. Helvetica Medium
 - i. Helvetica Bold
2. All graphics shall be made with the font specified using a link to the final graphic output device.

H. Typesetting:

1. All typeset messages shall be prepared on a computer. Letterforms shall match the samples shown in the drawings. Output for photographic reproduction shall be 2400 dots per inch. No typesetters' proofs shall be enlarged more than three times for use as graphics.
2. Standard letter spacing and standard word spacing shall be approved by Engineer for all fonts before final manufacture.
3. Typical type and symbol layout for each sign type is indicated on the Drawings. All type shall be placed according to the dimensions shown on the drawings. Should any design conflict occur in the fabrication of the signs; i.e., type not fitting, it shall be brought to the attention of the Engineer.

2.3 FABRICATION

A. Acrylic or Plastic Laminate Panel Signs: Fabricate as follows:

1. Construction: Backplate, 1/8 in. acrylic or plastic laminate.

2. Raised Letter Construction: 1/32 in. routed letters permanently mounted to surface of plate.
 3. Border Style: None (straight).
 4. Background Texture: Smooth.
 5. Edges: Eased.
 6. Fasteners: Flexible self-adhesive.
 7. Corners: Square.
 8. Braille: Provide raised Grade 2 Braille on each sign, as required.
- B. Acrylic Letterform Signs: Fabricate as follows:
1. Construction: 6 in. high, 1/2 in. deep acrylic.
 2. Projection: 1 in.
 3. Color: Integral black letters.
- C. Fabricate work to be truly straight, plumb, level and square with smooth flat surfaces and sharp corners, except where indicated otherwise.
- D. Precisely form work to sizes, shapes, and profiles indicated on approved shop drawings.
- E. Fabricate work with uniform joints that are not visible.

PART 3 - EXECUTION

3.1 INSPECTION

- A. The Installer shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.
- B. Notification Point - Work shall be subject to inspection and approval by the Engineer in the shop or field at any reasonable time. Provide at least 72 hours notice for Engineer's inspection of complete fabricated signs before delivery.

3.2 INSTALLATION/APPLICATION/ERECTION

- A. Strictly comply with approved shop drawings and manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.
- B. Install work plumb, level, in true plane and alignment. Provide signs and graphics where shown or scheduled using mounting methods indicated.
- C. Protect adjacent or adjoining surfaces and work from damage during installation in this Section.

- D. Work shall be designed and anchored so that work will not be distorted nor the fasteners overstressed from expansion and contraction of metal or other materials as applicable.

3.3 TOLERANCES

- A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Document and shall not be added to allowable tolerances indicated for other work:
 - 1. Allowable Variation from True Plumb, Level and Line: Plus or minus 1/16 inch from true position for signage smaller than 24 by 24 inches in size; plus or minus 1/8 inch from true position for signage 24 by 24 inches in size and larger.
 - 2. Allowable Variation from True Plane of Adjacent Surfaces: Plus or minus 1/16 inch.

3.4 CLEANING AND PROTECTION

- A. Adjust work to present the best possible appearance. Touch-up damaged finishes and repair damage to eliminate evidence of repair. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully repaired or cleaned.
- B. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.
- C. Manufacturer shall provide Authority with information on cleaning and maintenance recommendations for all signs.
- D. Names, stamps and decals of manufacturers, installers or maintainers of signs shall not be visible in the finished work.

3.5 SCHEDULES

- A. Interior Signage Schedule: Provide signage at locations scheduled. Provide required signage at locations indicated on Drawings, or if not indicated, at the following locations:
 - 1. Each room shall have a Room Number and Name sign; letter height 1 to 1-1 /2 inches.
 - 2. Each floor shall be properly identified in stairways, at each level; letter height 3 to 4 inches.
 - 3. Each floor shall be properly identified on elevator hoistway entrance jambs; letter height 4 inches.
 - 4. Each floor shall have elevator safety signage; letter height 1 to 1-1 /2 inches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 10440

SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishing and installing aluminum signs and trailblazer signs, including supports, as indicated in the Contract Plans and as specified herein.
- B. Temporary traffic signs required for construction shall be in accordance with Section 01570 – Traffic Regulation
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 03300 - CAST-IN-PLACE CONCRETE
 - 2. Section 05100 – STRUCTURAL STEEL
 - 3. Section 05500 - MISCELLANEOUS METALS; Frames and supports not integral with signage.
 - 4. Section 10422 - FIBERGLASS SIGNAGE.
 - 5. Section 10426 – TACTILE-BRAILLE SIGNAGE

1.2 SHOP DRAWINGS

- A. Shop Drawings: Provide shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations and details of anchorages, connections and accessory items. Provide installation templates for work installed by others.
- B. Take measurements in the field and verify all dimensions before submitting Shop Drawings or samples.
- C. Show in detail the various portions of the work, graphic and art layouts, kind of materials, size of members and method of securing same together and to work of other trades.
- D. Where provisions must be made for attaching other materials to work included under this Section or where provisions must be made for assembly and installation in the field, the required cut outs and attachments shall be provided in the shop. All such items shall be indicated on the Shop Drawings.

1.3 SAMPLES OF MATERIALS

- A. Initial Selection Samples: Submit a minimum of six samples measuring 8 inch x 8 inch each showing complete range of colors, textures, and finishes available for each material used.
- B. Verification Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected.
- C. For all permanent fixed signage:
 - 1. Submit paper proofs a minimum of 50% of full size, and;
 - 2. Submit samples of all colors being used.

- E. Submittals must be scheduled and made so that any problems can be addressed in time to fit within the station opening schedule milestone.
- F. The Engineer may inspect all material and workmanship at any time during the progress of the work and shall have the right to reject all material and workmanship that does not conform to the Specifications or that is not considered of adequate quality in terms of accuracy of registration, color, or coverage.
- G. Manufacturer's Data
 - 1. List manufacturer and branch name for each type and color of paint used.

1.4 COLOR SAMPLES

- A. Colors shall be pure, non-fading pigments, mildew-proof, sun proof, finely ground in approved medium. Colors used shall be submitted on the respective material surfaces. The "Commuter Rail" purple paint color shall match Dupont Imron 1976.

1.5 QUALITY ASSURANCE

- A. The approved manufacturer shall be experienced in the type of work required, shall have a reputation for doing satisfactory work on time, and shall have recently successfully completed similar work.
- B. Deliver and store work under this signage in a manner to prevent cracking, chipping or stress of components, and to prevent mechanical damage or damage by the elements. Damaged items shall be removed and replaced as directed.

1.6 STANDARDS

- A. Except as modified by governing codes and by the Contract documents, work shall comply with the applicable provisions and recommendations of the following:
 - 1. The Commonwealth of Massachusetts, Massachusetts Highway Department Standard Specifications for Highways and Bridges, 1988 Edition, and its latest supplements, Sections 828 and 840 referred to as MHD
 - 2. U.S. Department of Transportation Federal Highway Administration Manual on Uniform Traffic Control Devices, 1978.
 - 3. The Massachusetts Bay Transportation Authority Commuter Rail Design Standards.
 - 4. The Massachusetts Bay Transportation Authority Guidelines and Standards, Part V-Graphics.

PART 2 - PRODUCTS

2.1 METAL SURFACES, GENERAL

- A. Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, roughness, oil-canning stains, discoloration or other imperfections.

2.2 ALUMINUM SHEET

- A. Aluminum shall be of thickness and sizes shown, constructed of 6063-T5 and 6061-T6 sheet and extrusions or other alloy as required to receive finishes indicated. Aluminum in contact with dissimilar metals shall have bituminous or other protective coating applied to the contact surface to prevent electrolytic action.
 - 1. Aluminum traffic sign panels shall be Type A as referred to in the Standard Specifications for Highway and Bridges, MASS DPW. Sign panels shall be fabricated from flat sheet aluminum sheeting, ASTM B209, Alloy 6061-T6 not less than 0.080 inches thick.
 - 2. The sign background shall be reflective sheeting conforming to Federal specification L-S-300A. The reflective sheeting shall include a precoated pressure sensitive adhesive or a tack free heat activated adhesive either of which shall be applied exactly as specified by the sheeting manufacturer to recommended, properly prepared flat surfaces without necessity of additional adhesive coats on the reflective sheeting or application surface. The reflective sheeting and its application shall conform to the requirements of the Commonwealth of Massachusetts, Department of Public Works Standard Specifications for Highways and Bridges specification M9.30.1 Reflective Sheeting. The sign lettering shall be as noted on Contract Drawings.
- B. Where aluminum work is indicated to the standard manufacturer's item, construction shall be based on manufacturer's standard assembly. Where aluminum is shop fabricated, all joints, returns and the like shall be properly joined together and welded, ground smooth and finished with proper grit. All exposed welded edges shall be ground smooth to proper natural aluminum finish. Welding rod shall be of same alloy as aluminum sheet.

2.3 PAINT

Paint shall meet the following requirements:

- A. Suitable for exposure to severe weather conditions.
- B. Strong, vivid, non-fading colors.
- C. Semi-gloss finish.

2.4 SILK SCREENING

- A. Screen printed text and symbols shall utilize photographically prepared screens and shall be printed in accordance with accepted industry standards. No handcut screens shall be accepted. All screen printing shall be executed in such a manner that all edges and corners of letterforms are true and clean. Letterforms, color areas, or lines with rounded positive or negative corners, built-up edges, bleeding, spattering, etc. will not be accepted. All screen printing shall be executed from photoscreens prepared from typesetter's reproduction of the text specified, or camera ready artwork. All artwork and typesetting shall be not less than 50% of actual specified size. All inks shall be applied evenly without pinholes, scratches, orange peeling, etc. Screen printing inks shall be fast drying enamel finish.
- B. All silk screening processes shall be approved by the Engineer prior to fabrication. Masking shall be done carefully so as to not leave bleeding or rough edges at painted surfaces. Spray guns used for art work shall be airless type as approved. All graphic work shall receive at least two coats of paint.

2.5 TYPEFACES

- A. Unless otherwise noted, typefaces shall be Helvetica medium and shall be industry standard normal letter spacing.

- B. Typefaces and letter spacing shall be approved by the Engineer before final manufacture.
- C. Typical type and symbols layout for each sign type is indicated on the Drawings. All type shall be placed according to the dimensions shown on the Drawings. Should any design conflict occur in the manufacture and fabrication of the signage; i.e., type not fitting, it shall be brought to the attention of the Engineer.
- D. Application of all lettering, arrows, and other artwork shall be photographic silk screen. No modification of type faces or layout rules and the arrow/circle will be permitted without approval by the Engineer.

2.6 FABRICATION

- A. General: Verify measurements and dimensions at the job site and cooperate in the coordination and scheduling of work of this Section with work of related trades, with particular attention given to installation of sign supports and framing.
- B. Painted Aluminum Signs
 - 1. Form aluminum work to the required shapes and sizes, with true curves, lines and angles as shown. Provide necessary lugs, rebates and brackets for assembly of units. Use concealed fasteners where possible.
 - 2. Make all threaded connections tight so that threads are entirely concealed. Provide abutting bars which are shouldered and headed, doweled and pinned. Pass small bars through larger bars and pin. Provide flat and countersunk heads on rivets, bolts, and screws in exposed work and elsewhere as required. Carefully machine, fit and secure removable members by means of Allen set screws of proper size and spacing.
 - 3. Aluminum signs shall be pretreated by solvent cleaning and a wash coat of basic zinc chromate-vinyl butyral conforming to MHD materials specification M.7.04.10.

2.7 NEW SIGN FRAMING

- A. Fabrication of all required supporting and enclosing frames shall be in accordance with the Standards of Section 05500.
- B. Provide complete shop drawings.
- C. Framing shall be hot-dip galvanized after fabrication and touched-up as directed by the Engineer.

2.8 FASTENINGS AND ANCHORS

- A. Design a complete system of fastenings and anchorage devices for the various signs, as required for attachment to the various supporting structures. These may include, but are not limited to, concealed clip systems, face screws, epoxy adhesives, etc. Wherever reasonably possible, fastenings and anchorage devices shall be fully concealed, and shall be vandal proof. The Contractor is responsible to provide safe and secure installation in strict conformance to the governing laws and building code.
- B. Fully describe proposed fastenings and anchorage devices for each sign type on the shop drawings.
- C. Hardware: Provide all necessary hardware required to complete the Work, and as follows:
 - 1. Bolts, screws and miscellaneous fasteners: Brass or bronze.
 - 2. Hangers, studs, clip angles, and filler plates: Commercial stock galvanized steel, M10-20.
 - 3. Exposed fasteners: As indicated above, and tamper proof.

- D. Plywood: Provide exterior grade marine plywood as graded by the American Plywood Association.

2.9 SIGN SUPPORTS (P-5 POSTS)

- A. Standard ground mounted sign supports for aluminum traffic signs shall be furnished and installed in accordance with Section 840 of the Standard Specifications for Highways and Bridges of MASS. DPW, Type P-5 Channel Post.

2.10 MBTA LOLLIPOP SIGN

- A. Furnish and install sign fabricated as shown in the Drawings. Two aluminum sign panels are required for a single double faced sign assembly. Sign post shall be galvanized and shop painted steel. Sign assembly (sign panels, frame, post, foundation and related accessories) shall be installed at a location within the traffic island at the Central St. driveway entrance. Exact location will be determined by the Engineer.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erection of work under this section shall be performed by experienced qualified sign erectors. Panels and signs shall be true, plumb and level, located as shown on the Drawings and set with true joints to the width as shown on the Drawings. Fastenings shall be concealed of the type shown on the Drawings or as approved and shall be stainless steel spanner head sheet metal screws located on the sign where shown.
- B. Furnish and install shims, tabs, clips, screws, bolts, spacer sleeves, supports and all necessary items to make the complete installation. Upon completion of the installation, work shall be checked and readjusted as necessary.
- C. Non-Shrink Construction Grout shall be applied beneath the sign base plates and is included in the cost of the signs.
- D. All free-standing sheet aluminum signs shall be mounted on a standard P-5 break-away post assembly, in accordance with MHD Section 840, as shown on the Contract Drawings.
- E. Handicap signs are to be mounted on a standard P-5 post set as shown on the Contract Drawings.
- F. Double faced MBTA Lollipop Sign shall be mounted within frame/sign post as shown in Drawings and installed on footing. Sign will be located as directed by the Engineer.
- G. The exact location of all signs will be determined by the Engineer.

3.2 CLEANING

- A. Surfaces of sign work shall be cleaned as recommended by the sign manufacturer after installation and left in a condition satisfactory to the Engineer.
- B. Fiberglass shall be in prime condition, free from dirt, scratches, handmarks and other blemishes.
- C. Inspection shall be made by the Engineer to determine the condition of work. Damaged work, and work not in compliance with Contract Documents shall be rejected and replaced at no additional cost to the Authority.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 14241

ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 GENERAL DESCRIPTION:

- A. This provides design guidelines for the fabrication, installation, and testing of Machine Room Less (MRL) elevator at (Insert Station Name).
- B. Related Sections include the following:
 - 1. Section 03300 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 2. Section 05120 "Structural Steel" for attachment plates, angle brackets, and other preparation of structural steel to support elevator equipment and components.
 - 3. Section 08311 "Access Doors and Frames" for wall and ceiling access panels and access doors in elevator enclosures.
 - 4. Section 08801 "Glass and Glazing" for glass in elevator enclosures and doors.
 - 5. Division 16 Sections for electrical service to elevators, including disconnect switches.

1.3 ELEVATOR DEFINITIONS:

- A. Heavy duty elevator: An elevator designed specifically for the harsh environment and duty load cycles common to transportation system usage.
- B. Elevator - a hoisting and lowering mechanism, equipped with a car or platform, which moves in guide rails or racks and serves two or more landings.
- C. Elevator, passenger - an elevator used primarily to carry persons other than the operator and persons necessary for loading and unloading.
- D. Elevator, gearless- a traction machine, without intermediate gearing, that has the traction sheave and the brake drum mounted directly on the motor shaft.
- E. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions

- F. Contractor: The General Contractor.
- G. Installer: The responsible party who installs the elevator.
- H. OEM: Original Equipment Manufacturer.
- I. Owner: The owner in control of the facility.
- J. Dwell time: The period of time the elevator is at a landing while the doors open, passengers transfer and doors close.
- K. Substantial completion: The point at which the elevator is ready for use, whether the site is finished or not. This is where the jurisdictional inspection usually takes place.
- L. Final Acceptance: The point at which the owner accepts the elevator project as being complete including all submittal requirements. This may be a different point in time than substantial completion.
- M. Interim Maintenance: Planned monthly maintenance during the warranty period.
- N. Beneficial Use: When the elevator is placed into service, may be prior to the site being ready for public use.
- O. Revenue Service: The station or facility opening date.
- P. Notice to Proceed (NTP): within this document shall mean the date which the elevator installer is notified to proceed with the project.
- Q. Authority Having Jurisdiction (AHJ): as defined by ASME A17.1.
- R. MBTA: Massachusetts Bay Transportation Authority (Owner)
- S. MSDS: Material Data Safety Sheets, as defined by OSHA
- T. OSHA: Occupational Safety and Health Administration

1.4 ACRONYMS

- A. DF1: Full Duplex Serial Protocol
- B. OEM: Original Equipment Manufacturer
- C. SCADA: Supervisory Control and Data Acquisition

1.5 TEMPORARY AND PERMANENT ELECTRICAL POWER SERVICES:

Contractor shall provide and coordinate the following:

- A. Temporary power for installation shall be made available to Installer at the time of the installation. Permanent power shall be made available for testing. All power shall be provided at no cost to Installer.
- B. For the elevator drive systems: 480, 3 phase, 3 wire, 60 Hertz terminating in a disconnect switch within sight of the controller.
- C. For lighting and GFCI receptacles: 120 volts, 1 phase, 3 wire, 60 Hertz terminating at the elevator controller location.
- D. Separate disconnect for cab lighting and wiring to cab: 120 volts, 1 phase, 3 wire, 60 Hertz terminating in a disconnect switch within sight of the controller.
- E. Separate service for sill heaters, and other ancillary elevator equipment, where required.

1.6 APPLICABLE CODES, STANDARDS, ORGANIZATIONS AND PUBLICATIONS:

Elevator designs and installations shall be of the heavy duty type, and shall comply with the following.

- A. American Society of Mechanical Engineers (ASME)
 - 1. ASME A17.1 2004 (Edition to be determined by MA 524 CMR 13.00)
- B. National Fire Protection Association (NFPA)
 - 1. NFPA No. 130, "Fixed Guideway Transit and Passenger Rail Systems"
 - 2. NFPA No. 13, 70 and 72
- C. National Electrical Code (NEC)
- D. American Public Transit Association (APTA) Machine Room Less elevator design guidelines
- E. IEEE 519 Standard Practices and Requirements for Harmonic Control in Electrical Power Systems
- F. American Welding Society (AWS)
- G. American Society of Testing and Material (ASTM)
- H. International Standards Organization, ISO 281/I-1997
- I. American Federation of Bearing Manufacturers Association, AFBMA, Std. 9 and 11
- J. National Electrical Manufacturers Association (NEMA)
- K. The American Insurance Association
- L. Occupational Safety & Health Act (OSHA)

- M. International Code Council/ American National Standards Institute, (ICC/ANSI), A117.1-2004
- N. American Disabilities Accessibility Guidelines for Buildings and Facilities (ADAAG), 2004
- O. Building Officials & Code Administrators International, Inc. (BOCA)
- P. Massachusetts Architectural Access Board (MAAB), 521 CMR 28.00
- Q. Massachusetts State Building Code, 780 CMR
- R. Massachusetts Elevator Regulations, 524 CMR
- S. Boston Center for Independent Living Settlement Agreement (BCIL)
- T. Massachusetts Bay Transportation Authority (MBTA) 8th edition Elevator Design Standards
- U. Any additional requirements imposed by local agencies shall be incorporated into elevator installations.
- V. In case of a conflict between codes, regulations, or standards, the most stringent requirement shall take precedence.
- W. The elevator installer shall be licensed and strictly governed by local and governmental authorities of this area in order to perform this work.

1.7 SUBMITTALS:

- A. Submit OEM's product data and samples for the system proposed for use. Product data shall include, but not be limited to the following:
 - 1. Electrical characteristics and connection requirements.
 - 2. Expected heat dissipation of elevator equipment in machine room and control areas (i.e. BTU's/hr.) based on 120 round cycles per hour.
 - 3. Maintenance programs: within sixty (60) days after notice to proceed, and prior to installation, contractor shall submit to MBTA Engineering and Maintenance and Design and Construction Departments detailed interim and revenue service maintenance programs, showing functions to be performed and their scheduled frequency. MBTA departments must approve said programs
 - 4. Machine performance data sheets.
 - 5. Pre-acceptance test forms.
- B. Shop Drawings: Eight (8) copies of the shop drawings shall be provided by the Installer, including two (2) copies delivered to MBTA Engineering and Maintenance for review by staff and consultant. Submit approval layout drawings to scale. Drawings shall include, but not be limited to the following:
 - 1. Car, guide rails, buffers and other components in hoistway.

2. Maximum rail bracket spacing.
 3. Maximum loads imposed on guide rails requiring load transfer to the building structure.
 4. Loads on hoisting beams.
 5. Clearances and travel of car and counterweight runby.
 6. Clear inside hoistway and pit dimensions.
 7. Location and sizes of access doors, hoistway entrances and frames.
 8. Car & Hall signal and operating fixtures.
 9. Remote wiring layouts for each elevator.
 10. Refuge space on top of car and pit.
 11. Control room, machine area, pit and hoistway layout.
 12. Cab design, dimensions and layout.
 13. Hoistway-door and frame details
- C. Complete assembly detail of machine, machine mounting, machine beam assembly, dead end hitch and beam assemblies, governors, safeties, counterweights, with all load calculations.
- D. Samples of materials and products requiring color or finish selection.

1.8 OPERATING AND MAINTENANCE MANUALS:

- A. Maintenance Manuals: Prior to installation, Contractor shall submit two (2) complete sets of operation and maintenance manuals for approval. After MBTA Engineering and Maintenance Department and MBTA Engineer's approval and prior to the beginning of acceptance testing, four (4) sets of the approved manuals shall be provided by the Contractor. The manuals shall include the following:
1. Complete table of contents.
 2. Complete instructions regarding operation and maintenance of the elevator equipment. Included will be complete illustrated, exploded views of all assemblies, and a complete, illustrated, exploded view for identifying all system parts. Maintenance plans, procedures and frequency shall be in accordance with the MBTA Vertical Transportation Maintenance Agreement as identified in Section 1.10 Acceptance and Warranty E.3.a.2)
 3. Complete nomenclature of replaceable parts, part numbers, current cost, and warehouse location. If product source is another vendor, Contractor shall include name and address of other vendor.
 4. Sample copies of a proposed preventive maintenance chart.

5. Descriptions of safety devices.
6. Safety Sections, tests, and procedures, including testing of all systems and subsystems.
7. Procedures for adjusting all elevator components, including pictorials.
8. Troubleshooting techniques.
9. Detailed lubrication and cleaning schedule indicating weekly, monthly, quarterly, semiannual, and annual lubrication; and a description of each lubrication point, lubrication type, and specification.
10. Control and schematic electrical wiring diagrams of controller, including wiring of safety devices to connections with remote indication and control panels for the elevator.
11. Electrical layout showing placement of lighting, light switches, receptacles, light fixtures, disconnect switches, and convenience outlets in control areas, machinery spaces and pits.
12. Complete detailed drawings and wiring diagram of elevator system.
13. The Installer shall be required to provide certification, in writing and signed by an officer of the organization, that the Owner shall be provided with copies of any and all information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem, or material and services applicable to the elevator provided.
 - a. All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the elevator.
 - b. The referenced material shall be provided within thirty (30) days of publication or internal distribution by the elevator manufacturer. The material, even if labeled PROPRIETARY, shall be delivered to the Engineer without prejudice or delay and at no additional cost.
14. The entire manual, all software upgrades and service tools for elevators shall be provided in an electronic format on CD-ROM that is acceptable to the MBTA Engineering and Maintenance Department.
15. MSDS and product data sheets: Shall be submitted with an index listing each product, along with the application method of the product, approximate quantity of product per elevator, and the component the product is applied to or associated with. The Installer shall allow 6 (six) weeks for review of MSDS

1.9 QUALITY ASSURANCE:

- A. OEM's Qualification: Regularly engaged for the past five years in the manufacture of major components for machine room-less (MRL) passenger elevators. As a standard of quality the elevator equipment design and installation shall comply with the code.

- B. Installer's Qualifications: OEM's representative or authorized agent of elevator equipment OEM who is trained and approved for installation of units required for this Project.
- C. Source Limitations: Obtain elevators through approved source preferably a single manufacturing plant. Buy American provisions are stipulated in the General Terms and Conditions of this Contract.
- D. Welding: Welding shall be performed in accordance with the requirements of AWS or CWB Welders shall produce evidence of current certification by AWS or CWB.
- E. The elevator subcontractor shall guarantee the materials and workmanship of the apparatus furnished under these specifications and will make good any defects not due to ordinary wear and tear or improper use or careless, which may develop within one (1) year from date of completion of each elevator, inclusive of labor and traveling expenses.
- F. Labeling Requirements: Every elevator shall be clearly marked with rated load and speed, manufacture serial number, and the designated Owner's identification.
- G. Requirements of Regulatory Agencies
 - 1. Application, Permits, Inspections, and Tests
 - a. Contractor shall obtain and pay for all necessary permits, and perform such tests as may be required for acceptance and approval of elevators by jurisdictional agencies.
 - b. Contractor shall notify the proper inspectors to witness required testing.
- H. Testing: Perform all required testing as per paragraphs 3.3 and 3.4 of this specification

1.10 DELIVERY, STORAGE AND HANDLING:

- A. Store materials in original protective packaging in a dry and protected area.
- B. Protect equipment exposed finishes during transportation storage and erection against damage and stains.
- C. Deliver components with factory-installed wooden skids and lifting lugs; pack components in factory-fabricated protective containers.
- D. Handle components carefully to avoid damage to components, enclosures, and finish.
- E. Store components in clean, dry areas and protect them from weather. Storage shall be in areas designated by the Engineer.
- F. Comply with the OEM's rigging instructions for unloading components; and moving components to their final location for installation.

1.11 ACCEPTANCE AND WARRANTY:

- A. All acceptance tests must be completed as specified in contractual documents and technical specifications, reference paragraph 3.3 this specification

- B. To coincide with the current MBTA Vertical Equipment Transition Plan, the OEM shall warrant in writing that all equipment manufactured and installed under this specification, for a period of twelve (12) months from the date of Final Acceptance by the Owner, be free of defects in design, materials, and workmanship, under normal use and service.
- C. The warranty shall include materials and labor necessary to correct defects.
- D. Defects shall include, but not be limited to, noisy, rough, or substandard operation; loose, damaged, and missing parts; and fluid leaks.
- E. Warranty Maintenance Requirements:
 - 1. The installer shall provide twelve (12) month preventive maintenance service to coincide with the warranty period.
 - 2. The installer shall provide an interim maintenance service prior to being added into the Owner's maintenance program.
 - 3. This interim maintenance shall start at the final equipment acceptance and at the time of issuance of the Certificate for Operation by the State of Massachusetts Elevator Inspector. Interim maintenance shall be provided for a period of twelve (12) months.
 - a. Tasks:
 - 1) Inspection of completed installation and periodic testing to maintain elevator in completely operable condition.
 - 2) Perform service/maintenance on each elevator in accordance with the MBTA Vertical Transportation Maintenance Agreement and as follows:
 - (a) Traction Elevator Work

The preventive maintenance, service, repair, inspection and testing work specified hereafter shall be considered the minimum work requirements for traction elevators and associated systems and equipment included in this contract as part of the contract base scope and as included in the contract base price. If additional preventive maintenance, service, repair, inspection or testing is required for safe, reliable operation as directed by The Authority or as may be required in accordance with the original equipment manufacturers specifications, instructions or applicable codes, laws or regulations, the Contractor shall perform that required work at no additional cost to The Authority at any time throughout the duration of the contract. In support of this, the following list of standards is not meant to be all-inclusive but to serve as an outline for the nature of traction elevator work required in this contract at periodic intervals. The goal for this agreement is uninterrupted elevator service, with allowances for

preventive maintenance and scheduled inspections. Note the work performed, fill out log book entry form and provide other documentation requirements as shown.

A.1 Traction Elevator Monthly Requirements

- a) Observe operation of elevator throughout its full range and at all floors that it serves to test controls, safety devices, leveling, etc. Perform necessary adjustments or repairs.
- b) Check door operation. Clean and lubricate linkages, gears, motors, checks, check keys, set screws, contacts, chains, cams, etc. Clean, adjust or repair as required electronic door operation system (as applicable).
- c) Check and clean car door clutch assembly.
- d) Check door protective devices and fastenings for operation and tightness. Adjust or repair as required.
- e) Check car door rollers, eccentrics and gibs. Adjust or repair as required.
- f) Check selector operation. Inspect, clean, lubricate and adjust brushes, dashpots, traveling cables, chain, pawl magnets, wiring, contacts, relays, tape drive and broken tape switch.
- g) Check car. Inspect, Clean, lubricate and adjust car door tracks, pivot points, hangers, car grille and stile channels and car top exits.
- h) Inspect and test the emergency intercom and/or telephone devices and the emergency alarms or bells. Comply with Authority policies and procedures regarding that equipment and notify the MCC X5278 of any defects or problems discovered. Perform required adjustments or repairs.
- i) Inspect ADA fixtures, appliances, devices, components and equipment. Perform repairs as required
- j) Observe operation of the signal and dispatching system. Inspect compensating hitches, rope clamps, slack cable switch, couplings, keyways and pulleys. Check load weighing device

and dispatching time settings. Clean, lubricate and adjust as required.

- k) Inspect and test the firefighter's service, medical and hospital emergency service systems for proper operation. Perform adjustments or repairs as required.
- l) Inspect governor fastenings. Inspect, clean and lubricate governor working parts. Perform repairs as required.
- m) Clean motors, motor-generators, brakes and associated machinery components.
- n) Inspect commutators for finish, grooving, eccentricity and mica level. Clean, turn or refinish commutators to provide proper commutation as required.
- o) Inspect machine brushes for arcing and gear bearings for wear and end play. Perform repairs as required.
- p) Service guide rail lubricators.
- q) Clean, lubricate and adjust overload mechanism (as applicable).
- r) Visually inspect controller, contacts, relays, resistance tubes, grids, fuses, holders, controller connections and alignment of switches. Clean and make adjustments and replace components as required.
- s) Inspect, adjust, repair or replace as required: car interior, floor, walls, ceiling, car interior appurtenances, car ventilation system, hall and car call buttons, hall lanterns, car station buttons and switches and elevator out-of-service flip down signs.
- t) Inspect hoistway and pit, including buffers. Clean and lubricate equipment as required.
- u) Clean machine and machine room floor.
- v) Inspect and test float switches and sump pumps in pits, machine rooms and machine spaces. Notify the MCC X5278 in the event of failure of these devices.

- w) Perform a general inspection of machinery, sheaves, worm and gear, motor, generator, brake, seals, bearings, etc. and lubricate as required.
- x) Observe brake operation and adjust or repair as required.
- y) Inspect and lubricate machinery contacts, linkages and gearing.
- z) Inspect, clean and lubricate as required controllers, relays, connections, switches, contacts, traveling cables, chain and magnets, etc.
- aa) Ride car and observe operation of doors, door timing, leveling and opening devices, selector control mechanisms, car station and hall buttons, position indicators, etc. for smoothness and proper function. Perform adjustments or repairs as required.
- bb) Inspect, clean and lubricate signal drive mechanism.
- cc) Inspect condition and lubrication of rails, as applicable. Service lubricators.
- dd) Inspect tape tension sheave fastenings. Perform adjustments or repairs as required.
- ee) Clean pit, empty drip pans and remove rubbish, trash, debris, etc. Discard waste material in an approved, legal manner.
- ff) Inspect hall and landing area lighting at each floor or level. Notify the MCC X5278 of any defects or problems discovered.
- gg) Inspect button, indicator and signal lamps and lights in each car and hall, machine room, pit, landing areas, etc. for normal and emergency lighting. Replace all lamps and lights and perform repairs as required.

A.2 Traction Elevator Quarterly Requirements

Traction elevator quarterly requirements shall include the monthly requirements listed above, plus the following:

- a) Check leveling operation. Clean, lubricate and adjust leveling switches, hoistway vanes, magnets and inductors. Perform adjustments or repairs as required for proper leveling.

- b) Examine ropes for wear, proper lubrication and replace as required. Clean both governor and hoist ropes, lubricate hoist ropes as required (do not lubricate governor ropes). Inspect fastenings, sheaves, rope hitches and shackles and equalize rope tension.
- c) Inspect hoist reduction gear brake and brake drum, drive sheave, motor and bearings for wear.
- d) Thoroughly clean car light fixtures (normal and emergency power).
- e) Inspect, clean and adjust retiring cam device, chain, dashpots and commutators. Check oil level of car cam devices. Test emergency switch (ground case if necessary). Inspect safety parts, pivots, set screws, switches, etc. Check adjustment of car and counterweight gibs, shoes or roller guides. Lubricate and adjust as required.
- f) Empty and clean oil drip pans and devices and replace any approved absorbent materials in the pit and discard waste material in an approved, legal manner.
- g) Visually inspect and clean safety parts and lubricate moving parts to assure their proper operation. Check and adjust clearance between safety jaws and guide rails.
- h) Clean sides of hoistway, door and car glass (interior and exterior).
- i) Clean controller with blower or vacuum and inspect each of the switches, relays, timers, contacts, hinge pins, etc. for wear and adjust and lubricate. Check voltages, resistance tubes and grids. Check resistors for indications of overheating and if overheating is found, locate and correct the problem. Check oil in overload relays, settings and operation of overloads (manual and automatic) and adjust as required. Clean and inspect fuses, holders and controller connections. Check and adjust electronic components, protective circuits and devices on controller.
- j) Inspect machine worm and gear backlash, thrust end play and machine bearing wear. Perform repairs as required.

- k) Check inertia of doors on door closers and adjust as required. Observe operation of checks, interlocks, guides, hanger wheels and close cables, etc. and adjust or replace as required.
- l) Inspect all sheaves. Perform repairs as required.
- m) Examine hoist and governor ropes and fastenings for wear, lubrication, length and tension. Lubricate (as applicable), adjust or replace as required.
- n) Examine, clean and adjust guide rails, cams and fastenings of counterweights.
- o) Inspect, clean, adjust and lubricate traveling nut and gears on selector.
- p) Inspect, clean and adjust contacts and switches on car operating box.
- q) Inspect and test for proper operation of limit and terminal devices and switches. Perform adjustments or repairs as required.
- r) Inspect car stile channels, frame and cam supports for bends or cracks. Perform repairs as required. Clean car grille and stile channels.
- s) Check damping motor brushes and replace if required.
- t) Check car door operation. Check shaft bearings, tapered pins, alignment and operation of cams and rollers.
- u) Perform adjustments or repairs as required.
- v) Check hoistway door operation. Fill and adjust checks and door eccentrics. Check bottom gibs, struts, sills, headers, bumpers and fastenings. Adjust door contacts as required. Clean, lubricate and adjust chains, tracks, hangers, linkage gibs, interlocks and sheaves.
- w) Inspect, clean and repair as required car gate up-thrust, sill grooves and bottom guides.

- x) Check adjustment of car shoes or roller guides. Adjust and lubricate (as applicable) as required including guide shoe stems. Check car clearance and safety shoes and adjust as required.
- y) Check car frame, cams, supports and car steadying plates. Check pivot points, sheaves, guides and track for wear. Lubricate as required.
- z) Check car operating stations, hall buttons and indicators and their associated connections, contacts, springs and wiring. Clean and lubricate as required.
- aa) Inspect, test and repair or replace as required elevator safety and emergency systems including batteries, lighting, rescuators, glass-break security systems, firefighter's service, medical and hospital emergency service and auxiliary equipment.
- bb) Inspect, test and repair or replace as required hoistway, car and machine room ventilation equipment and associated mechanical and electrical components.
- cc) Thoroughly clean car guide rails using a non-flammable or high flash point solvent to remove lint, dust and excess lubricant.
- dd) Inspect traveling cable insulation, performance, hangers and junction box connections. Perform repairs or replacement as required.

A.3 Traction Elevator Semi-Annual Requirements

Traction elevator semi-annual requirements shall consist of the following:

- a) Twice yearly- once in April and once in October of each year- thoroughly clean, brush down and vacuum entire hoistway and car including car tops, sides, bottoms, door sills (entire length), hoistway walls (including glass), overhead and divider beams, pits and associated areas of materials foreign to the elevators (i.e. pigeon droppings, dust, dirt, debris, etc.) and dispose of waste material in an approved, legal manner.

A.4 Traction Elevator Annual Requirements

Traction elevator annual requirements shall include the quarterly requirements listed above, plus the following:

- a) Inspect machine brake and brake drum, drive sheave and motor. Remove, clean and lubricate brake cores on DC brakes, clean linings as required and inspect for wear.
- b) Inspect motors and generators. Thoroughly clean motors, armatures and commutators with blower or vacuum. Inspect armature and rotor clearances, commutator surface and clean and/or undercut as required. Check motor and MG set connections, change oil in bearings and lubricate in accordance with the original manufacturer's specifications and instructions.
- c) Thoroughly test and re-adjust equipment for proper slow-down, acceleration and stopping operations.
- d) Drain, flush and refill oil reservoirs of each hoisting motor and motor-generator in accordance with the original equipment manufacturers specifications and instructions. Dispose of waste oil and material in accordance with applicable code(s) and law(s) at a licensed disposal facility approved by the Authority. The contractor shall supply proof of licensing to the Authority for approval.
- e) Inspect and reset as required, brushes for neutral settings, proper quartering and spacing on commutators.
- f) Thoroughly inspect, test and adjust the control system's dispatching, scheduling and emergency service features in accordance with the original equipment manufacturers specifications and instructions. The Contractor shall prove to the satisfaction of The Authority that the system functions as designed. Work shall be scheduled and performed by the Contractor in a manner and time that shall not impact passengers, as specified elsewhere in this section. A full report for each elevator that includes adjustment time intervals, dispatch times on various programs, door standing times and door opening and closing speeds shall be furnished to The Authority, as specified elsewhere in this section.
- g) Thoroughly clean each elevator pit, machine area and machine room. Paint machine room floors.

4. Four (4) cab door gibs
5. One (1) electronic door detector
6. One (1) set of replacement lights for the elevator cab
7. One (1) box of each type of fuses
8. Two (2) complete door interlock assemblies
9. One (1) door operator motor
10. Two (2) complete pushbutton assemblies for car operating station and hall stations

1.14 DESIGN CRITERIA:

A. General

1. Elevators shall be designed with provisions for thermal expansion and contraction of complete elevator assemblies.

B. Operational Requirements

1. Hours of operation shall be considered as twenty-four (24) hours per day, seven (7) days per week.
2. Elevator components shall be designed based on the following applied duty cycle during operation:
 - a. Three (3) Hours with 100% Rated Load
 - b. Six (6) Hours with 50% Rated Load
 - c. Fifteen (15) Hours with 25% Rated Load
3. Maximum dwell time per landing in these calculations shall be no more than 10 seconds.

1.15 ENVIRONMENTAL REQUIREMENTS:

- A. Elevators shall be designed to operate while exposed to the natural elements of weather, including sunlight, rain, slush, snow and ice; all conditions of relative humidity while exposed to salt, de-icing chemicals, airborne dust, and debris, and corrosive elements; and in a dry bulb temperature range of minus twenty (20) to plus one hundred and ten (+110) degrees Fahrenheit.
- B. Sound Level: Elevators shall be designed to operate at or below a sixty-five (65) decibels sound level, measured five (5) feet above the elevator cab floor at any location, with the elevator operating normally, either free running or under load. For multiple elevator installations, the noise measurements shall be made with only one (1) elevator unit in operation, but with the entire installation complete and in operating condition. An ambient level not to exceed forty-nine (49) decibels shall be maintained prior to units being turned on.

- C. Seismic Zone Requirements: The elevator shall be designed to comply with seismic zone 2 requirements of MA 524 & 780 CMR regardless of edition of ASME A17.1 approved for this project. The sole exception to this requirement is where the Owner has designed the structure for a more stringent seismic requirement.
- D. Bearings: All fixed machine and motor bearing housings shall be provided with a drilled, tapped and spot faced area in the vertical and axial axis to accommodate a transducer that a Fast Fourier Transform (FFT) analyzer requires. Permanently mount transducers on the drive bearings or where recommended by the machine OEM and run the wires into the controller to a panel with BNC connectors on the ends to accommodate the FFT analyzer.
 - 1. Motor limit: rigid mount: .15 ips flex mount: .2 ips.
 - 2. Bearings shall be rated for an AFBMA L10 life as specified, under a fluctuating bearing load. All bearings shall have basic dynamic load ratings.
- E. Fasteners:
 - 1. Fasteners shall be compatible with materials being fastened
 - 2. Fasteners shall be furnished with self locking nuts or retaining rings (spring washers, toothed disks).
 - 3. Fasteners shall be equal to or of greater corrosion resistance than the most corrosion resistant metals being fastened.
- F. Ride Quality:
 - 1. All elevators shall have a maximum decibel reading of 70 Dba with the doors closed during a run in the up direction, measured 5 feet above the floor in the center of the cab.
 - 2. All elevators shall have a maximum vibration of 30 milli-g's in the X, Y and Z axis measured with an A95 filter.

1.16 COORDINATION REQUIREMENTS:

- A. Alterations: Contractor shall coordinate any alterations required to accommodate elevators with the Owner.
- B. Floor finish in cab: Contractor shall coordinate with other appropriate contractors and/or trades. Contractor shall be responsible for the supply and installation of the finish flooring.
- C. Electrical: The Contractor shall coordinate all trades regarding the installation of CCTV, communications, smoke detectors, power and cab lighting requirements.
- D. Pit Drainage: Provide a means to prevent water from accumulating in the pit for outdoor elevators and indoor elevators. If pumps are used, they shall have a backup power source. See 6.0 of Civil/Structural Design Requirements

- E. Rigging Plan: Installer shall supply a detailed rigging plan that is approved by the Owner. Rigging plans to include, but not limited to, path of entry/egress, imposed loading on floor surfaces and structures, product data of devices to be utilized in the rigging process with reference dimensions and lifting capacities. Rigging plans to be signed and sealed by a professional engineer registered in the State of Massachusetts.
- F. Safety Training: Installer shall attend appropriate safety training programs provided by the Owner at no extra cost.
- G. As-Built Drawings: Contractor is responsible to provide revised Contract Drawings to reflect the actual as built condition including all structural, architectural, electrical, mechanical and plumbing connections to the elevators.
- H. Lock Cylinders:
 - 1. All locks and keys shall be as per Owner's current standard lock requirements as defined in specifications and with the approval of the MBTA Engineering and Maintenance Department. The current cylinder is an Allen Bradley Water Proof 800 F Series 2MM #455.
 - 2. Contractor shall verify with the Engineer that the requirements for hardware have not been amended or superseded.
 - 3. Contractor shall provide the Engineer with length, finish, and camming requirements of each cylinder required
- I. Methodology: The contractor shall meet with the Owner and provide a written method of installation for approval.
- J. Installer is required to coordinate and absorb all costs and efforts to secure required variances for the elevator installations applicable.

1.17 PROTECTION:

- A. During installation and until the elevator system(s) are fully operational and accepted by the Authority, Contractor shall make all necessary provisions to protect all elevator components from damage, deterioration, and adverse environmental conditions. Contractor shall not use or allow the use of the elevator(s) for construction purposes for activities such as hauling materials or worker transport during construction.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURER:

- A. Subject to compliance with the requirements of this Section, provide machine room-less elevators of one of the following manufacturers:
 - 1. Global Tardif
 - 2. Minnesota Elevator

3. Delta Beckwith
4. United
5. Canton
6. Approved equal.

B. Subject to compliance with the requirements of this Section, provide elevator cabs as specified:

2.2 MATERIAL:

- A. Except where product conformance to specific standards is indicated on the Contract Drawings and in ASME/ANSI A17.1, OEM's standard materials and equipment may be used in elevator construction, subject to approval. Materials cited below are intended to establish the standard of quality for comparable materials used by the manufacturer.
- B. Structural Shapes, Plates, Sheets, and Tubing: ASTM A36 Steel.
- C. Sheet Steel: ASNI/ASTM A446, Grade B.
- D. Stainless Steel: ASTM A167, Type 316L
 1. Stainless steel with embossed texture to be rolled into exposed surface. Location as noted herein.
 2. Type 316L, #4 finish. Located as noted herein.
- E. Aluminum: ASTM B211 or ASTM B221, Alloy 6061, T6.
- F. Transparent Glazing Panels: 9/16 inch (14 mm) minimum laminated safety glass conforming to the requirements of ANSI Z97.1 and 16CFR Part 1201.
- G. Flooring: Provide finish flooring as specified herein.

2.3 SPECIAL FEATURES:

- A. General:
 1. Elevator shall be of size, arrangement, capacity and shall comply with design criteria specified in this Section and as shown on the Contract Drawings, and in accordance with the requirements of the ANSI/ASME A17.1 and MA 524 CMR hereinafter in this Section the "Code".
 2. Provide all material and equipment necessary for the complete execution of all elevator work as specified in this Section and as shown on the Contract Drawings.
 3. Provide hoistway guards for protecting hoistway during construction. Hoistway protection shall include high solid panels surrounding each hoistway opening at each floor.

4. All electric equipment, conduit, fittings and wiring shall conform to the requirements of ANSI/NFPA No. 70 National Electric Code and MA 527 CMR.
5. Provide concrete inserts and other similar anchoring devices for the installation of guide rails, machinery and other elevator components. Epoxy ceiling anchors or epoxy side wall anchors are not permitted.
6. Clearance around equipment located in each elevator control room and machine area shall comply with the applicable provisions of ANSI/NFPA No. 70 National Electrical Code, MA 524 & 527 CMR.
7. Each elevator system is to be provided with a hands free wireless maintenance communication system that provides for communication from within each elevator car enclosure, car top and control room.
8. Provide special control and notification instrumentation required by code officials for low overhead conditions that are not code compliant and require variances.

2.4 SUMMARY OF FEATURES:

A. South Acton Station: Elevator Quantity: 2

- | | |
|------------------------------|-------------------------------|
| 1. Elevator Use: | Passenger |
| 2. Contract Load, in pounds: | 4,000# |
| 3. Contract Speed, in FPM | 200 (with full load) |
| 4. Travel Distance: | [Insert Travel] |
| 5. Car Size: | per contract drawings |
| 6. Serves: | 2 |
| 7. Number of Stops: | 2 |
| 8. Number of Openings: | 2 |
| 9. Operation: | Selective/Collective |
| 10. Machine Location: | Overhead within Hoistway |
| 11. Controller Location | Upper Mezzanine Level |
| 12. Machine Type: | AC gearless machine room-less |
| 13. Motor Horse Power: | [Insert Motor HP] |
| 14. Power Supply: | 480V, 60Hz , 3 Phase |

- | | |
|---|---|
| 15. Lighting/ Signal Power Supply: | 120V, 60Hz, 20A |
| 16. Ancillary/Auxiliary Power Supply: | 120V, 60Hz, Amperage |
| 17. Car/Hoistway Door Size: | per contract drawings |
| 18. Car/Hoistway Door Type: | per contract drawings |
| 19. Car/Hoistway Door Operation: | Power High-speed, heavy duty
Maximum opening speed 3.0 FPS |
| 20. Hoistway Entrance: | New, as specified. |
| 21. Cab Enclosure: | New, as specified. |
| 22. Cab Flooring: | Poured Acrylic Epoxy, Polymer or
Equivalent |
| 23. Door-Reversal Device: | Non Contact (Weather Resistant)
door reversal device |
| 24. Car Operating Panel: | Type 316L stainless Steel #4
finish with vandal resistant
features |
| 25. Car Position Indicator | Type 316L stainless Steel #4
finish with vandal resistant
features |
| 26. Car Direction Indicator | Type 316L stainless Steel #4
finish with vandal resistant
features |
| 27. Hall Call Stations: | Single riser
Type 316L stainless steel #4
finish with vandal resistant
buttons |
| 28. Communication System: | “Hands-Free” VPP phone |
| 29. Provide keyed switch in hall pushbutton station as directed to shut down elevator. Allen-Bradley 800 F Series 2MM Key #455. | |
| 30. Maintenance Term: | One (1) year |

2.5 DOOR OPERATOR EQUIPMENT:

- A. Provide a water resistant heavy duty door operator with encoderless VVVF drive. Closed loop door operator designed to operate car and hoistway doors simultaneously at the speed specified. Door shall open automatically when car stops at landing to discharge passengers or to answer valid calls and close automatically after predetermined time interval has elapsed. The doors shall be capable of smooth and quiet operation without slam or shock. Door operator to have the following features:
1. ½ hp motor and heavy duty sprocket, chain, belt, and sheaves
 2. Closed loop regulated speed performance
 3. Hand-held keypad programming
 4. Adjustments can be stored in the keypad and downloaded to another operator
 5. Adjustable door obstruction reversal
 6. Optical cams with LED indicators
 7. Test switches for open, close, nudging and speed zone set up
 8. Universal inputs for open, close, and nudging
 9. Reversing switch to back up the door reversal device.
- 10.a. Cab Door Switch and Restrictor. The doors on cab doors shall be equipped with approved cab gate switch and door restrictor of the cab unit system type tested as required by the Code.
- a. Gate Switch shall prevent operation of the car away from a landing until doors are locked in the closed position. Interlock shall prevent doors from opening at any position within the hoistway and or landing from the cab side unless car is at rest at that landing, or is in the leveling zone and stopping at that landing

-OR-

- 10.b. Cab Door Interlock. The doors on cab doors shall be equipped with approved cab door interlocks of the cab unit system type tested as required by the Code.
- a. Interlock shall prevent operation of the car away from a landing until doors are locked in the closed position. Interlock shall prevent doors from opening at any position within the hoistway and or landing from the cab side unless car is at rest at that landing, or is in the leveling zone and stopping at that landing
 - b. Cab door unlocking devices shall conform to the requirements of the Code and shall be provided to permit authorized persons to gain access to hoistway when car is away from landing
 - c. Provide an electric contact mounted on the car that will prevent the car from moving away from landing unless car doors are closed.

- B. Door Protection: Electronic Entrance Detector Screen: Provide TriTronics electronic door detector device, which projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one beam of the curtain is penetrated. Unit shall have transmitters and receivers spaced at a minimum distance to provide the maximum amount of protection within the height of the doorway. Systems, which have the availability to turn Off or On individual zones within the curtain, will not be allowed.

2.6 HOISTWAY EQUIPMENT:

- A. Guide Rails:
 - 1. Guides shall be steel T-section rails. Rail surfaces shall be machined smooth to insure proper operation of guides. Rail ends shall be accurately machined with tongue and matching groove centrally located on web. Non wearing rail surfaces are to be painted at the completion of the elevator in color selected by the Architect.
 - 2. Guides shall be joined and installed in accordance with Section 2.23 of the Code.
 - 3. Guide rails are not to be in view from within the elevator cab.
- B. Car Buffers: Spring type with blocking and support.
- C. Counterweight Buffers: Spring type with blocking and support.
- D. Roller Guides: Roller guides shall be mounted on top and bottom of the car and counterweight frames to engage the guide rails.
- E. Suspension Means: If steel core ropes are supplied, a means to provide constant lubrication shall be provided. An alarm indicator shall be provided when the oil reservoir is at 25% of capacity.
- F. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave. Machine to be mounted to the car guide rail or support beam mounted at the top of the hoistway
- G. Stop Switch: An enclosed stop switch, mounted in the pit of each elevator in accordance with Section 2.2.6 of the Code, shall prevent operation of elevator when switch is activated. Switch shall be of the type described in Section 2.2.6 of the Code.
- H. Emergency Auxiliary Stop Switch: An enclosed stop switch, mounted in the overhead machine area and/or on the machine of each elevator in accordance with Section 2.7 of the Code, shall prevent operation of elevator when switch is activated. Switch shall be of the type described in Section 2.7 of the Code.
- I. Dead End Hitch Assemblies: Provide dead end hitch assemblies in accordance with OEM's loading requirements.
- J. Counterweight:
 - 1. Counterweights shall consist of a steel frame welded or bolted together and necessary steel weight sections. These weight sections shall be held securely in place within the frame. A

minimum of two (2)-tie rods shall pass through the holes in all weight sections. Submit paint finish of counterweights for approval. Paint color selection to be determined by the Architect.

- a. A required counterweight screen where no compensation is used.
 - b. The bottom of the counterweight shall have a buffer striking plate and means to attach knock-off blocks during rope stretch.
 - c. Idler Sheave: To be located directly above the counterweight frame and integral with counterweight frame. The sheave material shall be accurately machined of semi-steel of hardness BHN 220-250 or as per manufacturer's requirements.
 - d. Roller guides shall be mounted on top and bottom of the counterweight frames to engage the guide rails. Counterweight guides shall be of the roller type; each guide shall consist of a set of three (3) large diameter polyurethane rollers equipped with sealed preloaded ball bearings. Each roller shall be supported by a pivoted rocker arm that shall automatically adjust itself to guide rail misalignment and prevent excessive lateral car movement.
- K. Governor: Friction type over-speed governor rated for the duty of the elevator specified and to operate the car safety. The finish of pit tension sheave shall be factory paint.
1. Locate the governor where the car or the counterweight in case of overtravel cannot strike it, and where there is adequate space for full movement of governor parts
 2. An electrical governor overspeed protective switch that, where operated, shall remove power from the driving machine motor and brake before or at the time of application of the safety.
 3. Seal and tag the governor with the running speed, tripping speed, and date last tested as required by Code.
- L. Tension Sheave: Provide tension sheave in accordance with OEM's governor and car safety loading requirements.
- M. Terminal Limits: Limit switches shall slowdown and stop the car at the terminals if the primary automatic stopping system fails.
- N. Life Safety Provisions: Life safety hooks and/or other life safety devices for fall protection to be in accordance with OSHA standards/guidelines. Life safety hook and/or other life safety devices locations to be coordinated and installed by the Installer.

2.7 MACHINE COMPONENTS:

- A. Motor:
1. Bearings shall be rated with an AFBMA L10 life of 65,000 hours
 2. The motors shall be of the alternating current reversible asynchronous or synchronous type of a design adapted to the severe requirements of elevator service. Motor shall be capable of developing the torque required to meet or exceed an acceleration rate of 2 ft/sec² for the elevator car.

3. A means to protect the windings and bearings from airborne dust shall be provided
4. Insulation of all windings shall be impregnated and baked to prevent absorption of moisture and oil. The insulation resistance between motor frame and windings shall not be less than one megohm. The motor windings shall stand a dielectric test of twice the normal voltage plus 1000 RMS volts of 60 Hertz, alternating current for one minute.
5. Motor leads in the conduit box shall have the same insulation class as the windings. Motor lead wire shall be rated 125 C and shall be sized for 105 C at the motor nameplate amperes at 1.0 Power Factor per Electrical Apparatus Service Association (EASA) recommendations. Leads are to be numbered for clockwise rotation when facing opposite the shaft end.
6. The motor shall be designed to stand the severe loads encountered in elevator service and the windings shall have a minimum insulation temperature rating two ratings higher than the actual temperature rise of the motor, with a minimum rating of NEMA class F.
7. The motor shall be designed to the ASME A17.1 rated load requirements.

B. Brake:

1. The brake(s) shall be of the self adjusting fail-safe (spring applied and electrically released) type provided with an external manual brake release and designed to meet the service factor demand of its intended use.

C. Gearless Machine:

1. Sheave: The sheave material shall be accurately machined of semi-steel of hardness BHN 220-250.
2. Antivibrational Mounts: For machines that are support beam mounted, an antivibrational mounting pad is to be provided.

D. Unintended Movement Device:

1. Protection shall be provided with a device to prevent unintended car movement away from the landing with the hoistway door not in the locked position and the car door not in the closed position as a result of failure in the electric driving-machine motor, brake, coupling shaft, gearing, control system, or any other component upon which the speed of the car depends, except the suspension ropes and the drive sheave of the traction machine.
2. The unintended movement device shall be supplied and installed in accordance with OEM's machine design and Section 2.19 of the Code.

2.8 CONTROLLER COMPONENTS:

- A** An Allen Bradley Control Logix, or approved equal, PLC controller that supports DF1 communication over Ethernet /TCP/IP shall be designed to accomplish the type of elevator operation as indicated herein. Controller shall govern starting, stopping and direction of travel of the elevator.

- B Controller shall protect the motor against current overload, phase reversal, and phase failure. A reverse phase relay shall be provided on the controller. Controller shall automatically open the power supply, and bring the car to rest if any of the safety devices fail to operate or if the power fails.
- C Selective Collective Operation: As defined by ASME A17.1 and shall be the pressure upon one or more car buttons shall send the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed, provided the hoistway door interlock and car door switch circuits are completed. During this operation, the car shall also answer calls from the landings, which are in the prevailing direction of travel. Each landing call shall be canceled when answered
- 1 Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at that landing to enable the stop to be made. The first car or landing button actuated shall establish the direction of travel for an idle car.
 3. UP" landing calls shall be answered while the car is traveling in the up direction and "DOWN" landing calls shall be answered while the car is traveling down. The car shall reverse after the uppermost or lowermost car or landing calls has been answered, and proceed to answer car calls and landing calls registered in the opposite direction of travel
 4. If the car without registered car calls arrives at a floor where both up and down hall calls are registered, it shall initially respond to the hall call in the direction that the car was traveling. If no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite direction. Direction lanterns, if provided, shall indicate the changed direction when the doors reopen.
- D Controller to include programmable automatic dispatching system to enter a call to the opposite terminal landing upon entry of a patron into the elevator cab. Automatic dispatching shall be initiated based on registration of a hall call at an elevator landing. Control system will automatically enter a car call for the opposite terminal landing to the landing where the hall call is registered when the infrared light ray screen door edge protector detects passage of a patron through the door. Registration of the automatic car call shall be reflected on the car call station but illumination of the indicator lamp as done for normal car call entries. System shall be programmable to have the automatic dispatch feature on or off and shall be controllable remotely through the PLC interface to a network.
- E Controller shall be provided with starting switches of adequate size, together with all relays and switches to accomplish the type of elevator operation indicated herein. Switches that operate power circuits shall be designed to prevent sticking due to fusing. Overload relay shall be of the manual reset type of suitable size for the motor furnished.
- F All controller components shall be neatly mounted and wired in a vented NEMA 4X stainless steel enclosure. All terminals and wires shall have identification markings. When venting of NEMA 4X cabinet cannot be achieved, all controller cabinets shall be supplied with a NEMA 4X compact cabinet cooler sized in accordance with manufacturers anticipated controller heat dissipation as approved by the MBTA. For wall mounted enclosures, these types of controllers are to be affixed to walls utilizing unistrut of sufficient strength and size capable of sustaining overall controller

enclosure with components weight. For controller enclosures that are floor mounted and freestanding, these types of enclosures are to be supplied with a 6” high base to prevent potential water infiltration.

- G Provide a separate battery powered unit that senses loss of power. Two (2) Batteries shall be 12 volt minimum, sealed nickel cadmium or gel cell construction. When loss of power occurs, elevator shall ascend or descend to nearest landing and open doors automatically. After a predetermined time, the doors shall close and the elevator shall remain inoperative until normal power is restored. The door open and alarm button shall operate under battery power. Reduced speed for evacuation on battery operation is permitted.
- H The PLC shall communicate directly with the future Authority Maintenance System via standard Ethernet LAN connection through SCADA protocols.
- I The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the service person and the controller system.
- J A BNC connector (stud/pass thru) shall be mounted in the controller and shall be used for the CCTV coaxial cable. Terminal blocks for CCTV power cables shall also be mounted in the controller. These connections shall be kept away from high voltage. Additional noise suppression devices may be required to filter video signal. BNC connector (stud/pass thru) will act as a junction for the video coax cable. Additional coax cable will be needed for the connection between the OMK and controller. Refer to drawings for indicated distances and proper cables to use.
- K Car Stall Protective Circuit: Provide a protective circuit which shall stop the motor and return the car to its first floor landing in the event that the car, while traveling up, does not reach its designated landing within a predetermined time interval. This circuit shall permit a normal exit from the car but prevent further operation of the elevator until the problem has been corrected.
- L PLC will be used for future remote monitoring capabilities. The installer’s engineering department will be responsible for programming the PLC.
- M The PLC rack shall provide space for the following Signal List and for two (2) future single slot modules.

Signal Description	Data Registers	Comments
Signal Power Supply Good	1	24-volt supply for inputs is on
Safety Circuit Good	2	
Top Final Limit Tripped	3	
Bottom Final Limit Tripped	4	
Inspection Operation On	5	
Independent Service On	6	
Fire Service Phase 1 On	7	
Fire Service Phase 2 On	8	
Smoke Sensor @ Main On	9	
Smoke Sensor @ Others On	10	
Override On	11	
Car is running UP	12	
Car is running DN	13	

Signal Description	Data Registers	Comments
Car is in Door Zone	14	
Interlocks are made	15	
Front Door Gate Switch Made	16	
Rear Door Gate Switch Made	17	no signal wire if no rear door
Front Door Fully Closed	18	
Front Door Fully Open	19	
Front Door Reversal Activated	20	
Rear Door Fully Closed	21	no signal wire if no rear door
Rear Door Fully Closed	22	no signal wire if no rear door
Rear Door Reversal Activated	23	no signal wire if no rear door
Brake Lifted	24	
Drive Ready / Fault	25	no signal wire if no drive
Car Position 1 (Bit 1)	26	If more than 7 stops, provide binary position
Car Position 2 (Bit 2)	27	
Car Position 3 (Bit 4)	28	
Car Position 4 (Bit 8)	29	
Car Position 5 (Bit 16)	30	
Loss of DVR signal	31	
Telephone line voltage	32	Voltage deviates (+-) 10 % nominal voltage level
Pressure Switch ON	33	
Stop Switch ON	34	
PLC Backplane communication fault	35	
Processor reset	36	
Low Oil	37	
Power Off	38	
Electrical Protective Devices	39	
Emergency Alarm Bell On	40	
Travel Time	41	
Emergency Power On	42	
Sump Liquid Level	43	If Applicable
Door Protective Devices	44	
Availability for Service	45	

- N The PLC shall store the last 99 faults, accessible via laptop connection, panel view and remote communications.
- O OEM's may not supply their standard elevator controller for this project.
- P An alpha numeric fault indicator shall be provided in the service cabinet.
- Q In cases where the programming is done by the supplier, the supplier shall provide a copy of all working programs in electronic format as well as a printed program listing.
- R Each I/O shall be fuse protected or utilize optical isolation.

- S Provide UPS for PLC memory.
- T The ability to monitor the status of any processor remotely via the network.
- U The ability to communicate with all other models of programmable controller manufactured by said manufacturer.
- V The Programmable Controller shall have one dedicated serial port which supports RS-232-C signals. It shall be accessible in ladder logic and provide support for Point to Point and Slave communication protocol systems. Alternatively, it must be usable for programming purposes or for access to remote programmers via modems.
- W The Programmable Controller shall have one dedicated serial port which supports RS-485 signals. It shall be accessible in ladder logic and provide support for DH485 protocol systems. It must be usable for programming purposes.
- X Bi-directional communication between the programmable controllers and the communication network via a standard modem interface. The protocols shall meet EIA RS-232-C electrical standards and ANSI standard communication protocols.
- Y The processor shall have built-in diagnostics and self-test, such that each time power is cycled, the processor does a complete CPU and RAM memory test. Additionally the power-up test will momentarily light up all diagnostic LED's to be sure they are working. A power up test will not be performed if the internal flag (bit) for Fireman's Service Phase I is latched. The processor shall be capable of reporting major and minor fault codes and processor status information back to the polling master, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.
- Z The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer. The watchdog timer cycle shall be adjustable from 20 msec to 2.5 seconds in 10 msec increments.
- AA The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:
1. CPU is in RUN mode
 2. CPU is FAULTED
 3. CPU battery is LOW
 4. I/O points are FORCED and are not under program control
 5. COMMUNICATION channels are active.
- BB Input/Output Modules
- 1 The Input/Output Modules shall be slot type and compatible with the PLC processor I/O structure. Each module shall be provided with a wiring arm to connect panel wiring to the module.

- 2 Discrete Input Modules: 24 VDC, 16 point input module suitable for use with input devices. Provide Allen-Bradley Model 1746- IB16 or approved equal.
- 3 Discrete Output Modules: 24 VDC, 16 point output module for use with 24 VDC output relays. Provide Allen-Bradley Model 1746-OB16 or approved equal.
- 4 Analog Input Modules: Converts 8 differential analog signals to proportional twelve-bit binary values. The module shall accept 4 – 20 Ma signals. Provide Allen-Bradley Module 1746-NI8 or approved equal.
- 5 Analog Output Modules: Converts 12-bit binary values to four analog output signals. The module shall output a 4 – 20 ma DC signal. Provide Allen-Bradley 1746-N18 or approved equal.
- 6 DeviceNet network card. The PLC shall have a DeviceNet network card Allen-Bradley part number 1747-SDN or approved equal.

CC I/O Chassis and Power Supply:

- 1 The I/O Chassis shall be a minimum 7-slot chassis. The chassis shall accept PLC slot type modules to provide backplane connections. The first slot shall accept the processor. Provide Allen-Bradley 1746-A7 or approved equal.
- 2 Power supplies shall provide power to the PLC processors, I/O rack and I/O modules. The power supply shall be suitable for operation of 120 VAC, single phase power. Power supply capacity shall be a minimum of 150% of the connected load. Provide Allen-Bradley 1746-P2 or 1746-P4 or approved equal as required by the application.

DD The controller shall be designed to operate automatically on standby power.

EE Dielectric Matting: Dielectric rubber matting to be supplied on floor in front of controller to prevent accidental shock.

FF Controller Room Intercom/Two Way Communication Device: Provide within each controller/machine room a two way communication/ intercom that will interface with any type of ADA compliant telephone. Intercom shall be mounted directly on or within hands distance proximity to the elevator controller. Intercom shall be manufactured by Electronic Micro Systems Inc. (www.electronicmicrosystems.com) Model # SHWMRI-2 and or approved equal. Intercom system shall be provided with the following

- 1 NEMA 4X Enclosure
- 2 Handset
- 3 Two (2) Phone Line capability

2.9 HOISTWAY ENTRANCES

A. General:

1. Hoistway entrances shall be of the horizontal sliding type, with operation and number of panels as indicated on the Contract Drawings.
2. All materials and finished surfaces exposed to public view shall be stainless steel with embossed finish and glass panels as indicated on Contract drawings. Glass panels to be completely flush with door assembly.

B. Hoistway Frames and Doors:

1. Entrance frames shall be of welded and mitered construction for complete one-piece unit assembly. All frames shall be sound deadened and securely fastened to fixing angles mounted in the hoistway and shall be Rimex #6-0M of Type 316L stainless steel. The landing sills shall be extruded stainless steel with a mill finish.
2. Entrance frames shall be provided with an extended sill floor plate the full width and depth of each entrance frame assembly. The extended sill floor plates shall be extruded stainless steel with a mill finish.
3. Hoistway entrances shall be of the horizontal sliding type, with operation and number of panels as indicated on the Contract Drawings.
4. Hoistway doors are to be stainless steel with a Rimex #6-0M finish reinforced and provided with keyways as required for operating mechanisms and door hangers. Provide glass panels that are completely flush with door, as indicated. Each door panel shall have Z style/shaped stainless steel bottom guides that run in landing sill slots. Guides are to be replaceable without removing door panels.
5. Provide die cast stud mounted jamb markings (2 per entrance) mounted at 5'-0".
6. Hoistway door hangers and door operator shall be as specified herein.

C. Struts and Closer Support Angles: Hoistway entrances adjacent to non-load bearing walls (gypsum dry wall, gypsum block, etc.) shall have hanger housing and door closers supported by steel angles of adequate size. Angles shall be continuous between sill and building beams above and shall be bolted to the hanger support. For load bearing walls (masonry, concrete block), submit for Engineer's approval Shop Drawings of the method to be used to support hanger housing and door closers on the wall.

D. Landing Sills: Landing sills shall conform to Section 2.11 of the Code and shall be extruded stainless steel with a mill finish supplied with grooves and trash slots for door guides and machine planed for minimum clearance. Mount sills on combination of concrete/grout and steel supports anchored to floor construction.

E. Hanger Supports and Cover Plates: Hanger supports shall be Type 316L 3/16 inch thick stainless steel bolted to strut angles and closer support angles. Hanger cover plates shall be of Type 316L nominal 0.078 inch thick stainless minimum and shall extend, as indicated in the contact drawings. Covers shall be made in sections for convenient access when servicing hangers. Hanger sections above door openings shall be removable from within elevator car.

F. Dust Cover: Dust cover shall be Type 316L nominal 0.078 thick stainless steel with a number 4 finish, reinforced as necessary to ensure a flat even surface throughout. Dust cover shall extend at

least the full width of door opening on each side and fastened to hanger housings. Dust cover shall extend above entrance opening as indicated on Contract drawings.

G. Interlocks and Contacts:

1. The doors at each hoistway entrance shall be equipped with approved hoistway door interlocks of the hoistway unit system type tested as required by the Code.
2. Interlock shall prevent operation of the car away from a landing until doors are locked in the closed position. Interlock shall prevent doors from opening at any landing from the corridor side unless car is at rest at that landing, or is in the leveling zone and stopping at that landing.
3. Hoistway door unlocking devices shall conform to the requirements of the Code and shall be provided to permit authorized persons to gain access to hoistway when car is away from landing. Stainless steel ferrules to be supplied for all hoistway unlocking device keyholes to protect elevator hoistway doors.

H. Sight Guards: Rimex # 6-0M stainless steel to match hoistway entrance finish.

I. Hoistway Sill and Extended Sill Floor Plate Heat Trace/ Heaters: Provide heat trace/heaters at each hoistway entrance to prevent the accumulation of snow, ice and water at each hoistway entrance. Heaters shall be approved by the MBTA. Heaters and Hydraulic oil cooler shall be provided with the following

1. Commercial grade PVC coated polyester tarpaulin.
2. Thermostatic Control. Control to be mounted next to adjacent wall closest to hoistway and in proximity to elevator controller.
3. Moisture sensor.
4. Electrical box for direct wiring to 115VAC, 20 Amp separate circuit

2.10 CAB ENCLOSURE COMPONENTS:

A. Elevator Car:

1. General:
 - a. Elevator car and car components shall meet the applicable requirements of the Code. Car control station and position indicator shall be as specified herein.
 - b. Entire car assembly, including car frame and platform, shall be free from warps, buckles, and squeaks and rattles. Joints shall be lightproof.
2. Car Frame and Platform:
 - a. Car frame and platform shall be welded galvanized steel units designed and fabricated in accordance with applicable requirements herein and Section 2.14 of the Code.

- b. Protect car platform with fire retardant material. The platform shall be recessed as required to accept floor finish.
 - c. Sub floor material to be nominal ¼” stainless steel to prevent water infiltration between finished floor, cab and platform base.
 - d. Coved Floor covering for platform: Acrylic Poured Epoxy, polymer system by Vikon LLC, or approved equal. The epoxy shall have a low VOC, fast cure time and longevity.
3. Elevator Car Guides: Car guides shall be of the roller type; each guide shall consist of a set of three (3) large diameter polyurethane rollers equipped with sealed preloaded ball bearings. Each roller shall be supported by a pivoted rocker arm that shall automatically adjust itself to guide rail misalignment and prevent excessive lateral car movement.
4. Car Enclosures:
- a. Car Top: Car top shall be of stretcher leveled, cabinet grade, and nominal 0.109 thick furniture sheet steel, reinforced to support 300 pounds on any one square foot area. An emergency exit shall be installed in the car top in conformance with the Code. Interior surface of car top shall be painted reflective white. Exterior surface of car top shall be painted black.
 - b. Size and detail to withstand design stresses and provide for attachment and support of cladding, housing, ceiling, glass panels, and appurtenances. Paint all members after fabrication. Exterior of car glazing shall be easily accessible for cleaning.
 - c. Suspended Ceiling:
 - 1) ¾” nominal overall thickness. Ceiling to be constructed by bending and forming individual ceiling sections which are to be bolted together. Additional ribbing material on non-exposed side, allowed to be added for reinforcement to panel sections and for the compensation for heavy vandal resistant type light fixtures. Material to be nominal 0.125 thick stainless steel Type 316L. Finish to be Rimex Pattern No. 6-0M and or approved equal. All edges are to be deburred and ground smooth to prevent bodily injury.
 - 2) Lighting: Car lighting shall provide a minimum of 15-foot candles measured at any point on the cab floor and shall of the type shown on the Contract Drawings. Car lighting shall be provided with emergency battery backup upon failure or interruption of normal car lighting. Emergency lighting unit shall provide required lighting for a minimum of four (4) hours. Battery charger shall be capable of restoring battery to full charge within sixteen (16) hours after resumption of normal power. Provide an external means for testing battery, lamps, and alarm bell. Lighting is to be Benfield Electric Luminaire Model RVP26PLEL (NYC Housing Authority Grade) total quantity of fixtures as per Contract drawings. Fixture to be supplied with stainless steel face plate and stainless steel backer box. Gasketing/weatherstripping to be supplied on interior portion of hinged portion of flange to prevent water and dust accumulation when in the closed position. Outer mounting flange to be supplied with welded nuts for vandal resistant spanner head screw mounting.

- d. Interior Walls: Interior walls shall be as shown on the Contract Drawings and in accordance with the following:
 - 1) Finish shall be Type 316L Stainless with rigidized textured surface. Finish to be Rimex Pattern No. 6-0M and or approved equal.
 - 2) Glazing per Section 2.2.
 - e. Stationary front and rear returns, transom and entrance column are to be provided in Type 316L stainless steel. Exposed surfaces are to be finished with Rimex Pattern No. 5-SM and or approved equal
 - f. Car Doors: Car doors to be supplied with glazed panels as indicated on Contract drawings. Glazed panels are to be completely flush with door frames. Doors shall be of the horizontal sliding type with operator, number of door panels. Exposed surfaces are to be finished with Rimex Pattern No. 5-SM and or approved equal. Doors shall protect the full width and height of car entrance opening when in the fully closed position. Car doorframe shall be integral with front wall of cab.
5. Car Door Equipment:
- a. Door Hangers: Door hangers for car and hoistway doors shall be of the two point suspension sheave type equipped with grease packed heavy duty precision ball bearings, eccentric up-thrust rollers, and oiler/cleaners. Track shall be of formed cold rolled steel or cold drawn steel with rounded track surface to receive sheaves. Track shall be mounted on an eccentric stud to provide for adjustment.
 - b. Car/Hoistway Door Operator: Car and hoistway doors at each landing shall be opened and closed quietly and smoothly by a direct current electric operator.
 - c. Door Protection: Electronic Entrance Detector Screen: Provide TriTronics electronic door detector device, which projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one beam of the curtain is penetrated. Unit shall have Transmitters and Receivers spaced at a minimum distance to provide the maximum amount of protection within the height of the doorway. Systems, which have the availability to turn Off or On individual zones within the curtain, will not be allowed.
6. Appurtenances:
- a. Handrails: Tubular Type 316L stainless steel with #4 satin finish,. Tube steel to be 1 ½” diameter minimum with rolled and tapered ends and supplied with stainless steel spacers. Provide as shown on the Contract Drawings.
 - b. Bumper Rails are not permitted.
7. Safety: A governor actuated mechanical safety device mounted under the car platform and securely bolted to the car sling. The car safety shall be sized for the capacity and speed noted on the Contract Drawings.

- a. When tripped, the safety mechanism shall engage the rails with sufficient force to stop a fully loaded car with an average rate of retardation within the limits given by the ASME A17.1 Code for the capacity
- b. Make provisions to release the car safety. In no event shall the safety be released by downward motion of the car. Raising the car to reset the safety shall be allowed
- c. Include an electrical safety plank switch that will interrupt the power to the hoist machine when the safety is set. Resetting the plank switch shall be separate from resetting the safety jaws.
- d. Install a car safety marking plate of corrosion resistant metal showing the data required by the Code.

2.11 SIGNAL DEVICES AND FIXTURES:

- A. General: Provide signal fixtures and control devices for each elevator. Buttons and signals shall be tamper resistant of the illuminated type that light-up when activated and remain lit until call or other function has been fulfilled. All signal fixture and control device faceplates shall be of Type 316L, nominal 0.135 inch thick stainless steel with No. 4 finish, unless otherwise shown on the Contract Drawings.
- B. Car Operating Station:
 1. Provide one (1) main station in the front and one (1) auxiliary station at the rear return of the elevator.
 2. Car operating stations shall contain Braille plates adjacent to each call button. Contractor to coordinate proper landing call outs based on maximum characters as indicated on Contract drawings. Buttons for DOOR-OPEN, DOOR-CLOSE, ALARM, EMERGENCY PHONE call functions are to be supplied. Buttons are to be vandal resistant and of the positive stop type. Buttons to be Monitor Control Model #HPS1300 with rounded edges and 1 3/8" in diameter.
 3. Station shall also have in a locked service cabinet, keyed switches for car light, inspection, independent operation, as indicated on the Contract drawings.
 4. Station faceplate shall be Type 316L stainless steel with #4 finish as indicated on the Contract drawings.
 5. Engrave the car operating panel with the following:
 - a. No Smoking. Minimum 1 inch high lettering.
 - b. In Case of Fire Do Not Use Elevator, as per 524 CMR regulations
 - c. Elevator Capacity: Minimum 3/8 inch high lettering.
 - d. Firefighters Operating Instructions.
 - e. No Smoking Symbol

- f. MBTA Elevator Number
6. Provide die cast raised markings for the car buttons and car controls in compliance with MA 521 CMR, ADAAG 2004 and the "Handicapped Requirements" of ANSI/ASME A17.1. Die cast plates are to be flush with faceplate surface, as indicated on Contract drawings.
 7. Provide die cast raised markings for the elevator and station identification in compliance with MA 521 CMR, ADAAG 2004 and the "Handicapped Requirements" of ANSI/ASME A17.1. Die cast plates are to be flush with faceplate surface, as indicated on Contract drawings
 8. Emergency Communication: "Hands-free" ADA compliant telephone/intercom, VPP model T-1250E.
- C. Top of Car Operating Device: Provide a top-of-car operating device in compliance with the requirements of Sections 2.26 of the Code. The device shall have control switches for UP, DOWN, OPERATE/INSPECT and EMERGENCY STOP. The device shall also have an 110v ac outlet for extension cord and provided with a light and protective guard as required by code.
- D. Hall Stations: Hall stations of the push-button, call acknowledging, stainless steel, tamper resistant type shall be recess mounted into the wall and or returns at all elevator landings, as indicated on Contract drawings.
1. Buttons are to be vandal resistant and of the positive stop type Buttons to be Monitor Control Model #HPS1300 with rounded edges and 1 3/8" in diameter with red jewel.
 2. Highest landing shall have a single DOWN button. Lowest landing shall have a single UP button. Intermediate landings shall have UP and DOWN buttons with the Up button on top.
 3. Phase I Fire Service illuminating fire hat to be supplied.
 4. Provide die cast raised markings for the hall buttons in compliance with MA 521 CMR, ADAAG 2004 and the "Handicapped Requirements" of ANSI/ASME A17.1. Die cast plates are to be flush with faceplate surface, as indicated on Contract drawings.
 5. Provide die cast raised markings for the elevator and station identification in compliance with MA 521 CMR, ADAAG 2004 and the "Handicapped Requirements" of ANSI/ASME A17.1. Die cast plates are to be flush with faceplate surface, as indicated on Contract drawings
 6. Engrave the hall station with the following:
 - a. In Case of Fire Do Not Use Elevator, as per 524 CMR regulations
 - b. Firefighters Operating Instructions, as indicated on Contract drawings
 7. "Hands-free" ADA compliant telephone/intercom, VPP model T-1250E.
 8. Additional switches for Hoistway access, Phase I Firefighters Operation and Parking feature are to be supplied. Keyswitch requirements for Phase I Firefighters Services to be in accordance with national and local code requirements. Keyswitch requirements for Hoistway access and Parking feature per Owner's current standard lock requirements and or Engineer approval

9. Faceplate finish shall be Type 316L stainless steel #4 finish

F. Hall Lanterns:

1. Tamper resistant hall lanterns shall be equipped with illuminated UP and DOWN signal arrows, but provide single arrow where only one direction is possible. Provided units projecting from faceplate for ease of angular viewing. Match materials, finishes and mounting method with hall stations.
2. In conjunction with each hall lantern, provide an adjustable electronic chime signal to indicate that a car is arriving in response to a hall call and to indicate direction of car travel. Signal shall sound one for up direction of travel and twice for down direction.

G. Bell Alarm System: Bell alarm system for each elevator shall be properly located within building and audible outside hoistway when activated by the EMERGENCY STOP switch or the ALARM call button on each car control station.

H. Firefighters' Service System: Firefighters' service system shall be provided in compliance with national and local code requirements.

2.12 WIRING AND ELECTRICAL INSTALLATION:

A. Electrical installation shall be in accordance with Division 16.

B. Conduit and Wiring:

1. Unless otherwise specified, all electrical conductors in the pits and hoistways, except traveling cable connections to the car shall be provided in rigid zinc-coated steel conduit with steel outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete. Terminal boxes and other similar items shall be of approved construction, thoroughly reinforced, and in no case less than number 12 USSG. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. The rigid conduit shall conform to the specifications here in before specified. All raceway shall be threaded rigid steel conduit. Flexible heavy-duty service cord, type SO, may be used between fixed car wiring and switches on car doors for door reversal devices.
2. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. If the bushings are constructed completely of insulation material, a steel locknut shall be installed under the bushing. At ends of conduits not terminating in steel cabinets or boxes, the conductors shall be protected by terminal fittings having an insulated opening for the conductors. All conduits terminating in NEMA 4X boxes shall be backed up with flat rust resistant steel plates to fit the entire area where the conduit penetrated the box.
3. Conduit fittings and connections using set screws or indentations as a means of attachment are not permitted
4. Connect motors and other components subject to movement or vibration, to the conduit systems with flexible conduit.

5. The Contractor shall furnish all materials and completely wire all parts of the electrical equipment of the elevators including electrical devices on hatch doors.
6. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures
7. The conduits shall be of such size that the wires or cables can be readily installed and replaced, if necessary. No conduit or raceway shall be less than 3/4 inch trade size, except that for small devices such as door switches, interlocks, etc., 1/2 inch conduit may be used. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit.
8. Conduits shall be neatly and systematically run. All exposed conduit and boxes shall be supported by approved and substantial straps, hangers or clamps to the structural steel, reinforced concrete, or other approved supports. Riser conduits in hoistway shall be supported at each floor level.
9. All interlock, hall button and limit switch branch wiring shall be enclosed in flexible steel conduit with covering of liquid tight Type "EF" with connectors having nylon insulated throat.
10. All screws used for terminal connections of all wiring (control room, machine area, hoistway and pit) shall be provided with "star washers" of proper size and type.

C. Conductors:

1. No joints or splices shall be permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements
2. All wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one meg-ohm.
3. Provide all necessary conduit and wiring between all remote control rooms, machine areas and hoistway.

D. Traveling Electrical Cable

1. Shall be Type EO, rated for a maximum of 300 volts, and shall comply with the requirements of UL Standard #62 and Articles 400 and 620 of ANSI/NFPA No.
2. Travel cables shall include separate shielded coaxial cable for the communications system
3. For elevator CCTV camera communications provide two (2) RG-6 type shielded coaxial cables, two (2) 20 AWG shielded twisted pairs and four (4) 18 AWG stranded copper conductors. Cable shall extend from junction box in hoistway to ceiling of elevator cab.
4. Provide 10 percent spares, but not less than 6 spare conductors in each traveling cable.
5. Provide separate traveling cables for car lighting and fan control circuits.

6. Provide traveling cable for telephone in the elevator car. Cable shall extend from junction box in hoistway to telephone box in car.
 7. Provide traveling cable for car work lights
 8. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminals in the motor room or controller location and hoistway junction box, elevator cab junction box, and push-button stations within the cab, and shall agree with the approved wiring diagrams.
- E. Car and hall operating signal circuits shall not exceed 48 volts.
- F. All cabinets containing motor drives, filter boxes, transformers and power reactors shall be supported on rails and isolated from the base building structure with elastomer pads having a minimum static deflection of 3/8" (Mason Type N, or equivalent). All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use non-rigid conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert.

2.13 OPERATION:

- A. General: Operation shall be simplex collective.
1. Simplex Collective Operation:
 - a. Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at that landing to enable the stop to be made. The first car or landing button actuated shall establish the direction of travel for an idle car.
 - b. "UP" landing calls shall be answered while the car is traveling in the up direction and "DOWN" landing calls shall be answered while the car is traveling down. The car shall reverse after the uppermost or lowermost car or landing calls has been answered, and proceed to answer car calls and landing calls registered in the opposite direction of travel.
 - c. If the car without registered car calls arrives at a floor where both up and down hall calls are registered, it shall initially respond to the hall call in the direction that the car was traveling. If no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite direction. Direction lanterns, if provided, shall indicate the changed direction when the doors reopen.
- B. Independent Service: Provide a key switch in the car operating panel which, when actuated, shall cancel previously registered car calls, disconnect the elevator from the hall buttons and allow operation from the car buttons only.
- C. Non-Contact Door Reopening Device operation shall be as follows:

1. The doors shall be prevented from closing from their full open position if any obstruction comes within the zone of detection. The detection zone shall move with the doors and if a person or object enters the zone as the doors are closing, the doors shall reverse and reopen. The doors shall re-close after a minimal time interval. A passenger entering or leaving the car shall not cause the doors to stop and reverse unless the doors reach a predetermined proximity to the passenger.
 2. After a stop is made, the doors shall remain open for a time interval to permit passenger transfer, after which the doors shall close automatically. This interval shall be less for a car call stop than for a hall call stop or a coincident car/hall call stop.
- D. Car Stall Protective Circuit: Provide a protective circuit which shall stop the motor and return the car to its first floor landing in the event that the car, while traveling up, does not reach its designated landing within a predetermined time interval. This circuit shall permit a normal exit from the car but prevent further operation of the elevator until the problem has been corrected.
- E. Door Operation:
1. Door close shall be arranged to start after a minimum time, consistent with MA 521 CMR, ADAAG 2004, from notification that a car is answering a hall call.
 2. Doors shall be arranged to remain open for a time period sufficient to meet MA 521 CMR, ADAAG 2004 requirements.
 3. The time interval for which the elevator doors remain open when a car stops at a landing shall be independently adjustable for response to car calls and response to hall calls.
 4. An approved positive interlock shall be provided for each hoistway entrance, which shall prevent operation of the elevator unless all doors for that elevator are closed and shall maintain the doors in their closed position while the elevator is away from the landing. Emergency access to the hoistway as required by governing codes shall be provided.
- F. Standby Power Transfer: Upon the loss of normal power provide controls to automatically send the elevator(s) nonstop to the landing designated by the Fire Department. When arriving at the designated landing, the elevator doors shall open automatically and remain open.
- G. Automatic Leveling: Machine room less gearless machine/motor design shall be coordinated with the control so that car shall slow down and stop automatically at the floor (within 1/4 inch) after transition from contract speed. Car level shall be maintained automatically within one-quarter inch of the landing by an anti-creep leveling device regardless of any deviation that maybe caused by the loading or unloading of the car. Landing zone detection shall indicate to the control system the position with respect to the floor level.
- H. Top-of-Car Operating Device: Operation of elevator from top-of-car device shall also be subject to applicable electrical protective devices required in Section 2.26 of the Code.
- I. Elevator Control Room:
1. A metal cabinet of not less than twenty (20) cubic feet in volume shall be provided and located in the control room area. Cabinet to be rated to hold flammable materials.

2. Cabinet shall have lockable doors and be mounted on legs or a pedestal, minimum of four (4) inches off the floor.
3. Cabinet shall be painted and marked for elevator purposes, as directed by the Owner , and Contractor shall store small parts, supplies, tools, and other materials within.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing with the installation of elevator equipment, examine the following and verify that no irregularities exist that would affect the quality of execution of work as specified.
 1. Hoistway size and plumbness.
 2. Anchor brackets.
 3. Sill support.
 4. Pit depth.
 5. Overhead clearance.

3.2 INSTALLATION:

- A. Install elevator in accordance with the OEM's installation procedures and approved Shop Drawings.
- B. Verify that electrical wiring installation is in accordance with the OEM's submittal and in accordance with the installation requirements of other Sections of the Specifications.
- C. Erect all items square, plumb, straight and accurately fitted with tight joints and intersections.
- D. Coordinate all trades to ensure that the installation of the elevators is not in conflict with the work performed of other trades.
- E. Isolate non-compatible, dissimilar materials from each other by providing vibration isolation, gaskets or insulating compounds.
- F. Provide protective coverings for finished surfaces.
- G. Upon completion, touch up and restore damaged or defaced factory finished surfaces. Touch up any marred finishes and replace as directed by the Authority.
- H. Remove protective coverings and clean exposed surfaces after completion.
- I. Welding shall comply with AWS D1.1. Identify field welds with welder's identification stamp.

3.3 FIELD TESTING

A. Acceptance Testing:

1. General: After installation and before date approved for start of interim maintenance, inspect and test the elevator and related equipment to the MBTA Engineer's, MBTA Engineering and Maintenance Department's and Department of Public Safety Inspector's satisfaction that operation of every part of equipment complies with applicable requirements of ASME/ANSI A17.1 and MA 524 CMR including sound level criteria specified in paragraph 1.4E herein. Elevator shall be inspected in accordance with procedures outlined ANSI/ASME A17.2 and MA 524 CMR, including the 72 hour test.
 - a. Provide test instruments, materials, other necessary facilities, and all labor required for acceptance tests specified.
2. Notification Requirements:
 - a. Notify the Project Manager and the Engineer a minimum of five (5) working days prior to each scheduled test.

3.4 72 HOUR PERFORMANCE PERIOD PROCEDURE

- A Performance Period: The purpose of the performance period is to provide the Authority with a high level of assurance that the elevator system has been installed in the prescribed manner, and operate within the guidelines set in the Design Standard. The performance period is intended to enhance the quality of system start-up and aid in the orderly transfer of elevators for use by the Authority.
- 1 The performance period shall be for 72 hours starting after the contractor has received state acceptance. Run elevator continuously a minimum of seventy two (72) hours with full specified rated load, during which time car shall be stopped at top and bottom landings with a minimum standing period of 10 seconds at each landing.
 - 2 Contractor shall operate the elevator at full load under normal modes of operation. Workmanship and equipment compliance with Contract Documents, Contract speed, capacity, floor-to-floor, and door performance comply with Contract Documents.
 - 3 Elevator shall start at five minute intervals.
 - 4 All faults recorded during performance period will be turned over to the Authority for review. Such as, but not limited to:
 - a Door lock or car gate switch malfunction.
 - b Pump motor and valve protection timer.
 - c Time out of service timer.
 - d Emergency stop switches and safety circuit malfunction.
 - e Door protection timer.

- f Motor overload circuits
 - g Stuck button protection features.
 - h Low oil and oil pressure devices.
 - i Test emergency telephone in car
- 5 Any deficiencies found during the performance period will be repaired by the contractor at no charge to the Authority. If deficiencies are found a new 72 hour test will be performed. The MBTA shall be notified of any testing or re-testing to be performed
6. Speed Test: Make tests before and after full load tests. Using a tachometer on guide rail, determine actual speed of car in both directions of travel, both with full-specified rated load and no load in car. Tolerances for determining if car speeds meet the specified requirements are as follows:
- a. Ascending Car Speed: Not more than 10 percent above or more than 10 percent below required speed.
 - b. Descending Car Speed: Not more than 10 percent above or more than 10 percent below required speed.
7. Car Leveling Test: Determine accuracy of floor landing tests both before and after full load run tests. Minimum of 1/4 inch leveling must be maintained. Test accuracy of landing at all floors with full load and no load in car, in both directions of travel.
8. Electrical Tests: Ensure elevator wiring system is free of short circuits and accidental grounds. Test ground resistance of elevator structure, equipment, and raceways for continuity. Using megohm-meter, determine that insulation resistance of each circuit is more than one (1) megohm or higher as required by the cable manufacturer. Insulation resistance for motors shall be determined under actual conditions after installation.
9. Test Reports: Within 24 hours after completion of a test, submit a test report stating type of test, test requirements, failures, or problems, and name of certifying Engineer and Title. Safety device failure or defective equipment shall be identified, with description of cause and corrective action taken.
10. Failures for any reasons shall be identified with cause(s) and corrective action taken.
11. Retest Notification Requirements:
- a. The Project Manager and Engineer shall be notified ten (10) days prior to the scheduled retest.
 - b. If any equipment is found to be damaged or defective, or if the performance of the elevator does not conform to the requirements of the contract specifications or the Safety Code, no approval or acceptance of elevators shall be issued until all defects have been corrected. When the repairs and adjustments have been completed and the discrepancies corrected, the Owner shall be notified and the elevator will be

reinspected. Rejected elevators shall not be used until they have been reinspected and approved.

12. The certificate of inspection for operational use will be issued to the Owner by the enforcing inspection agency. The certificate shall be posted in the elevator control room and in the car operating station.
- B. Any deficiencies and defects discovered during the field-testing shall be corrected, repaired, replaced and a new 72 hour test performed to the satisfaction of the MBTA Engineer and MBTA Engineering and Maintenance Department.
- C. Acceptance: Elevator acceptance will be based upon elevators meeting requirements of Contract Documents and upon evidence of passing specified acceptance tests and inspections. Final testing will be after elevators are connected to permanent power.

3.5 FINAL TURN-OVER TESTING UPON COMPLETION OF THE WARRANTY PERIOD

- A. 30 days prior to the completion of the warranty period a 24 hour turn-over test shall occur. The purpose of the turn-over test is to provide the Authority with a high level of assurance that the elevator system has been maintained in the prescribed manner, and operates within the guidelines set in the Design Standard. The turn-over test is intended to enhance the quality of the system turn-over and aid in the orderly transfer of elevators for use by the Authority.
 1. The turn-over test shall be for 24 hours. Run elevator continuously a minimum of twenty four (24) hours with full specified rated load, during which time car shall be stopped at top and bottom landings with a minimum standing period of 10 seconds at each landing.
 2. Contractor shall operate the elevator at full load under normal modes of operation. Workmanship and equipment compliance with Contract Documents, Contract speed, capacity, floor-to-floor, and door performance comply with Contract Documents.
 3. Elevator shall start at five minute intervals.
 4. All faults recorded during turn-over test will be turned over to the Authority for review. Such as, but not limited to:
 - a Door lock or car gate switch malfunction.
 - b Pump motor and valve protection timer.
 - c Time out of service timer.
 - d Emergency stop switches and safety circuit malfunction.
 - e Door protection timer.
 - f Motor overload circuits
 - g Stuck button protection features.

- h Low oil and oil pressure devices.
 - i Test emergency telephone in car
5. Any deficiencies found during the turn-over test will be repaired by the contractor at no charge to the Authority. If deficiencies are found a new 24 hour test will be performed. The MBTA shall be notified of any testing or re-testing to be performed
 6. Speed Test: Make tests before and after full load tests. Using a tachometer on guide rail, determine actual speed of car in both directions of travel, both with full-specified rated load and no load in car. Tolerances for determining if car speeds meet the specified requirements are as follows:
 - a. Ascending Car Speed: Not more than 10 percent above or more than 10 percent below required speed.
 - b. Descending Car Speed: Not more than 10 percent above or more than 10 percent below required speed.
 7. Car Leveling Test: Determine accuracy of floor landing tests both before and after full load run tests. Minimum of 1/4 inch leveling must be maintained. Test accuracy of landing at all floors with full load and no load in car, in both directions of travel.
 8. Electrical Tests: Ensure elevator wiring system is free of short circuits and accidental grounds. Test ground resistance of elevator structure, equipment, and raceways for continuity. Using megohm-meter, determine that insulation resistance of each circuit is more than one (1) megohm or higher as required by the cable manufacturer. Insulation resistance for motors shall be determined under actual conditions after installation.
 9. Test Reports: Within 24 hours after completion of a test, submit a test report stating type of test, test requirements, failures, or problems, and name of certifying Engineer and Title. Safety device failure or defective equipment shall be identified, with description of cause and corrective action taken.
 10. Failures for any reasons shall be identified with cause(s) and corrective action taken.
 11. Notification Requirements:
 - a. The Project Manager and Engineer shall be notified ten (10) days prior to the scheduled retest.
 - b. If any equipment is found to be damaged or defective, or if the performance of the elevator does not conform to the requirements of the contract specifications or the Safety Code, no turn-over or acceptance of elevators shall be allowed until all defects have been corrected. When the repairs and adjustments have been completed and the discrepancies corrected, the Owner shall be notified and the elevator will be reinspected.
 12. Any deficiencies and defects discovered during the turn-over testing shall be corrected, repaired, replaced and a new 24 hour test performed to the satisfaction of the MBTA's Engineer and MBTA Engineering and Maintenance Department.

13. Turn-over Acceptance: Elevator acceptance will be based upon elevators meeting requirements of Contract Documents and upon evidence of passing specified acceptance tests and inspections and including the following:

- Complete installation including completion of all punch list items
- Complete function and acceptance test performed
- All test reports turned over to MBTA
- Completed maintenance agreement to meet MBTA current requirements
- Unit numbers matched to MBTA inventory
- All keys and cylinders matched to MBTA units
- DPS certificate of acceptance
- Spare parts inventoried and delivered
- All as-builts and drawings turned over to MBTA
- All maintenance manuals turned over to MBTA
- All maintenance software turned over to MBTA
- Any maintenance and test equipment turned over to MBTA
- Unit and machine room are completely cleaned and inspected prior to first use.

3.6 ADJUSTING AND CLEANING:

- A. Immediately upon the completion of the elevators, thoroughly clean each elevator including car and hoistway doors and install 3/4 inch fire retardant plywood on wood studs (2 feet –0 inches on centers) to protect all hoistway doors, frames and sills. This protection shall be maintained until the Owner orders its removal, just prior to acceptance. At that time the Installer shall perform a complete re-cleaning including doors and cabs.
- B. Remove all debris not necessary for the elevator's operation that could cause safety problems.
- C. Keep areas orderly and free from debris during the progress of the Project.
- D. Remove all loose materials and filings resulting from this work from hoistway surfaces, pits and control room spaces.
- E. Clean control room floor of dirt, oil and grease.

3.7 OWNER COORDINATION:

- A. Engage OEM authorized service representative to train Owner's maintenance personnel to operate elevators. Refer to Section 01820 "Demonstration and Training."
- B. Check operation of elevators with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.
- C. Check operation of elevators with Owner's personnel present not more than 60 days before end of warranty period. Determine that operation systems and devices are functioning in accordance with the contract documents

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16050

BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies basic materials and methods for electrical work.
- B. Related Work: Refer to Section 16450-Grounding, for proper installation of components identified in this section. The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Determine interfaces and coordinate electrical work with utility company or the Authority where power source is the Authority's.
 - 2. Determine interfaces and coordinate with work completed, progressing, or to be performed under other sections of these Specifications or by other contractors. Make indicated connections to previously completed work. Where future connections to or extensions of the work are indicated, make safe and convenient provisions for such future connections and extensions.
 - 3. Where indicated, take possession of, maintain, and operate as required any electrical plant and equipment left in place by others. Where indicated, leave temporary and interim electrical work, plant and equipment in place for maintenance and operation by others.
 - 4. Furnish and install a 4 way – 4 inch low voltage/signal concrete encased duct bank system as shown in the contract drawings.
 - 5. Furnish and install exterior raceway/conduit systems (underground and surface mounted) as indicated in the contract drawings.
 - 6. Furnish and install a 277/480V, Three phase 60Hz secondary metering power service obtained from NSTAR.
 - 7. Furnish and install an electrical service consisting of 277/480V distribution panels, 208Y/120V electrical panels, lighting contactor, controls, receptacles, and associated appurtenances as specified herein and as shown on the Contract Drawings.
 - 8. Furnish and install grounding systems including ground rods, Thermit welds, cables and connections.
 - 9. Furnish and install exterior lighting systems.
 - 10. Furnish and install Variable Message Sign (VMS), as indicated in the Contract Drawings.
 - 11. Work under this item shall also include furnishing and installing RGS and/or PVC conduits under platforms and other areas as shown on the Contract Drawings.
 - 12. Disconnect/reroute/extend existing aerial signal/power cable as shown on contract drawings.

1.2 REFERENCES

- A. Comply with applicable requirements of the following:
 - 1. National Electrical Code
 - 2. Massachusetts Electrical Code

1.3 SUBMITTALS

- A. Submit shop drawings for review showing fabricated work being furnished and installed under these Specifications. Submit such drawings prior to fabrication and within ample time to prevent delays in the work.
- B. Submit verified test results to the Engineer promptly upon completion of test.
- C. Before installation of the wire and cable, submit the following information for each type and size of wire and cable for review:
 - 1. Manufacturer of the wire and cable.
 - 2. Number and size of strands composing each conductor.
 - 3. Conductor insulation composition and thickness in mils.
 - 4. Average overall diameter of finished wire and cable.
 - 5. Minimum insulation resistance in megohms per 1000 feet at 20°C ambient.
 - 6. Jacket composition (if any) and thickness in mils.
 - 7. Total number of conductors per cable.
 - 8. Shield material (if any) and thickness.
 - 9. Conductor resistance and reactance in ohms per 1000 feet at 20°C ambient.
 - 10. Conductor ampacity at 20°C ambient.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Furnish all items of the materials, design, sizes, and ratings shown on the Contract Drawings and herein specified.
- B. Furnish materials and equipment bearing evidence of UL listing where UL standards exist and such product listing is available.
- C. Methods of fabrication, assembly and installation are optional unless otherwise specifically indicated.
- D. Provide products that are free from defects impairing performance, durability, or appearance, and of the commercial quality best suited for the purpose shown on the Contract Drawings or specified herein.

- E. Steel conduit and accessories specified to be zinc coated: Hot-dipped galvanized after fabrication in accordance with ASTM A286.
- F. Conform to applicable requirements of Insulation Power Cable Engineers' Association (IPCEA).

2.2 RIGID GALVANIZED STEEL CONDUIT AND ACCESSORIES

- A. Conduit, couplings, elbows, bends, and nipples: ANSI C80.1 and UL 6, with each length bearing manufacturer's stamp and UL label.
- B. Method used to determine the thickness of zinc coating: The Referee Test included in the appendix to ANSI C80.1.
- C. Fittings and Accessories:
 - 1. Galvanized steel or malleable iron, ANSI C80.4.
 - 2. Provide separable watertight hub fittings with a gasket, separate nylon insulated throat and a case hardened locknut.
 - 3. Bushings: Nylon insulated metallic and grounding type.
 - 4. Furnish conduit straps, clamps, and clamp backs made of galvanized malleable iron.
- D. PVC Coated Conduit
 - 1. NEMA Standard No. RN1, Coating Type A-40.
 - 2. Thread protectors installed on both ends of conduit for shipment and handling, couplings packaged separately.
- E. Almost without exception, in any below grade structures, the MBTA requires the use of RGS conduit.
- F. Buried conduits cannot have buried pull boxes.

2.3 LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT AND FITTINGS

- A. Furnish conduit consisting of a core of flexible galvanized steel with an extruded liquid-tight plastic or neoprene jacket overall. Jacket shall be moisture and oil-proof, capable of conforming to the minimum radius bends of flexible conduit without cracking.
- B. Furnish conduits with a continuous copper bonding conductor spiral wound between the convolutions, as required by NEC, and as indicated.
- C. Fittings: UL Standard 514, cadmium or zinc-coated.

2.4 PVC ELECTRICAL CONDUIT AND FITTINGS (ONLY FOR OUTDOOR USE)

- A. Heavy wall, high impact strength, rigid PVC conforming to the requirements of EPC-40-PVC conduit of NEMA TC2 and fittings for EPC-40-PVC conduit of NEMA TC3.

- B. UL listed in accordance with Article 347 of the NEC for underground and exposed use.
- C. Flammability rated as self-extinguishing, and having the following minimum properties:
 - 1. Tensile strength, ASTM D638 at 78°F: 6,000 psi.
 - 2. Flexural strength, ASTM D790: 11,000 psi.
 - 3. Compressive strength, ASTM D695: 8,500 psi.
 - 4. Hardness (Durometer D), ASTM D2240: 77.
 - 5. Water absorption, percent maximum, in 24 hours at 72°F. ASTM D570: 0.03.
 - 6. Dielectric strength, volts per mil, ASTM D149: 1,100.
 - 7. Thermal conductivity: 1.3 BTU per square foot per degree F per inch.

2.5 CONDUIT EXPANSION FITTINGS

- A. Fabricate from material similar to the type of conduit with which they are to be used.
- B. Include a factory installed packing ring, designed to prevent the entrance of moisture, and a pressure ring.
- C. Also include a grounding ring or a grounding conductor for metallic expansion couplings.

2.6 MULTIPLE PIPE HANGERS (TRAPEZE TYPE)

- A. Fabricate two or more steel hanger rods, a steel horizontal member and all U-bolts, clamps, and other attachments necessary for securing hanger rods and conduits.
- B. Hanger Rod: Not smaller than 3/8 inch diameter, threaded either full length or for a sufficient distance at each end to permit at least 1-1/2 inches of adjustment.
- C. Horizontal Member
 - 1. Standard structural steel shapes such as angles or channels, 1-1/2 by 1-1/2 or 1-5/8 by 1-5/8 inches, 12 gauge, cold-formed, lipped channel, and designed to accept special spring-held hardened steel nuts for securing hanger rods and other attachments.
 - 2. Two or more channels may be welded together to form horizontal members of greater strength than single channels.
 - 3. Galvanize after fabrication.
- D. Design
 - 1. Capable of supporting a load equal to the sum of the weights of the conduits and wires, the weight of the hanger itself, plus 200 pounds.
 - 2. The stress at the root of the thread of the hanger rods; not more than 9,475 psi at design load.
 - 3. Size the horizontal member such that the maximum stress will be not more than 12,650 psi at design load.

2.7 INSERTS

- A. Channel Inserts. Fabricate from not less than 12 gauge steel channel having an overall size of 1-1/2 by 1-1/2 or 1-5/8 by 1-5/8 inches with continuous 7/8 inch wide slot, in lengths as indicated. Galvanize after fabrication.
- B. Channel Inserts for Embedding in Concrete
 - 1. Fabricate from channels having a solid base.
 - 2. Weld concrete anchors to the channel during fabrication and before coating.
 - 3. Galvanize after fabrication
 - 4. Provide assemblies with a minimum pull-out load rating of 4,500 pounds per linear foot uniformly distributed.
 - 5. Furnish all channel inserts for installation embedded in concrete with the channel interior completely filled with Styrofoam to prevent seepage of concrete into the channel during installation.
- C. Channel Inserts for Surface Mounting
 - 1. Fabricate from channel having 3/8 inch by 3-inch slots on 4-inch centers in the base.
 - 2. Galvanize inserts for surface mounting on concrete surfaces or for installation in damp or wet areas.
- D. Spot Inserts for Embedding in Concrete
 - 1. Steel, galvanized after fabrication
 - 2. Designed for a maximum loading of 800 pounds with safety factor of three.
 - 3. Knockout openings to accommodate either square or rectangular nuts.

2.8 FIBERGLASS STRUT CHANNEL

- A. NEC and ASTM D-4385
- B. NEMA 4X rating (minimum).
- C. Shall be of type Cooper-BLine series BFP22 or equivalent.

2.9 SURFACE METAL RACEWAYS AND FITTINGS

- A. ANSI/UL 5 and the NEC.
- B. NEMA 3R rating (minimum).

2.10 OUTLET, JUNCTION AND PULL BOXES

- A. Conform to NEC Article 370. Electrical boxes shall conform to UL-50, "Standard for Electrical Cabinets and Boxes", and UL-514, "Standard for Electrical Outlet Boxes and Fittings".
- B. Provide electrical boxes of the material, finish, type and size indicated and required for the location, kind of service, number of wires, and function. Boxes shall have mounting holes retapped for 10-24 machine screws.
- C. Provide boxes complete with accessible covers designed for quick removal and suitable for the purpose for which they will be used, except that boxes in which or on which no devices or fixtures are to be installed, shall be equipped with flat or raised blank covers as required. All ceiling fixture outlet boxes shall be equipped with 3/8-inch boltless fixture studs.
- D. Boxes not over 100 cubic inches in size shall be cast. Boxes over 100 cubic inches in size shall conform to the requirements for cabinets.
- E. Covers: Same thickness as boxes and secured in position by means of No. 10-24 stainless steel machine screws. Arrange covers to be readily and conveniently removed.
- F. Coat junction boxes inside and outside to prevent oxidation. Where outlet boxes are used as junction boxes they shall be cast aluminum and not be smaller than 4 inches square by 1-1/2 inches deep. Provide such boxes with flat blank covers.
- G. Outlet Boxes: Cast aluminum, not be smaller than 4 inches square by 2-1/8 inches deep.
- H. Concealed Switch Boxes: Cast aluminum, not less than 4 inches square by 1-1/2 inches deep for two devices unless otherwise indicated. Provide covers with rectangular openings of proper size and shape. Furnish and install special boxes required to suit the kind of service and location requirements, as indicated, and as may be directed by the Engineer.
- I. Cast metal boxes shall be of aluminum alloy, with compatible conduit fittings.
- J. Boxes for exposed switches and receptacles: Cast metal, FS and FD Types.
- K. Furnish brackets, supports, hangers, fittings, bonding jumpers and all other accessories required.
- L. Provide neoprene gaskets 1/8 inch thick with boxes subjected to weather, and as directed by the Engineer.
- M. Grounding. Provide each box to which a lighting fixture or receptacle is to be attached with a grounding terminal.
 - 1. Grounding Terminal: Either a green-colored washer-in-head machine screw not smaller than No. 10-32 in a drilled and tapped hole in the back of the box, or a grounding bushing with green-colored machine screw terminal attached to one of the conduits.
 - 2. Provide suitable grounding terminals in motor connection boxes.
 - 3. Install grounding jumpers as specified in Section 16450 - GROUNDING.
- N. Junction and pull boxes must be surface mounted and not buried.

2.11 WIRE AND CABLE (600 VOLT)

- A. Conductors: Conform to the requirements of the NEC.
 - 1. Feeder and Branch Circuit Conductors: Soft-drawn copper.
 - 2. Control Circuits: Soft-drawn copper.
 - 3. Conductor Sizes: Standard American Wire gauge sizes. Conductors No. 10 and smaller, solid copper; No. 8 and larger, stranded copper.
 - 4. Minimum AWG sizes unless otherwise indicated:
 - a. No. 12 for branch circuits.
 - b. No. 14 for control wire and fixture wire
 - c. No. 16 for low voltage circuit and indication wire.
- B. Wire and Cable 600 volts and Below Installed Raceways: Single conductor, NEC type XHHW, conforming to requirements of NEMA WC 7, or THWN.
- C. Fixture Wire: Type AF single conductor, rated for 150°C conductor temperature, 300 volts.
- D. Color Coding of Conductors
 - 1. Color code supply cables and branch circuit conductors throughout the secondary alternating current wiring system as follows:

Conductor	208/120 Volts	480/277 Volts
Phase A	Black	Orange
Phase B	Blue	Yellow
Phase C	Red	Brown
Neutral	White	Off-White
Ground	Green	Green

2. Branch circuit phase conductors No. 10 and smaller and all neutral and equipment conductors: Solid color insulation or solid color coating.
3. Solid color coatings and tracers: A strongly adherent paint or dye not injurious to the insulation and which will not be obliterated by pulling into a conduit or raceway.
4. On-site coloring of ends of conductor may be permitted by the Engineer upon receipt of satisfactory evidence that the Contractor is unable to order color-coded wire and cable as specified. Provide certification from the cable manufacturer that the paint or dye proposed for field application is non-injurious to the insulation. Colored tape may be used to mark the ends of conductors in lieu of paint or dye.

E. Identification Tags

1. Provide waterproof identification tags of brass, aluminum, plastic, or pressure-sensitive moisture-resistant labels designed for fastening to cables, feeders, and power circuits in vaults, pull boxes, manholes, and switchboard rooms and at all terminations of cable or wire.
2. Stamp or print tags or labels to correspond with markings on the Contract Drawings or accepted Shop Drawings, or mark so that feeder, cable or conductor may be readily identified. Tags on conductors at switches, receptacles, motor control panels, wireways, and junction boxes shall bear the circuit number of the conductor as it appears in the circuit directory. Mark conductors in motor control panels with the terminal number.
3. If suspended type tags are provided, design tie tags with slip-free plastic cable lacing unit or design for attachment by nylon bundling straps.

F. Cable Supports and Fasteners: Design for use with channel inserts.

G. Conductor Bundling Straps

1. Formed from self-extinguishing nylon having a temperature range of minus 65°F to plus 250°F.
2. Equip each strap with a locking hub or head with a stainless steel locking barb on one end and a taper on the other end.
3. Make wire and cable ties for installation outdoors and in exposed locations of ultraviolet resistant nylon material.

H. Splice and Terminal Connectors

1. Design termination fittings for use with the cable furnished, NEMA Standard, and UL approved.

2. Termination and splice fittings for No. 10 and smaller conductors; Screw on, spring pressure-type copper connectors with nonflammable, self-extinguishing insulation of temperature rating equal to that of cable being connected. Terminals to provide a metal insulation grip on the conductor for strain relief.
3. Termination and splice fittings for No. 8 and larger conductors: Tool-applied compression connectors of material and design compatible with the conductors for which they are used.
4. Terminal connectors for conductors Size No. 4/0 and larger: Long-barrel, double compression type, and furnished with two bolting holes in the pad.

I. Insulating Material for Splices and Terminations

1. Of the type approved by the Engineer for the particular use, location and voltage, 3/4 inch nominal width.
2. Plastic electrical insulating tape for general use: Vinyl plastic with rubber-based pressure-sensitive adhesive. Pliable at temperature of minus 18°C to 105°C. When tested in accordance with ASTM D 3005, the tape shall have the following minimum properties:
 - a. Thickness: 7 mils.
 - b. Breaking Strength: 15 pounds per inch.
 - c. Elongation: 200%.
 - d. Dielectric Strength: 10,000 volts/mil
 - e. Insulation Resistance (Direct method of electrolytic corrosion): 1,000,000 megohms.
3. Rubber electrical insulating tape for protective overwrapping: Silicone rubber with a silicone pressure-sensitive adhesive. When tested in accordance with ASTM D1000, the tape shall have the following minimum properties:
 - a. Thickness; 15 mils.
 - b. Tensile Strength: 11 pounds per inch.
 - c. Elongation: 525%.
 - d. Dielectric Strength: 13,000 volts
 - e. Insulation Resistance (Indirect Method of Electrolytic corrosion): 1,000,000 megohms.
4. Arcproof Tape: Flexible, conformable organic fabric, coated one side with a flame-retardant flexible elastomer-self-extinguishing, with the following minimum properties:
 - a. Thickness, ASTM D1000: 55 mils.
 - b. Tensile strength, ASTM D1682; 50 pounds per inch.
 - c. Thermal conductivity, ASTM D1518; 0.478 btu/hour/square foot/degrees F.
 - d. Electrical Arc Resistance: Withstand 200 ampere arc for 40 seconds.
5. Mark each tape package to indicate shelf-life expiration date.
6. Glass Cloth Electrical Insulating Tape (for use with arcproof tape): Woven glass fabric; when tested in accordance with ASTM D1000, the tape shall have the following minimum properties:
 - a. Thickness: 7 mils
 - b. Breaking Strength: 170 pounds per inch.
 - c. Elongation: 5%.
 - d. Dielectric Breakdown: 2,500 volts.
 - e. Insulation Resistance (Indirect Method of Electrolytic Corrosion): 5,000 megohms.

2.12 WIRING DEVICES

- A. General. Wiring devices include switches, receptacles and special outlets installed in raceway or conduit boxes, complete with cover plates.
- B. Switches
1. AC tumbler-toggle switches: Meeting minimum requirements of UL 20 and further requirements herein specified and of specification grade, heavy duty, of the type indicated.
 2. Provide switches that operate in any position and are fully enclosed with entire body and cover of molded phenolic, urea or melamine. Do not use fiber, paper or similar insulating material for body or cover.
 3. Equip switches with metal mounting yoke with plaster ears, insulated from the mechanism and fastened to the switch body by bolts, screws, rivets or other substantial means that meet test requirements.
 4. Provide a green-colored equipment grounding screw on the yoke.
 5. Provide the section of the yoke normally intended to bear on the surface outside the box with a minimum over-all dimension of 3/4 inch, measured at right angles to the longitudinal axis of the yoke.
 6. Make switch contacts between silver or silver alloys.
 7. Switches shall be back and side wired with terminals of screw or combination screw-clamp type.
 8. Terminal Screws: No. 8 or larger, captive or terminal type.
 9. Provide access holes for back wiring.
 10. Wiring terminals capable of receiving and holding proper wire sizes as shown below:

Switch Rating	Wire Size, AWG No.
20 amperes	12 and 14
30 amperes	10

- C. Switches for general use shall be fully rated at 20 amperes, 120 volts. Actual connected lamp wattage not to exceed the following:

Switch Rating at 120-Volts	Maximum Wattage Allowed
20 amperes	1,400

2.13 RECEPTACLES AND PLUGS

- A. Configuration and requirements for connector and outlet receptacles; UL 498 and NEMA WD 1 for heavy duty general use type.
- B. Receptacles: Fire-resistant nonabsorptive, hotmolded phenolic composition or equal bodies and bases with metal plaster ears integral with supporting member.
- C. Type: Flush type, except where otherwise indicated.
 - 1. Wall receptacles; Single or duplex as shown on the Contract Drawings.
 - 2. Provide receptacles and plugs (caps) with light-colored terminal facilities for neutral connections, amber or brass colored for phase conductor connections, and green-colored hexagonal machine screws for the equipment grounding conductor or connections.
 - 3. All contracts of the receptacles, including the grounding contract: Double grip bronze type with spring steel backup clips so that both sides of each male prong of the plug will be in firm contact.
 - 4. Provide all receptacles with self-grounding clip or mounting strap screws.
 - 5. Ground fault circuit interrupter duplex receptacles shall be 120 volt, 60 Hz, 15 ampere with built-in test, reset buttons, and ground fault tripped indication. They shall interrupt the circuit within 1/30th of a second on a 5 milliampere earth leakage current. They shall be designed for end of run installation or with provisions for feeding through to protect other outlets on the circuit. Maximum circuit capacity for the latter shall be 20 amperes. The receptacles shall be furnished with necessary wire connectors, clips, mounting scores and instruction.

2.14 COVER PLATES

- A. Provide cover plates for each switch, receptacle, and special purpose outlet.
- B. Use multi-gang plates for multi-gang boxes.
- C. Unless otherwise indicated, use cover plates conforming to FS W-P-455.
- D. Provide and install cover plates of brushed stainless steel in power/control shed (see contract drawings).

2.15 DISCONNECTION DEVICES

- A. Safety Switch Type Disconnecting Devices: Enclosed, conforming to UL Standards and the following:
 - 1. Heavy Duty Safety Switches (240 Volts AC):
 - a. Furnish heavy-duty safety switches having electrical characteristics, ratings, and modifications indicated.
 - b. Furnish switches with NEMA 3R General Purpose Enclosures, unless otherwise indicated, and with metal nameplates, front cover mounted, containing a permanent record of switch type, catalog number, and HP ratings.
 - c. Furnish handle with visible blades; reinforced fuse clips; nontearable, positive, quick make-quick break mechanism, and which is pad-lockable in the OFF and ON position.

- d. Furnish switches meeting NEMA (exterior use) requirements.

2.16 COMMUNICATION SHELTERS

- A. Communications shelters shall conform to UL standards and the following:
 - 1. NEMA 4X Stainless Steel type construction and free standing.
 - 2. Shall have pad-lockable doors and full size rear equipment mounting interior back planes. Enclosure heights shall be 90 inches, depth dimension shall be 36 inches, width dimensions shall be as listed in contract drawings.
 - 3. Model type shall be Cooper B Line “ENVIRO SHIELD” or equivalent.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all items in their proper locations as shown on the Contract Drawings, rigid and secure, plumb and level, and in true alignment with related and adjoining work. Do not weld electrical materials for attachment or support.
- B. Furnish anchor bolts and anchorage items as required, and field check to ensure proper alignment and location. Provide templates, layout drawings, and supervision at the job site to ensure correct placing of anchorage items in concrete. Check embedded items for correctness of location and detail before concrete is placed.
- C. Install supporting members, fastenings, framing, hangers, bracing, brackets, straps, bolts and angles as required to set and connect rigidly the work.
- D. Control erection tolerance requirements to not impair the strength, safety, serviceability, or appearance of the installations, as approved by the Engineer.
- E. The trade size, type and general routing and location of conduits, raceways, and boxes shall be as indicated.
- F. Install individual conductors in conduits, raceways, cable trays, ducts, and trenches and multiple-conductor sheathed cables as shown on the Contract Drawings to complete the wiring systems.
- G. Install switches, receptacles, special purpose outlets, and cover plates complete in a neat manner in accordance with the NEC and local electrical codes.

3.2 CONDUIT AND FITTINGS

- A. Metallic (rigid galvanized steel & PVC coated rigid galvanized steel) Electrical Conduit
 - 1. Install metallic conduit in accordance with the NEC and as indicated. Prevent concrete and other materials from obstructing the conduit. Pack all outlet, pull and junction boxes with paper

- prior to pouring concrete ends of embedded conduit. Do not use conduit smaller than 3/4-inch diameter.
2. Make all conduit bends in accordance with the NEC, with not more than 3 bends per run. Where more than 3 bends are required in a particular run, install pull boxes as required to facilitate pulling conductors.
 3. Unless otherwise indicated, terminate metallic conduit installed for future extension with flush couplings set to finished floor level.
 4. Provide metallic numbering tags indicating the conduit number on the end of conduit. Identify train control and communication conduit as indicated.
 5. Properly support conduit to be embedded to maintain correct location and spacing during concreting operations. If necessary, provide suitable metal supports for this purpose.
 6. Install conduit so that any moisture collecting in the conduit will be drained to the nearest outlet or pull box.
 7. Whenever exposed or buried conduit passes through an expansion or contraction joint in the structure, install the conduit at right angles to the joint, and provide an approved conduit expansion joint at the joint. Paint the conduit with an approved bituminous compound for one foot on each side of the expansion couplings.
 8. Provide expansion joints in conduit runs where required to compensate for thermal expansion.
 9. Rod and swab embedded conduit after installation to remove foreign matter, which may have worked in at the joints. If obstructions are encountered which cannot be removed, or if any conditions exist which may result in damage to wires and cables pulled through the conduit, install new conduit at no additional expense to the Authority.
 10. After the conduit has been rodded and swabbed, repack boxes and protect conduit ends to prevent any foreign material from entering the conduit.
 11. Where metallic conduit is exposed to different temperatures, seal the conduit to prevent condensation and passage of air from one area to the other.
 12. Use only conduits that are electrically and mechanically continuous and connect to the structure ground system. Secure continuous ground by bonding where required.
 13. Apply conductive antisieze compound to the threads of threaded rigid conduit joints. Do not use compounds containing lead. Terminate the conduit in appropriate boxes at all motors, switches, outlets, and junction points.
 14. When field cutting of conduit is required, thread and ream the conduit to remove any rough edges. Where a conduit enters a box or other fitting, provide a bushing to protect the wire from abrasion. Provide insulation type bushings and double locknuts on ends of rigid conduits terminating at steel boxes, panelboards, cabinets and similar enclosures.
 15. Support individual horizontal conduits not larger than 1-1/2 inches diameter by means of one-hole pipe straps with back spacers or individual pipe hangers.
 16. Space conduits installed against concrete surfaces away from the surface by clamp backs or other approved means.
 17. Support individual horizontal conduits larger than 1-1/2 inches diameter by individual pipe hangers.
 18. In dry locations, spring steel fasteners, clips, or clamps specifically designed for supporting exposed single conduits may be used in lieu of pipe straps or pipe hangers.

19. Hanger rods used in connection with spring steel fasteners, clips, and clamps shall be either 1/4-inch diameter galvanized steel rods or, if concealed above a suspended ceiling, galvanized perforated steel strapping. Do not use wire for support of conduit.
20. Support parallel conduits at the same elevation on multiple conduit hangers or channel inserts. Secure each conduit to the pipe hanger or channel insert member by a U-bolt, one-hole strap, or other specially designed and approved fastener suitable for use with the pipe hangers or channel inserts.
21. Space supports not over 10 feet on centers for vertical conduits spanning open areas. Securely anchor conduit at each end and run so as not to interfere with the installation and operation of equipment at the location.
22. Support conduits and raceways above suspended ceilings from either the floor construction above or from the main ceiling support members, using the applicable method specified herein.
23. Install liquid-tight flexible metal conduit so that liquids tend to run off the surface and not drain toward fittings. Provide sufficient slack to reduce the effects of vibration. Running threads are not acceptable. Where necessary for connecting conduits, use right and left hand couplings.
24. All conduits crossing under the railroad tracks shall be rigid galvanized steel type with minimum cover of 2" concrete encasement, at a minimum burial depth of 36" below finished grade.

B. Non-Metallic Electrical Conduit

1. Non-metallic electrical conduit includes polyvinyl chloride (PVC).
2. Cap or plug the ends of embedded conduit to prevent concrete and other materials from obstructing the conduit.
3. Sandpaper joints in PVC conduit to remove all burrs, clean and dry the joints, and brush with solvent cement acceptable to the manufacturer before installing.
4. Properly support conduits to maintain the correct location and spacing during concreting operations and, if necessary, provide suitable plastic supports and spacers for this purpose.
5. Wherever buried non-metallic conduit passes through an expansion or contraction joint, or where required to compensate for thermal expansion and contraction, provide a conduit expansion joint. Install the conduit to cross the joint at right angles. In areas of floating slabs, install horizontal runs of conduit beneath the floating slab. Conduit shall pass through the floating slab only where required to terminate in a vertical direction as shown on the Contract Drawings.

C. Pull Wires

1. Use nylon pull wires of tensile strength not less than 240 pounds in each conduit and duct, leave pull wires in ducts and conduit after cleaning.
2. No splices in pull wire will be allowed.
3. Leave ample slack length at each end of pull wire.

D. Filling of Openings. Wherever slots, sleeves, or other openings are provided in floors or walls for the passage of raceways, including bus ducts, fill such openings as follows:

1. Use fire-resistive filling material for openings similar to the material of the wall/surface being penetrated, and finish to prevent passage of water, smoke, and fumes.
2. Seal all above ground conduit penetrations with filling material that matches, and is flush with the surface being penetrated.

3.3 INSERTS

- A. Channel Inserts. Install embedded channel inserts with the slotted face flush with the finished concrete surface.
- B. Spot Inserts
 1. Install with the insert face flush with the finished concrete surface, firmly embedded, with no evidence of movement.
 2. Test selected inserts, as required by the Engineer, by suspension of 800 pounds of weight from the insert. If there is evidence of failure, replace the inserts in a manner satisfactory to the Engineer.

3.4 SURFACE METAL RACEWAYS

- A. Securely ground surface metal (NEMA 3R) raceways to outlet boxes or to backplates and fixtures by means of bolts, screws or other approved means and as specified in Section 16450 - GROUNDING.
- B. Install surface metal (NEMA 3R) raceways where indicated, in accordance with the NEC. Use fittings and accessories designed for the raceway.

3.5 OUTLET, JUNCTION AND PULL BOXES

- A. Outlet Boxes
 1. Mount boxes so that the long axis of the devices will be vertical, unless otherwise indicated.
 2. Locate conduit boxes and conduit box knockouts so as not to interfere with the reinforcing steel.
 3. The mounting height indicated for a wall-mounted outlet box shall be construed to mean the height from grade to the horizontal centerline of the cover plate.
- B. Junction and Pull Boxes
 1. Install so that covers are readily accessible after completion of the installation.
- C. Boxes Set in Concrete
 1. Adequately support boxes to prevent movement during placement of concrete.
 2. After installation, clean boxes placed in concrete.

3.6 WIRING

A. General

1. Furnish wires and cables to the site in unbroken standard coils or reels, to which shall be attached a tag bearing the manufacturer's name, trade name of the wire, and the UL label for 600 volt wire and cable.
2. Provide all wiring complete as indicated. Provide ample slack wire for service connections and extensions.
3. Do not bend cables during installation, either permanently or temporarily, to radii less than 12 times the outer diameters, except where conditions make the specified radius impracticable, and shorter radii are permitted by the NEC and NEMA Standard WC 7, Appendix N.
4. Neatly and securely bundle cable conductors located in branch circuit panelboards, cabinets and control boards. Use nylon bundling straps.

B. Wire Pulling

1. Install wire and cable in conduit as indicated. Do not pull wiring into any conduit until conduits and outlets have been thoroughly cleaned and swabbed to remove water and debris. Do not use block or tackle or other mechanical means in pulling conductors smaller than No. 2 AWG in raceways.
2. Provide suitable installation equipment to prevent cutting and abrasion of conduits and wire during the pulling of feeders. Use lubricant and installation procedure as recommended by the cable manufacturer, and as approved by the Engineer.
3. Use masking or other means to prevent obliteration of cable identifications when solid color coating or colored tracers are used.
4. Pull together all cables to be installed in a single conduit.

C. Cable Supports. Install cable supports for vertical feeders in accordance with the NEC.

D. Splices and Terminations

1. Make wire and cable splices only in outlet, junction or pull boxes, or in equipment cabinets. Splices in conduit or raceway will not be permitted. Make splices by means of compression type connectors, and cover with tape to an insulation level equal to that of the cable.
2. Use positive type connector installation tools as recommended by the manufacturer.
3. Mechanical hand tools, with dies for each conductor size, recommended by the manufacturer, may be used on conductor sizes through No. 4/0.
4. For conductor sizes larger than No. 4/0, use hydraulic tools with hexagonal or circumferential installing dies for each conductor size, as recommended by the manufacturer.
5. For inspection purposes, clearly mark die numbers on the installed connectors.
6. Before installation, apply anti-corrosion electrical joint compound to conductors and terminal bolting pads.

3.7 WIRING DEVICES

- A. Locate switches four feet above finished surface, or as indicated on drawings.
- B. Attach receptacles rigidly to outlet box by means of two screws.
- C. Mount receptacles in watertight (NEMA 3R) cast type outlet boxes with threaded hubs or bosses and equipped with gasketed cover and captive cap of the screw or twist type.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART I - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the furnishing and installing of nameplates and labels, wire and cable markers, and conduit markers. Engraved nameplates shall be designed, furnished and installed for every major piece of electrical equipment shown on the single line diagrams. The single line diagrams are shown on the Contract drawings.
- B. Related requirements are included in, but not limited to, the following Sections.
 - 1. Section 16050 - BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK

1.2 REFERENCES

- A. National Fire Protection Association (NFPA)
 - 1. NFPA No. 70 - National Electrical Code

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300, except as modified herein.
- B. Product Data/Catalog Cuts
 - 1. Nameplates and labels.
 - 2. Wire and cable markers.
 - 3. Conduit markers.
- C. Certificates of Compliance
 - 1. Nameplates and labels.
 - 2. Wire and cable markers.
 - 3. Conduit markers.
- D. Manufacturer's Instructions
 - 1. Delivery, handling, transportation, storage and protection.
 - 2. Surface preparation, and application/installation of products.
 - 3. Application conditions and limitations of use.
- E. Engraved nameplate schedule shall be submitted for review and approval by the Engineer.
- F. Submittals required for painting work shall be as specified in Section 09900.

1.4 DELIVERY, HANDLING, TRANSPORTATION, STORAGE AND PROTECTION

Delivery, handling, transportation, storage and protection shall be in accordance with the manufacturer's instructions, unless otherwise required by Division 1.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Conform to requirements of NFPA No. 70.
- B. Provide products listed and classified by Underwriters Laboratories, or a testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.
 - 1. The Contractor shall submit certificates of compliance for products provided.
 - 2. The Contractor shall provide the manufacturer's instructions indicating application conditions and limitations of use stipulated by the product testing agency.

2.2 NAMEPLATES AND LABELS FOR EQUIPMENT

- A. Nameplates and Labels
 - 1. Engraved three layer laminated plastic, black letters on white background.
- B. Locations
 - 1. Electrical equipment including, but not limited to, each electrical distribution enclosure and control equipment enclosure, communication cabinets, transfer switches and panels.
- C. Letter Sizes:
 - 1. Use 1/4-inch letters for identifying individual equipment and loads.
 - 2. Use 1/4-inch letters for identifying grouped equipment and loads.
 - 3. Use 1/8-inch letters for identifying voltage, phase, and neutral.

2.3 WIRE MARKERS

- A. Wire markers shall be manufactured by Panduit, Ideal, 3M, or approved equal.
 - 1. Description: Cloth tape or tubing type wire markers.
 - 2. Locations: Each conductor at panelboard, gutters, pull boxes, outlet and junction boxes and each load connection.
- B. Legend
 - 1. Power and lighting circuits: Branch circuit or feeder number indicated on the **Drawings**.
 - a. Control circuits: Control wire number indicated on schematic and interconnection diagrams on the Drawings.

2. Power supervisory control and data acquisition (SCADA) system circuits:
 - a. Circuits shown on the riser diagrams or schematic diagrams. The riser diagrams and schematic diagrams are shown on the Drawings.

2.4 CONDUIT MARKERS

- A. Conduit markers shall be manufactured by Banded Labeling System, Brady USA, Inc., Panduit, or approved equal.
- B. Location: Furnish markers for each conduit longer than 6 feet.
- C. Spacing
 1. Spacing shall be 20 feet on center, unless otherwise specified.
- D. Color:

<u>System Name</u>	<u>Color</u>
1. 277/480 volt system	Per NEC
2. 208Y/120 volt system	Per NEC
3. Management information system	Purple
4. Passenger assistance system	Green

- E. Legend:

<u>System Name</u>	<u>Legend</u>
1. 277/480 volt system	Per NEC
2. 208Y/120 volt system	Per NEC
2. Management information system	MIS -
3. Passenger assistance system	PNRA

2.5 PAINTED CONDUIT IDENTIFICATION

- A. Conduit shall be painted for identification purposes. Paint system Identification Number shall be as specified Section 09900 - PAINTING
- B. Paint colored band on each conduit longer than 6 feet.
- C. Paint bands, 3 inches wide, 20 feet on center, unless otherwise specified.
- D. Color

<u>System Name</u>	<u>Color</u>
1. 277/480V and 208Y/120 volt systems	Per NEC
2. Management information system	Purple
3. Passenger assistance system	Green

2.6 UNDERGROUND WARNING TAPE

- A. Underground warning tape shall be manufactured by Panduit, Ideal, Seton, or approved equal.

- B. Description: Underground warning tape shall be 6 inch wide plastic tape, colored yellow with suitable warning legend describing: CAUTION - BURIED ELECTRICAL LINES BELOW.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates, labels and markers, in accordance with the manufacturer's instructions.

3.2 APPLICATION INSTALLATION

- A. Application/installation of products shall be in accordance with the manufacturer's instructions.
- B. Nameplates and Labels
 - 1. Install nameplates and labels parallel to equipment lines.
 - 2. Secure nameplate to equipment front using screws.
 - 3. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- C. Conduit Identification by Markers
 - 1. Identify conduit using conduit markers.
 - a. Apply conduit markers parallel to conduit runs.
- D. Conduit Identification by Painting
 - 1. Identify conduit, using paint. Paint shall be field applied.
 - a. Painting, including surface preparation, shall be in accordance with Section 09900 - PAINTING
- E. Identify underground conduits using underground warning tape. Install one tape per trench at 12 inches below finished grade.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies furnishing and installing complete system neutral grounding, equipment grounding system for the MBTA South Acton Commuter Rail Station electrical system - as shown on the Contract Drawings and indicated herein.

1.2 SUBMITTALS

- A. Catalog cuts and descriptive literature for materials specified herein and as shown on the Contract Drawings.
- B. Field Quality Control Test Report. Submit reports complying with requirements of Part 3 "Field Quality Control" Article.
- C. As-Built Drawings. Submit prior to final acceptance of the work, drawings showing complete layout of systems installed including physical location of ground rods to which connections were made

PART 2 - PRODUCTS

2.1 BARE GROUND WIRE

- A. Soft drawn copper, Class A or Class B stranded, meeting the requirements of ASTM B8; size in accordance with the NEC except where sizes specified herein or shown on the Contract Drawings are larger than those required by NEC; UL listed, Label A for lightning protection conductors. Grounding cable shall be continuous without joints or splices through its length.

2.2 INSULATED GROUND WIRE

- A. Copper, Class B Stranded, 600-Volt, 90 degree C, NEC type THWN or XHHW; meeting requirements of AAR Specifications No. 535.2; sized as indicated; and UL listed.

2.3 PRODUCTS USED FOR COPPER THERMIT WELDED CONNECTIONS

- A. Use products for copper thermit welded connections which are the products of one manufacturer and are produced for the specific application for which they are used.
- B. Use materials and equipment which meet or exceed the applicable acquirements of the AAR Manual, Electrical Section, Section 13, Chapter 3, Part 6.

- C. Coating Materials for Thermit Welded Connections: Use black, rubber based compound coating materials, which are soft, permanently pliable, moldable, and unbacked, not less than 1/8 inch thick, with properties as follows:

Solids	100 percent
Density	12.0 pounds per gallon minimum
Penetration	90-130 ASTM D5
Water Absorption	0.10 percent maximum ASTM D570
Dielectric Strength	500 volts/mil ASTM D149
Volume Resistivity	2,000 megohms-inches ASTM D257 5,000 megohms-cm ASTM D257
Service Temperature	Minus 40 degrees to 160 degrees F.
Chemical Resistance	Melting point, none; flammability, slow burning (ASTM C653); resists alcohol, water, aqueous hydrochloride and sodium hydroxide; dissolved by carbon tetrachloride, naphtha gasoline, mineral spirits, ketones, and benzene.
Highly cohesive and Adhesive	Adheres strongly to metals and concrete and to itself.

2.4 BOLTED GROUNDING CONNECTORS

- A. For solderless type made of high strength electrical bronze with silicon bronze clamping bolts and hardware; designed such that bolts, nuts, lock washers and similar hardware which might nick or otherwise damage the ground wire will not directly contact the ground wire.

2.5 GROUND RODS

- A. Medium carbon steel core, copper clad by the molten weld casting process; sizes as shown on the Contract Drawings; UL approved.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform testing as specified in Part 3 "Field Quality Control" Article.

3.2 GENERAL GROUNDING REQUIREMENTS

- A. General. Provide station electrical grounding complying with procedures of NEC and as indicated.
- B. Equipment Ground Conductors

1. Provide each conduit entering power shelter with equipment ground conductor, colored green.
 2. Terminate conductor directly on main panel ground bus.
- C. White Neutral Conductor. Provide each conduit feeding line-to-ground loads, such as 277 and 120 volt control power with both an equipment ground conductor and insulated white neutral conductor.
- D. For the Electrical room/Communications closet/Town Hall closet, provide grounding for the 277/480V distribution panels, 208Y/120V power panels and communication closet ground bus.
- E. Provide grounding for Comm Shelter (Inbound side) ground bus
- F. Provide grounding for Signal Shelter (Inbound side) ground bus
- G. Provide grounding for the NSTAR meter, Main service disconnect switch and associated equipment.
- H. For the Prefabricated Maintenance Sheds, provide grounding for the dedicated circuits.
- I. Provide convenience outlets having ground fault circuit breakers, complying with Section 16050 – BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK.

3.3 EQUIPMENT GROUNDING

- A. Wiring, Channels, Cable Trays, Metallic Conduit, Rigid Electrical Metallic Tubing, Flexible Conduits, Metallic Boxes, Panelboards, Generator Frames and Transformer Enclosures. Ground to ground bus with copper ground conductors sized as specified in the Construction Specifications.
- B. Lighting Fixtures and Equipment.
1. Accomplish grounding with equipment ground.
 2. Provide equipment ground conductor electrically and mechanically continuous from system equipment and neutral ground connection at source of supply to equipment to be grounded.
- C. Junction Boxes and Other Enclosures Sized Above Five Square Inches. Securely bond equipment ground conductors to enclosures utilizing equipment ground bus or lug.
- D. Ground Electrodes (Rods)
1. Ground rods shall not protrude above finished grade to prevent a tripping hazard.
- E. Grounding Conductors
1. All direct buried grounding conductors comprising of the main ground grid for the new power and communications sheds and control cabinets/enclosures and transformer pads shall be installed a minimum of 30 inches below finished grade or ballast.
 2. Separate grounding conductors shall be provided for all circuits as required by these Specifications and as indicated on the Contract Drawings
- F. Ground Terminations
1. All ground rod electrical connections should be welded with the CADWELD copper-based exothermic welding process. Exothermic welds shall adhere to manufacturer's instructions. Exothermic welds shall be Erico or approved equal

3.4 CONVENIENCE OUTLETS

- A. Ground all convenience outlets in accordance with the NEC.

3.5 THERMIT WELDING CONNECTIONS

- A. Connect electrical wires together, to reinforcing steel or soldier piles, as indicated, by thermit welding using the manufacturer's recommended molds and size of charges for application.
- B. Prepare the material to be welded and perform thermit welding in accordance with manufacturer's instructions.
- C. Test completed thermit welds before coating by striking with two pound hammer. If cracks develop, replace welds at no additional expense to the Authority. When required by the Engineer, test the electrical continuity of bonds.
- D. Apply coating so that it extends one inch beyond point of attachment to steel member, overlaps wire coating one inch, and provides insulation thickness equivalent to wire insulation, but not less than 1/8 inch in thickness. Do not apply coating material at ambient temperatures below 20 degrees F or above 125 degrees F. Maintain, by an approved method, curing temperature within above temperature range for at least four hours after application of coating. Protect coating by approved means until embedment.

3.6 FIELD QUALITY CONTROL

- A. Control Shed and Control Cabinet/Enclosed Ground System Testing
 - 1. General. After installation of the main ground grids and ground electrodes and prior to interconnection of other grounding systems, perform ground resistance testing.
 - 2. Test Report. Provide report-giving results of testing procedures, which shall also include temperature, humidity and condition of soil at time of tests.
 - 3. Ground Resistance Testing
 - a. Test Equipment and Method. Perform testing using ground resistance direct-reading single test meter utilizing alternating current fall-of-potential method and two reference electrodes.
 - b. Test Procedure
 - 1) Orient ground electrode to be tested and two reference electrodes in string line spaced minimum 50 feet apart.
 - 2) Drive two reference electrodes five feet deep.
 - c. Resistance Test Value. The maximum allowable resistance value of the grounding system for the new power and communication sheds shall be 1 ohm. If it is found that the resistance value of the grounding system exceeds 1 ohm, the Contractor shall install additional ground rods in series until the resistance value reaches 1 ohm or less. Additional ground rods shall be spaced no less than 10 feet apart. If, after additional ground rods are installed, excessive resistance readings persist, the Contractor shall notify the Engineer.

B. Miscellaneous Equipment Grounding System Testing

1. Electrical equipment such as power service equipment, electrical manholes and handholes and other electrical apparatus requiring grounding shall meet the resistance test value specified below.
2. Resistance Test Value. The maximum allowable value for electrical apparatus specified above shall be 25 ohms or less. If it is found that the resistance value exceeds 25 ohms, the Contractor shall install additional ground rods in series until the resistance value reaches 25 ohms or less. Additional ground rods shall be spaced no less than 10 feet apart. If after additional ground rods are installed, excessive readings persist, the Contractor shall notify the Engineer

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16471

DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies distribution and branch circuit panelboards and panelboard enclosures.
- B. Related Work- Related work should be performed under sections 16050-Basic Methods for Electrical Work, and 16450-Grounding.

1.2 SUBMITTALS

- A. Submit for approval catalog cuts, drawings, and data, for each item, indicating the following:
 - 1. Manufacturer's model number or item identification.
 - 2. UL listing and rating.
 - 3. Critical dimensions and mounting arrangements.
 - 4. Complete replacement parts list.
- B. Enclosures: Materials and methods of construction, door arrangement, conduit hub and knockout locations, and identification of intended panelboard.
- C. Circuit Breakers: Circuit for which intended, voltage ratings, insulation level, current rating, and interrupting ratings.
- D. Panelboards: Base material, general arrangement, location and identification of each circuit breaker and the circuit breaker information specified above, location and identification of all terminals, location of barriers, applicable UL 67 Tables A through F information, wiring diagrams, and identification of the enclosure for which intended.

1.3 QUALITY ASSURANCE

- A. Manufacturing: Manufacturer's and UL standard inspecting and testing procedures.
- B. UL Labels
 - 1. Each factory-assembled enclosure panelboard.
 - 2. Each panelboard shipped separately.
 - 3. Each circuit breaker shipped for field mounting.
- C. Listing and Special Marking
 - 1. Each enclosure shipped separate from panelboard shall be UL listed and marked with the identification of the panelboard for which intended.
 - 2. Raintight marking for all enclosures exposed to weather or unusual spray or moisture conditions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Distribution and branch circuit panels shall be enclosed, completely factory assembled type unless otherwise approved, dead-front grounded enclosure complete with circuit breakers as shown on the Contract Drawings. Design and assemble interiors so that any individual breaker can be replaced without disturbing adjacent units or without removing main bus connectors. Design main buses and back pans of distribution panelboards such that branch circuits may be changed without additional machining, drilling or tapping. Provide cutout type only where specifically indicated.
- B. Materials of construction: UL 67; appropriate NEMA Standards, UL listed.
- C. Field Wiring and Miscellaneous Hardware: Section 16050 – BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK and Section 16450 - GROUNDING, UL listed.
- D. Field Touch-up or Repainting Paint: As recommended by enclosure manufacturer.

2.2 CIRCUIT BREAKERS

- A. Circuit Breakers of the Same Ratings: Interchangeable, quick-make, quick-break.
- B. Breakers shall have an interrupting rating not less than 20,000 amperes rms symmetrical or as otherwise indicated. The breaker trip element; enclosed compensated for temperature rise and calibrated to 40°C ambient temperature.
- C. Circuit breakers shall be of the indicating type, providing "on", "off", and "tripped" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position between "on" and "off". All multi-pole breakers shall be so designed that an overload on one pole automatically causes all poles to open. The circuit breaker shall be quick-make and quick-break on manual as well as automatic operation and shall have inverse time characteristics secured through the use of a bimetallic tripping element supplemented by a magnetic trip.
- D. The branch circuit breakers shall have fixed thermal-magnetic trips, of values shown on the Contract Drawings, and shall have minimum UL listed interrupting ratings of 20,000 symmetrical amperes at 277/480 and 208Y/120 Volts. All breakers shall be bolt-on type.
- E. Provide handle "lock-on" devices on the circuit breakers indicated on the schedules. "Lock-on" devices shall prevent accidental deenergization of critical circuits. These devices shall be trip-free, permitting the circuit breaker to trip automatically on overload. Provide one "lock/on" device for every four circuit breakers indicated in the lighting and power panels. Furnish the Authority for future use all "lock-on" devices not installed.
- F. All circuits, which serve convenience outlets, shall be protected by ground fault circuit breakers for personnel protection.
- G. Main panel circuit breaker must be fully (100%) rated.

2.3 ENCLOSURES

- A. Panel type with hinged door. Trim must also be hinged.

- B. Mark enclosures for easy identification of intended panelboard unless panelboard is shipped factory installed.
- C. Enclosures for mounting exposed to the weather or in unusually wet locations shall be rainproof type, and so marked. All others shall be standard type.
- D. Directory: Card type, suitable for typewriting directory of circuits, mounted under unbreakable transparent protective cover set in metal frame on inside of door, with provisions for:
 - 1. Panel designation and panel or switchboard from which panel is fed.
 - 2. For each circuit breaker, complete information concerning the circuit controlled, including the voltage and the area, room number, or appliances served; or Main or Spare as applicable.
- E. Finish: Thoroughly cleaned, phosphatized or equivalent, coated with at least one coat of corrosion resisting paint inside and out suitable for the material, and painted with manufacturer's standard electrical grey paint suitable for touch-up or repainting in the field.

2.4 PANELBOARDS

- A. UL listed and UL labeled unless shipped as a factory-mounted component of a UL labeled enclosed type panelboard with bases not over 48 inches top edge to bottom edge.
- B. Interrupting Devices: Circuit breaker type except where cutouts, meter fuses, or switches are specifically indicated. All cutouts, fuses and pull-out type UL listed.
- C. Panelboards, where shown on the Contract Drawings, shall be equipped with a main protective device consisting of a three-pole switch and current limiting fuses. Ratings shall be as indicated on the panelboard schedules.
- D. Panelboards shall be furnished with an insulated solid neutral bus and a suitable grounding, bus-connected to interior of panel enclosure for termination of green equipment grounding conductor.
- E. Panelboards shall have provisions, including space, terminals, and bus capacity, for future addition of at least one and not less than 10% of the total outlet circuit breakers of each rating. Close extra spaces with spare breakers.
- F. Terminals: Rated solderless type, suitable for either copper conductors sized at maximum rated terminal capacity.
- G. Buses and Connecting Straps: Solid copper, main bus rated at the sum of the branch circuit ratings, including motor loads in accordance with Section 430-24 of the National Electrical Code plus 100% of the sum of the trip ratings of the spares specified in paragraphs above, but in no case less than specified in UL 67. Full neutral bus and separate ground bus.
- H. Color markings per optional provision UL 67, Paragraph 143.
- I. Marking for easy identification of intended enclosure unless shipped factory mounted in enclosure.
- J. Permanent numerical identification by each breaker space.
- K. Spare breaker spaces closed with spare breaker. Must provide space for 100% spare breakers.

- L. Panelboard cabinets shall have means for securing, supporting, and adjusting the panelboards and trim.
- M. Panelboard gutter space shall be as required by the NEC.
- N. Where gutter spaces are occupied by feeder cables, gutter spaces shall be increased as required.
- O. Panelboard cabinets shall be ordered without knockouts.
- P. Panelboards shall be furnished with an insulated solid neutral bus and a suitable grounding bus connected to interior of panel enclosure for termination of green equipment grounding conductor.
- Q. All panelboard covers and doors must be hinged.

2.5 ENCLOSED PANELBOARDS

- A. Conform to requirements specified in Part 2 “Panelboards” Article.
- B. UL Enclosed Panelboard Label: Form 6, Form 12, or general. Enclosed cutout label only where cutout is specifically indicated.

2.6 DISTRIBUTION PANELBOARDS

- A. Distribution panelboards shall be 277/480 Volt, three phase, four wire, and shall have bolt-in type (20 KAIC rated minimum) molded case circuit breakers in the quantities and sizes indicated.

2.7 POWER PANELBOARDS

- A. Power panelboards shall be 208Y/120 Volt, three phase, four wire, and shall have bolt-in type (20 KAIC rated) molded case circuit breakers in the quantities and sizes indicated.

2.8 LIGHTING PANELBOARDS

- A. Miscellaneous power and lighting panelboards shall be 277/480 volt, three phase, four wire, and shall have single pole, bolt-in type (20 KAIC rated) molded case circuit breakers in the quantities and sizes indicated.

2.9 MISCELLANEOUS POWER AND LIGHTING PANELBOARDS

- A. Miscellaneous power and lighting panelboards shall be 208Y/120 Volt, three phase, four wire and shall have 20,000 Amp interrupting capacity bolt-in molded case circuit breakers in the quantities and sizes indicated.

PART 3 - EXECUTION

3.1 GENERAL

- A. Prior to commencing installation, verify that all surfaces upon or in which enclosures are to be mounted are properly prepared and that all pre-mounting wire pulling has been completed and properly tagged. Take corrective action if necessary.
- B. Verify that enclosure mounting provisions are suitable for intended mounting. Make corrective adjustments, if necessary.
- C. Verify that all factory-installed circuit breakers are correct rating for the applicable circuit application as indicated. Take corrective action if necessary.
- D. Install panelboards in enclosures in accordance with manufacturer's instructions, if practicable before mounting enclosure.
- E. Complete all directory cards with the information indicated in Part 2 "Enclosures" Article above. Typewrite information on directory cards.

3.2 ENCLOSURES AND PANELBOARDS

- A. Install at indicated or approved locations in accordance with manufacturer's instructions, and at convenient operating height such that no manually operable device will be within 2- 1/2 feet of grade or more than 6-1/2 feet above finish grade, and so that the mid-point of all manually operable devices is as nearly as practicable 5-1/2 feet above finish grade without exceeding the above maximum height limitations.
- B. Adjust straight and plumb and fasten securely in place. Align and securely and independently fasten each section of multi-section enclosures.

3.3 WIRING

- A. Perform wiring in accordance with Section 16050 – BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK, and UL 67; NFPA 70, Article 240; and manufacturer's instructions.
- B. Perform circuit wiring as specified in Section 16050 – BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK.
- C. Ground as specified in UL 67; NFPA 70, Articles 200 and 250; and Section 16450 - GROUNDING. Connect neutral wire directly to neutral bus, and ground wire to ground bus, in same panel as circuit interrupting device.
- D. Neatly route, harness and support conductors in gutters, wiring spaces and compartments. Bending radii not less than recommended by conductor manufacturer.
- E. Verify that circuits are wired as indicated and are continuous and free of shorts. Energize, as permitted by the Engineer, and test each circuit, including lights and outlets. Check voltage at outlets. Test other electrical equipment as recommended by manufacturer. Measure ground bus and grounded conductor resistance to true ground, resistance between enclosure and ground bus, between pairs of bus bars, and between insulation and ground bus. Resistances shall be within limits specified in Part 3

“Acceptance Tests” Article. If resistances are not within the limits specified, the cause of such resistances shall be determined and corrective action shall be taken to obtain the acceptable resistances specified.

- F. Install bonding jumpers from conduits entering cabinets to ground bus.

3.4 ACCEPTANCE TESTS

- A. Repeat the tests specified in Part 3 “Wiring” Article in the presence of and to the satisfaction of the Engineer. Test operation of each circuit and circuit control a minimum of 10 times and operation of each circuit continuously for a minimum of 1/2 hour. For all lighting circuits, comply with additional requirements specified in Section 16500 - LIGHTING.
- B. Acceptable Resistances
 - 1. Ground Bus and Grounded Conductor to True Ground: 2 Ohms maximum.
 - 2. Between Enclosure and Ground Bus: less than 0.1 Ohm.
 - 3. Between Pairs of Bus Bars: 50,000 Ohms minimum.
 - 4. Between Insulation and Ground Bus: 10 Megohms minimum.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16500

LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies lighting systems, complete and operable, as indicated in the Contract drawings including fixtures; fixture mounting hardware including brackets, canopies, hangers, and poles; lamps; auxiliary lighting equipment; and lighting control equipment for the MBTA South Acton Commuter Rail Station.
1. The equipment and materials required under this Section shall be in accordance with the general description as indicated in Section 16050 - BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK.
 2. Lighting levels shall exceed code minimums for safety and security purposes.
 3. The Light control panels shall be located in the Electrical Room.
- B. Related Work:
1. Section 16050 - BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK

1.2 SUBMITTALS

- A. Submit shop drawings, catalog cuts, descriptive information and photometric data for all lighting fixtures, lamps, auxiliary lighting equipment, lighting control equipment, and mounting hardware. Photometric data to include a computerized print-out detailing the entire finished area being lighted by the submitted luminaires detailing a statistical summary of maintained illuminance levels (MF-.65) on the platform by means of a grid spaced no further than 3 feet on center at a scale of 1" = 8'-0" accompanied with a copy of all input data used to create report. Approval of printout and lighting calculations will be made by the Engineer prior to manufacture of any material.
- B. Submit manufacturer's installation instructions detailing the installation procedures and recommended maintenance procedures that will comply with the warranty specified in Section 16500-1, 1.02, D.
- C. If specified, before production is commenced, submit a sample fixture of each style, mounting and lamp arrangement specified. Reports indicating that required tests specified have been successfully completed shall accompany each pre-production sample at the time it is submitted. The sample, if approved, will be retained until completion of the work to confirm quality conformance to the prescribed requirements herein. Provide the sample for operation at 120 volts with six-foot cord and plug.
- D. Sample for finishes and colors:
1. Submit samples for acceptance showing nominal color(s) and gloss, and the high and low color and gloss range(s) within which the production materials will be processed.
 2. Identify samples as to alloy, pretreatment and color.

3. Hold Point. Do not begin processing of production materials until Engineer's written approval of samples has been obtained.
4. Maintain variation in color of installed materials to the color range established by the acceptance samples.

1.3 QUALITY ASSURANCE

- A. Fixtures and auxiliary equipment shall be listed, labeled or certified by UL.
- B. Replace lamps, which fail within 90 days after final acceptance, at no cost to the Owner.
- C. Installation Tolerances: Deviation from location, alignment and mounting height: 1/2 inch noncumulative in any unit or continuous run of fixtures.

1.4 PRODUCT DELIVERY, STORAGE & HANDLING

- A. The Manufacturer is required to ship the lighting fixtures, poles, and accessories securely packaged and labeled for safe handling during shipment to avoid damage or distortion.
- B. The Contractor is responsible for storing lighting fixtures, poles and accessories in a secure and dry facility and in original packaging to prevent soiling, physical damage, wetting or corrosion prior to installation.
- C. Contractor must provide for storage inspection by the Engineer after fixtures have been delivered.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

- A. General Requirements
 1. Provide lighting fixtures, complete and ready for service, in compliance with UL 57, of the number, type, material, finish, electrical components and characteristics, and with all necessary hardware and auxiliary equipment indicated.
 2. The fixtures shall be clearly marked with manufacturer's name and catalog number, voltage, acceptable lamp type, maximum wattage, ballast type, and self-protection, if any. The fixtures shall be identified with standard lamp type and wattage on the exterior of the fixture housing visible from ground level. Two-inch adhesive labels with a number indicating wattage and color signifying lamp type shall be provided.
 3. Fixtures shall be rain-tight and dust-tight for use along trackways, for outdoor use, and as indicated. Fixtures must meet IP55 test for water and dust.
 4. Fixtures shall be of the same design shape and supplied by the same manufacturer. Luminaires for the project are broken down as follows:

Parking areas, stairwells, sidewalks and platforms will use a 150 watt metal halide luminaire with a fixture (housing) dimension measuring 12" x 17" x 6", or as shown on the contract drawings.

Canopies will use a 100 watt Metal halide luminaire indirect with an (inverted) fixture (housing) dimension measuring 12" x 17 x 6", or as shown on the contract drawings. All canopy fixtures shall be UL approved for raintight use.

B. Materials

1. Thicknesses, gauges and tempers of products: indicated, and as recommended by the manufacturer for the specific finish, proper forming operations and structural requirements.
2. Lighting sheet for reflector material: Prefinished aluminum, minimum thickness 0.032 inch, architectural Type 1 with Class M1, anodic coating providing 83% reflectivity.
3. Concrete for base foundations: Section 03300 - CAST-IN-PLACE CONCRETE
4. Acrylic lenses: 100% virgin acrylic plastic.
5. Polycarbonate lenses and diffusers: Injection molded, crystal clear material, polycarbonate.
6. Lenses shall be clipped and hinged.

C. Finishes

1. Finishes shall be in accordance with the manufacturer's recommendations for the specific application.
2. Commence no finishing operations until fabrication and forming operations have been completed.
3. Aluminum work shall be anodized shall be given a preanodic treatment followed by an architectural Class 1, anodic coating as described by the Aluminum Association.
Anodize aluminum in accordance with procedures established by alloy manufacturer to achieve color within specified range.
Apply a clear organic protective coating to exposed aluminum surfaces that may experience prolonged contact with caustic material, i.e., concrete, plaster.
4. Baked enamel: Factory applied to clean surfaces prepared with a chromate conversion coating, and prime coating, as indicated.
5. Porcelain enamel coating: In accordance with the requirements of Porcelain Enamel Institute, PEI-S-100.
6. Galvanized coating: Hot-dip galvanized or hot-zinc conforming to ASTM A 386. Where painting of the galvanized surface is indicated, prepare the surface with vinyl acid wash primer with polyvinyl butyral resin 56 pounds, 80 gallons zinc chromate pigment and phosphoric acid.

D. Electrical Components

1. Lampholders and sockets: Class and style recommended by the lamp manufacturer for the specified lamp required by each fixture design and rated for 660 watts, 600 volts or as indicated. Rigidly and securely fastened to the mounting surfaced with the necessary provisions to prevent lampholder from turning and front removable without dismantling any part of the fixture. Located in the lighting fixtures to place each lamp, of size specified, in proper position with relation to the fixture design specified, clearly marked to indicate manufacturer lamp type and

voltage and appropriate listings. High intensity discharge (HID) lampholders: Glazed porcelain body with nonferrous metal components of heavy duty design, vibration resistant, Edison-based lampholders in accordance with the applicable requirements of UL 496.

- 1) Metal halide lamps that are to be operated in the horizontal position: Position oriented mogul base socket.
2. Ballasts: Ensure ballast operating characteristics comply with the recommendations of the lamp manufacturer with regard to lamp electrical characteristics. Provide ballasts suitable for the line voltage with 0.9 power factor, and maximum current crest factor of 1.8. The ballast shall provide reliable lamp starting at the minimum temperature indicated, and operate in ambient temperatures up to 105°C with maximum ballast case temperature of 90°C. Each ballast shall be securely mounted inside the fixture, in such a manner as to obtain the necessary heat dissipation. High intensity discharge ballasts shall conform to the applicable requirements of UL 1029. Fluorescent ballasts shall conform to the applicable requirements of UL 935.
Metal halide lamps: Operated by a lead peaked auto, LPA, type ballast. The ballast shall provide reliable single lamp starting at minus 20°F, and allow plus or minus 10 percent lamp watts variation for a plus or minus 10 percent input voltage variation.
One light fixture per ballast.
Use of remote ballasts shall be restricted to canopy arm light fixtures only.
3. Fixture Wiring
Fixture Wires: Stranded tinned-copper construction, not smaller than No. 16 AWG. Insulation: silicone rubber type SF-2 and 200°C rated. Conductor size, temperature rating, voltage rating and manufacturer clearly marked on the insulation of each conductor.
Use wires between lampholders and associated operating and starting equipment of the same ampacity rating as leads from the ballast. Wiring within the fixtures shall conform to the requirements of the NEC.
Tape wires at all points of abrasion. No splices shall be permitted within fixtures other than as required to connect lampholders and ballasts.
Fixture Grounding. Unless otherwise specified, the housing of each ballasted lighting fixture shall be provided with a separate, factory-installed grounding device. The grounding device is to be used for connecting a separate, green, grounding conductor to the fixture housing.
Wireways and wiring channels shall have rounded edges or bushed holes wherever conductors pass through. Insulated bushings shall be installed at points of entrance and exit of wiring.

E. Fixture Hardware

1. Latch and release mechanism, hinges, pins and other retaining parts of fixtures; screws, bolts or other assembly and mounting parts: manufactured of Type 316 stainless steel. All springs: heavy duty stainless steel. All retaining hardware: self-retaining.
2. Frame light transmitting elements of the fixture to permit replacement of panels in the frames without the use of tools other than screwdriver or pliers. Secure panels in the frames in a neat, rattle-free manner that will provide proper tolerance for normal expansion and contraction.
3. Form gaskets, sealants and adhesives subjected to high temperature from silicone rubber. Provide other gaskets of neoprene, or as indicated.
4. Fasteners: Provide bolts, nuts, washers, screws, nails, rivets and other fastenings necessary for proper erection or assembly of work. When exposed to the atmosphere, provide fasteners made of 18-8 stainless steel. Fasteners within the housing shall be made of zinc plated, bright iridite, steel or electrogalvanized, gray. Nuts shall have captive externally footed lockwashers.

F. Welding

1. Locate welds in assemblies to be anodized to conceal visible discoloration in the heat-affected zone.
2. Where weld metal will be exposed after anodizing, select filler alloys to closely match composition of base metal. Comply with parent metal manufacturer's recommendations for such filler alloys.

2.2 FIXTURE MOUNTING HARDWARE

- A. General Requirements. Provide the fixtures with brackets, straps, canopies, poles and miscellaneous hardware suitable for the mounting method specified.
- B. Secure mounting brackets to housing, quantity and spacing as indicated. When exposed to public view, fabricate and finish hardware in matching material to fixture body. Fabricate internal brackets from sheet steel, zinc coated after fabrication.
- C. Canopies, holders and similar parts shall be drawn or spun in one piece with a minimum 0.026 inch finished thickness.
- D. Tubing used for supporting member shall be seamless drawn with a minimum of 1/16 inch wall thickness of size and length as indicated.
- E. Light poles: quantity shall be as per contract drawings. Shall be square, straight (non-tapered) one piece construction with one flush-welded vertical seam, designed to support the light fixture. Pole manufacturer shall provide a wireway access through the base of the pole to accommodate (3) 1" conduits. The wireway access shall cover the entire inside opening of the pole shaft. Pole heights shall be as indicated on the Contract Drawings. Unless otherwise indicated, all poles shall measure nominally 4" x 4" square and shall be manufactured of the same gauge cold rolled steel. Lighting poles along the Platform shall have a mounting height of 12 feet to the top fixture, as shown on Contract Drawings. Poles shall be capable of supporting sign housings measuring 1'-0³/₄ in size including brackets as required. Sign housings (Track Number Signs & Train Approach Signs) shall be mounted by means of stainless steel hardware in accordance with Section 5500 (Miscellaneous Metals). Poles where speakers will be located shall have the assembly mounted at the top of the pole centered on the mounting for the luminaires (unless otherwise noted). The installing contractor shall coordinate all drilling patterns with the pole manufacturer to accept luminaire(s), sign housings and speaker assemblies as required for mountings as well as wireway access and conduit connections. Poles with sign housings require a 3"x 5" handhole shall be located in line with the top of the sign (9'-0" above finished platform as shown on drawings). The installing contractor shall field verify base conditions and coordinate with base details shown in contract drawings to assure that no field modification of bases will be required. Pole base and anchor bolts shall be covered by a one piece galvanized shroud and secured to the pole base by stainless steel screws.
- F. Pole Mounted Fixture Support Arm: Shall be one-piece extruded aluminum measuring 4¹/₄ x 1³/₄ in section and 5" in length with internal bolt guides and fully radiussed top and bottom. Luminaire-to-pole attachment shall be by internal stainless steel hardware with a gasket to protect from galvanic action and a pole reinforcing plate with a strain relief-wiring device. The arm shall be cut for the specified pole to insure a clean fit.
- G. Pole Mounted Fixture Housing: Shall be one-piece die-cast aluminum with integral cooling fins over the optical chamber and electrical compartments. A solid barrier wall shall separate the optical and

electrical compartments. There shall be a double-thick wall with gussets on the support-arm mounting end. Fixture finishes to match that used for the canopy luminaire.

- H. Pole Mounted Fixture Lens, Frame, and Latch: Furnish a one-piece die-cast aluminum lens frame with 1" minimum depth around the gasket flange. Integral hinges with stainless steel pins shall provide no-tool mounting and removal from housing. Single die-cast aluminum cam-latch shall provide positive locking and sealing of the optical chamber by a one piece extruded and vulcanized EDPM gasket. A one piece vacuum formed clear UV stabilized polycarbonate enclosure shall be furnished to maintain the seal in lieu of standard tempered glass lens.
- I. Pole Mounted Fixture Reflector Module: Modules shall consist of specular Alzak optical segments rigidly mounted in an aluminum frame that attaches to the housing as a one piece module. Modules shall be field rotatable in 90E lateral increments by loosening 4 stainless steel screws and shall meet or exceed the IES distribution referred to as Type III with a Medium classification. The lamp shall be held in place by a 5KV pulse rated socket which is pre-wired by the manufacturer with a quick disconnect plug. All wireways to the optical compartment shall be sealed to prevent unnecessary dirt accumulation.
- J. Pole Mounted Fixture Luminaire Electrical Assembly: Provide a removable plate which supports the electrical components. The assembly shall be removable by means of stainless steel spring latches or a quick turn fastening device. Quick disconnect plugs shall be incorporated to aid in the removal of the assembly. All electrical components within this assembly must conform to Section 16500, 2.01.D. Electrical Components.
- K. Canopy & Covered Ramp Mounted indirect Fixture Housing: Shall be of sealed, captive, extruded aluminum construction with window cut out for regressed lens and silicon gasket. The 100W metal halide fixture housings shall have integral electronic cold weather ballast suitable for 240V operation.
- L. Canopy & Covered Ramp Mounted Fixture Lens, Frame, and Latch: Furnish a one-piece die-cast aluminum lens frame with 1" minimum depth around the gasket flange. Single die-cast aluminum cam-latch shall provide positive locking and sealing of the optical chamber by a one piece extruded and vulcanized EDPM gasket. Lens shall be tempered glass type with micro-prismatic aperture.
- M. Canopy & Covered Ramp Mounted Fixture Reflector Module: The module shall consist of specular Alzak optical segments rigidly mounted in an aluminum frame that attaches to the housing as a one piece module. All wireways to the optical compartment shall be sealed to prevent unnecessary dirt accumulation.
- N. Canopy & Covered Ramp Mounted Fixture Luminaire Electrical Assembly: Provide a removable plate that supports the electrical components. The assembly shall be removable by means of stainless steel spring latches or a quick turn fastening device. Quick disconnect plugs shall be incorporated to aid in the removal of the assembly. All electrical components within this assembly must conform to Section 16500, 2.01.D. Electrical Components.
- O. Finishes
 - 1. Pole Mounted and Canopy Mounted Fixture Housing: A Gray/Galvanized TGIC Thermoset Polyester Powder-Coat 2.5Mil nominal thickness paint shall be applied over a chromate conversion coating to housing, lens frame, latch and support arm.
 - 2. Lighting Poles & Base Cover: Finish shall be hot-dip galvanized conforming to Section 16500-2.1, C, 6.

2.3 LAMPS

- A. General Requirements. Provide each lighting fixture with the number, type, and wattage of lamps required by the Contract Drawings. Provide lamps of standard manufacture, readily available, and of the highest efficiency and life consistent with other requirements of the illumination system.
- B. Metal Halide Lamps: Clear and provided with position oriented mogul bases. Photometric characteristics shall provide lamp maximum luminous output while lamp operates in the vertical position.
- C. Provide an additional 10% spare of each type of lamp installed.

2.4 LIGHTING CONTROL EQUIPMENT

- A. General Requirements. Provide lighting control components suitable for the lighting system specified and compatible for interface with other associated control devices. Lighting control components shall be rated for continuous service and operate satisfactorily in every respect while the branch circuit power supply voltage to each system is within a 110 to 480 volt range at 60 hertz. Electrical contacts shall have precious metal surfaces.
- B. Lighting Contactors
 - 1. Conform to the applicable requirements of UL 508.
 - 2. Electrically operated and mechanically held.
 - 3. Rated at 600 volts, 60 hertz with ampere rating, number of poles and enclosure as indicated.
- C. Time Switches
 - 1. Conform to the applicable requirements of UL 887.
 - 2. Pre-wired with astronomic dial, 36-hour synchronous reserve power motor.
 - 3. Manual on-auto-off bypass switches for up to three individual circuits.
 - 4. Rated at 277 volts, 60 hertz, 40 amperes continuous duty with number of poles, throws and enclosure as rated.
- D. Photoelectric Sensor
 - 1. Conform to the applicable requirements of UL 773.
 - 2. Operation in temperature range of minus 50°C to plus 60°C.
 - 3. Dusk to dawn operation with adjustments from two to 50 foot candles with a five-second time delay to preclude false switching.
 - 4. Weatherproof and tamperproof.
 - 5. Acceptable for operation from a supply voltage range of 105 to 285 volts AC.
 - 6. Model/manufacturer type as indicated in the drawings
 - 7. Minimum life at rated load: 8000 on-off operations.
 - 8. Photoelectric sensors shall be mounted facing a northerly direction.

9. 1Photoelectric sensors, upon failure, shall default to the “on lighting” position.

E. Wall Switches

1. Installed where indicated in drawing package.
2. Switches: Single unit, toggle, butt contact, quiet type with an integral mounting strap.
3. Switch Ratings - for 120 volt circuits: 20 amperes at 120 volts AC.
4. Switches shall be connected to the wiring with screw clamp type terminals.
5. Wall Plates

F. Wall Plates

1. Type 304 stainless steel. Standard designs so the products of different manufacturers will be interchangeable.

PART 3 - EXECUTION

3.1 LIGHTING FIXTURES

- A. Install lighting fixtures in accordance with the manufacturer's instructions, complete with lamps, hangers, brackets, poles, fittings, and accessories, ready for operation as indicated. Align, mount and level the lighting fixtures uniformly.
- B. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Engineer.
- C. Lighting fixture supports shall provide support for all the fixtures. Anchor supports to the structural slab or to structural members as indicated. Supports shall maintain the fixture positions after cleaning and relamping.
- D. Surface mounted lighting fixtures shall be bracketed rigidly from the mounting surfaces. Provide a 1/4-inch clearance between surfaces when the fixture is flat mounted against concrete surfaces. Nipples carrying wire between fixtures shall be watertight.
- E. Exterior fixtures mounted on block or brick walls shall be supported by anchor devices of the expansive lead type. No power driven anchors will be acceptable.
- F. Where aluminum is placed in contact with dissimilar materials, except galvanized steel, zinc or stainless steel, treat contact surfaces as follows:
 1. When in contact with dissimilar metals, apply a prime coat of zinc chromate primer followed by two coats of aluminum and masonry paint.
 2. When in contact with concrete, masonry and plaster, apply to aluminum contact surfaces zinc chromate primer, bituminous paint, aluminum metal and masonry paint or pressure tape.
 3. When in contact with wood or other absorptive materials, apply two coats of aluminum house paint to such materials and protect aluminum contact surfaces with bituminous paint.

- G. Fixtures shall be pole mounted in accordance with the manufacturers recommended installation practices as indicated.
- H. Provide required lamps in each lighting fixture as soon as fixtures are properly installed.

3.2 BALLASTS

- A. Install ballasts, other than those mounted integrally within luminaires, as indicated, and in such a manner that the ballast is protected from weather, moisture, and other atmospheric conditions, and in such a manner that ambient temperature surrounding the ballast will not cause the temperature of the ballast housing hot spot to exceed UL requirements. Voltage drop to lamp, due to remote mounting shall not exceed one percent of the nominal lamp voltage. Secondary ballast conductors for metal halide lamps shall have 1000-volt, high temperature insulation. When more than one ballast is mounted at one location, the minimum spacing between ballasts shall be 6 inches in a horizontal direction and 12 inches in a vertical direction. Ballasts shall be cold weather rated type suitable for outdoor operation.

3.3 LIGHT POLES

- A. Install light poles in accordance with the manufacturers recommended installation practices as indicated.

3.4 CONCRETE BASES

- A. Obtain necessary templates and anchor kits before starting work.

3.5 AUXILIARY LIGHTING EQUIPMENT

- A. Install as indicated and in accordance with manufacturer's instructions.
- B. Anchor firmly in place.
- C. Test and adjust for proper operation in accordance with the manufacturer's instructions.

3.6 LIGHTING CONTROL DEVICES

- A. Install lighting control devices in accordance with the manufacturer's recommended installation practices, and as indicated.

3.7 NEW ELECTRICAL SERVICE – NSTAR

- A. NSTAR shall provide pad mounted transformer, new poles and connection to existing aerial medium voltage network. Electrical contractor shall provide concrete transformer pad per NSTAR standards. Electrical contractor shall provide secondary duct bank and cabling to new electrical service closet as indicated in the contract drawings. Electrical contractor shall also provide primary duct bank, concrete encasement and trench backfill up to NSTAR riser pole as indicated in the contract drawings. NSTAR shall provide primary underground cabling, primary and secondary terminations at transformer.

3.8 FIELD QUALITY CONTROL AND INSPECTION

- A. Inspect luminaires, lamps and associated hardware prior to and after installation to confirm that they are of the quality and type as specified herein and as indicated, and are free of defects and damage.
- B. Provide luminaires and lighting equipment to the project site complete, with suspension accessories, canopies, hickey, castings, sockets, holders, reflectors, ballasts, diffusing materials, louvers, frames, recessing boxes, and related items, completely wired and assembled as indicated.
- C. Whenever practicable, verify lighting system operation at the same time that the distribution panelboard or switchboard is tested.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES
- B. An allowance item No. 0130.436 ELECTRIC COMPANY is included in the schedule of bid prices to reimburse the Contractor for costs associated with materials supplied and work performed by NSTAR in relation to NSTAR bringing an electrical service to the South Acton Commuter Rail Station. The allowance does not cover the Contractors costs associated with the installation of this service. Those cost shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES

4.2 PAYMENT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS
0130.436	ELECTRIC COMPANY	AN

END OF SECTION

SECTION 16700

POWER WIRE AND CABLE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies furnishing and installing power wire and cable for the AC power distribution system of the South Acton Commuter Rail Station.

1.2 QUALITY ASSURANCE

- A. Material and workmanship shall be of the highest quality assuring durability for minimum life expectancy of 40 years. These cables shall be suitable for use in the environment to be encountered on a railroad system, and underground distribution system. The cables shall also be certified for continuous operation at 90 degrees C in wet or dry locations with no conductor failing in continuity or with loss of insulation to cross or ground less than one (1) meg-ohm.

B. Qualification

- 1. All wire and cable manufacturers must be approved by the Engineer. The Contractor shall provide all data required for the Engineer's evaluation and shall make the arrangements for any required demonstrations and tests.
- 2. Qualifications shall be based on the following criteria:
 - a. Past Performance and Experience. The cable manufacturer(s) must demonstrate previous successful experience in supplying cable to the railroad industry for use as AC power cables. A list of such installations shall be provided for each cable manufacturer to be considered.
 - b. The manufacturer(s) shall certify that he shall comply with the following warranty prior to selection:
 - 1. The manufacturer(s) warrants that the design, material, and workmanship incorporated in each item of cable shall be of the highest grade and consistent with the established, and generally accepted, standards for aerial and underground cable for ac power circuits; and that each such item and every part and component thereof shall comply with these Specifications.

C. After Selection

- 1. The Contractor shall monitor the manufacturer(s) of the wire and cable to assure that the approved Quality Assurance Program is being closely adhered to and that the wire and cable is being manufactured in accordance with these Specifications and the approved submittals.
- 2. Each finished wire and cable shall be traceable to the test date on file for each step in its manufacturing process.
- 3. Inspection
 - a. The Authority, or its authorized representative, shall have the right to make such inspection and tests as necessary to determine if the cable meets the requirements of these Specifications. The Authority shall have the right to reject cable, which is defective in any

- b. The manufacturer(s) shall provide, at the point of production, apparatus and labor for making any or all of the following tests under the supervision of the Authority's Inspector or Engineer; to include:
 - 1. Conductor size and physical characteristics.
 - 2. Special tests on materials in coverings.

1.3 SUBMITTALS

- A. The Contractor shall submit the following to the Engineer for approval:
 - 1. Each cable manufacturer's Quality Assurance Program.
 - 2. Full technical data for each type of cable which each cable manufacturer intends to supply.
- B. The Contractor shall furnish to the Authority five (5) copies of the cable manufacturer's instructions and procedures for potheading of each type underground cable to be furnished.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Packing
 - 1. Products shall be so assembled or packed as to permit convenient handling and to protect against loss or damage during shipment.
 - 2. Wire smaller than No. 4 AWG shall be shipped in cartons or in coils. When shipped in coils, the wire shall be securely bound with a layer of waterproof paper with each turn overlapping the other one-half its width if flat-edge paper is used, or one-third its width if folded-edge paper is used. Wires larger than No. 4 AWG shall be shipped on nonreturnable reels protected by fiberboard covering, bound with a steel strap or wire to prevent damage in transportation.
- B. Handling
 - 1. Each shipment shall be inspected by the Contractor for evidence of damage upon delivery. Any damage such as reels loose from their blockings, damaged protective wrapping or lagging, or broken flanges shall be reported to the manufacturer, the carrier, and the Authority. The Authority reserves the right to reject any cable damaged during the shipment, storage or handling process.
 - 2. Cable reels shall be lifted with a lifting sling and spreader attached to a shaft through the wheel hubs, or with a forklift with tines supporting both reel heads. Lift pressure shall not, at any time, be placed on the cable.
- D. Storage
 - 1. Cable reels shall be stored indoors, or on a firm paved surface or on cribbing with good drainage. Outdoor storage time shall not exceed the manufacturer's recommendations.
 - 2. Suitable means, such as protective barriers, shall be provided to protect the cables from accidental damage during storage.
 - 3. Security against theft and vandal damage shall be provided by the Contractor at no additional cost to the Authority.

PART 2 - PRODUCTS

2.1 AC POWER DISTRIBUTION CABLES

- A. Low Voltage Power Cables (less than 1000 volts)
 - 1. Low voltage power cables less than 1000 volts shall be Type, XHHW, RHH, RHW or USE, intended for use as direct burial, in raceways or aerial applications. Conductors shall be stranded copper per ASTM B-3 or B-8. Insulation shall be cross-linked polyethylene in accordance with NEMA WC 7/ICEA S-66-524.
 - 2. High voltage power cables (both insulated and aerial) shall be installed, provided and terminated by NSTAR.

2.2 MV CABLE FIREPROOFING TAPE

- A. Shall be provided as required by NSTAR.

2.3 CABLE TERMINATIONS

- A. Ac power cable terminations shall be in accordance with NEC 2011 code guidelines.

2.4 IDENTIFICATION TAGS

- A. Identification tags for power and control wires shall be in accordance with MBTA Standard Specifications Section 16050, Article 2.14.

2.5 CABLE IDENTIFICATION

- A. Conductors shall be marked indicating the manufacturer's name, conductor size, conductor material, insulation type, voltage rating and year of manufacture repeated every two feet on the outside of the cable jacket.

PART 3 - EXECUTION

3.1 GENERAL

- A. The installation of power wire and cable shall conform to applicable sections of the NEC and the requirements as specified herein.
- B. The Contractor shall give the Engineer 24 hours notice prior to installing cables.
- C. In certain types of installation where the cable cannot be constrained, ample cable slack shall be provided for additional flexibility due to vibration of such equipment.
- D. Cables shall not be bent to a radius less than eight (8) times the diameter of the cable during installation or as finally installed.
- E. All cables shall be tagged at their termination points. In addition, all cables shall be tagged within handholes, manholes, enclosures, etc. and on each side of any barrier the cable passes through. Cables shall also be tagged at aerial exits from conduit risers.

- F. All cable entrance openings shall be sealed with either a compression type fitting or pliable sealing compound after the cable is in place. Sealing compound shall be used to seal the area around cable where the cable emerges from the end of a conduit or pipe. All spare conduits shall be sealed or plugged in an approved manner.
- G. Where cables leave conduits, the ends of the conduit shall be fitted with approved fittings for the conduit system.
- H. Wherever multiple conductor cables are terminated, the outer sheath of the cable shall be carefully removed to the point of cable entrance. At the end of the cable sheath or covering, two (2) layers of plastic electrical tape shall be applied.
- I. Contractor shall arrange the cables to allow free access to all existing cables for maintenance.
- J. Cable terminations and splices shall be made in strict accordance with NEC standards. Terminations and splice fittings for all underground conductors shall be tool applied compression connectors of material and design compatible with the conductors for which they are used. All spliced ends of cables will utilize a "Raychem" or equivalent watertight seal covering, over the compression lug. This watertight seal covering will have an insulation rating equivalent to the conductor for which it is being used.

3.2 INSTALLATION IN CONDUIT

- A. Reels shall be stripped of all nails in outside edges of reel heads before pulling of cable, and shall be conveniently located for feeding cable into the conduit without excessive bending or possible injury to cable by abrasion on the sides of manholes or handholes. Reels shall be jacked to clear ground level by at least six (6) inches before pulling of cable.
- B. Cable reels shall be carefully handled to avoid injury to persons or cables. Movement of reels on loading skids or sloping grades shall be controlled by use of a snub line or wedge. Reels shall always be blocked after positioning.
- C. Cable shall be pulled into conduits with the use of a pulling eye approved by the Engineer. Pulling ropes shall be attached to the pulling eye with ball-bearing swivels to prevent twisting of cable during pulling.
- D. Cable shall be pulled into conduits under moderate tension. Manufacturer's recommended maximum pulling tension shall not be exceeded at any time. Before pulling any cable into conduits, the Contractor shall first consult with the Engineer as to methods and locations of cable pulling.
- F. Cables shall be lubricated with an approved material in accordance with the manufacturer's recommendation which shall be placed onto the cable during the pulling operation.
- G. Cables shall not be allowed to chafe on the ground, handhole edges, or any sharp surfaces during pulling. Flexible cable pulling tubes shall be provided to guide and protect the cable, where necessary.
- H. All cut ends of the cable shall have a watertight seal installed immediately after installation, until the cable is spliced or terminated.
- I. Cables shall be installed with freedom of horizontal movement to accommodate expansion and contraction of the cables in the conduits. Cables passing through handholes shall have at least one (1) bend to accommodate such changes in length.

3.3 SPECIAL PROTECTION

- A. The Contractor shall provide appropriate special protection for cables in areas where the cables are unavoidably exposed to hazardous conditions such as vibration or sharp corners on equipment. The Contractor shall be responsible for replacing, at no additional cost to the Authority, any cable he has installed which is subsequently damaged prior to acceptance as a result of his failure to provide such special protection.

3.4 TESTING

A. General

- 1. The Contractor shall provide all instruments, materials and labor required for tests specified herein.
- 2. Tests conducted at the factory shall include, but not be limited to, the following:
 - a. Manufacturer's standard tests.
 - b. Tests relevant to NEMA WC 7/ICEA S-66-524 standards that are not included in the manufacturer's standard tests. These tests include, but are not limited to, the following:

NEMA 6.15 Insulation Resistance
- 3. Tests and checkouts in the field shall include, but not be limited to, the following:
 - a. Continuity Test
 - b. Insulation Resistance
 - c. Phasing Test
- 4. All high voltage cable testing (i.e. primary side) to be completed by NSTAR power company.

B. Conditions for Tests

- 1. Prior to performing any cable testing, the following conditions shall be fulfilled by the Contractor:
 - a. Contractor shall have submitted cable testing procedures for the Engineer's approval at least 45 days in advance of the testing. No testing shall be performed unless the Contractor has the approved test procedures in hand.
 - b. For factory tests, a minimum of four weeks advance notification shall be given to the Engineer on the schedule date of tests to enable him to witness the tests. Field tests shall be scheduled in consultation with the Engineer.

C. Witness Tests

- 1. The Engineer, at his option, shall witness complete testing on all cable installation.

D. Field Tests

- 1. General. All AC power cables shall be subjected to Acceptance Tests as specified below to ascertain that the dielectric strength of the cable insulation has not been impaired during installation, that the splices and termination are properly made and to confirm the integrity of the cable system prior to energization. Tests shall include continuity tests and insulation resistance tests.

2. Acceptance Tests. After installation of the entire length of a cable, the Contractor shall perform the tests listed below on each cable. To preclude damage to equipment and devices, the tests shall be conducted before the cable is terminated at the electrical equipment. If terminations have already been made, cables shall be disconnected from the equipment for testing and shall be reconnected after completion of tests.
 - a. Continuity Test
 1. This test shall be performed to prove the continuity of the conductor.
 - b. Insulation Resistance Test
 1. This test shall be performed to determine the cable insulation resistance to ground.
 2. Tests shall be conducted with a motor-driven megger. Test voltage shall be applied between the conductor and ground and shall be held until the reading reaches a constant value for five minutes. Insulation resistance values obtained by the megger tests shall not be less than two megohms. Contractor shall bring to the attention of the Engineer the results of similar tests having unequal readings with the variations of 25 percent or more.
 3. For each test, the Contractor shall record the temperature, humidity, and duration of the test.
 3. Defective Cables
 - a. Any cable installed under this Contract found defective during the testing shall be replaced with new cables at the expense of the Contractor.
- E. A record of all approved tests shall be forwarded to the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16725

ELEVATOR INTERCOM SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies the provisioning of an Elevator Emergency Intercom System. Equipment shall be compatible with the existing Elevator Emergency Intercom Supervisory System located at the Town of Acton Police Department at 371 Main Street and with the Authority's Police Station and maintenance terminal located at 500 Arborway.
- B. The audio path between the Station the Acton Police Station and the MBTA Police Station shall be via Verizon analog Centrex telephone service. A maximum of three Elevator Emergency Intercom units shall be connected to one Centrex telephone circuit.
- C. Location of Elevator Emergency Intercom units shall be in the elevator cab as indicated on the Contract Drawings for station design. Locations shall conform to the Americans with Disabilities Act (A.D.A.) standards.
- D. The Contractor shall be responsible for programming each unit and updating the software/database on each supervisory and maintenance computer.
- E. Major components of the Elevator Emergency Intercom System shall include, but not be limited to, the following equipment as shown on the Contract Drawings:
 - 1. Elevator Emergency Intercom Units.
 - 2. Uninterruptible Power Supplies.
 - 3. AC/DC power converters.
 - 4. Wiring and cables.
 - 5. Mounting hardware, conduit, connectors, and any other miscellaneous hardware.

1.2 REFERENCES

- A. Americans with Disabilities Act (ADA)
- B. National Electric Code
- C. EIA / TIA
- D. IEEE
- E. Architectural Access Board

1.3 SUBMITTALS

- A. Submit descriptive literature, including manufacturer specification sheets, for all Passenger Assistance equipment and materials proposed for approval prior to fabrication, assembly, installation and testing. Also, submit the following to the Engineer for approval:
 - 1. Block diagram of complete system, illustrating proposed configuration and interconnections.

- B. Prior to ordering any equipment required under this Section, submit six (6) copies of the following to the Engineer for approval:
 - 1. Full technical data and manufacturer cut sheets for all equipment.
 - 2. Site specific plans showing details of the following:
 - a. Elevator Emergency Intercom unit location and mounting details.
 - b. Cable and conduit details.
 - c. Communication room equipment layout.

- C. Provide maintenance instruction manuals to the Engineer including information regarding installation and maintenance as follows:
 - 1. Operational Description and Procedures
 - 2. Troubleshooting and Routine Test Procedures
 - 3. Adjustments and Alignment Procedures
 - 4. Wiring Diagrams, Tables and Schematics

- D. Hold Point
 - 1. Prior to installing any equipment, submit to the Engineer for approval six (6) copies of a detailed test procedure intended to ensure all components of the system are functioning properly, in accordance with these Specifications and the Contract Drawings. The tests performed shall include, but not be limited to, the tests outlined in Paragraph 3.02 of this Section. The detailed test procedure shall include a description of all test equipment to be used, and specific pass/fail criteria for each test.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor is responsible for the delivery, storage, and handling of all materials for the Elevator Intercom System. Items shall be stored in a safe and secure location. All electronic components shall be protected from water, dust, etc.

1.5 WARRANTY

- B. The Contractor shall provide a one-year warranty on parts and labor commencing on the day that the Emergency Elevator Intercom System is accepted by the MBTA Communications Department.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. All material shall be new and unused and the workmanship shall be in accordance with the highest standards of the electronic equipment industry. Bids will be accepted only for new and current equipment. Equipment discontinued by the manufacturer will not be accepted. All components shall be UL listed.
- B. Equipment purchased under this Section shall be covered by EIA/TIA standards and the manufacturer's warranties against material and workmanship commencing from the date the Authority accepts the Elevator Emergency Intercom System for the period noted on the manufacturer's warranty or for a minimum of one (1) year, whichever is greater.
- C. Provide all equipment capable of operating within a transit system environment, subject to temperature, humidity, vibration, and light conditions typically encountered.

2.2 ELEVATOR EMERGENCY INTERCOM UNITS

- A. Elevator Emergency Intercom Units provided under this Section shall meet the following requirements:
 - 1. The Elevator Emergency Intercom Unit shall be a microprocessor based, programmable, flush mount, no handset, full-duplex speaker telephone with a front panel of stainless steel. Depressing the call button shall activate the Elevator Emergency Intercom Unit. The emergency button shall have a diameter of $\frac{3}{4}$ inch or greater. The button will have no moving parts to jam or seize. The front panel shall be sealed and impervious to water, dust, and spray. The speaker and microphone shall be protected from vandalism by mesh screens. The internal electronics shall be encapsulated with a military specified protective coating to protect against moisture and dust accumulation.
 - 2. The Elevator Emergency Intercom Unit shall be fully ADA compliant as specified in ADAAG 4.10.14 and ASME 17.1. Two LED indicators shall be incorporated in the front panel, one to show that a call has been placed, and the other to indicate that it has been answered. The Elevator Emergency Intercom Unit shall incorporate stainless steel raised lettering and grade 2 Braille to aid the sight impaired persons in identification. The Elevator Emergency Intercom Unit shall have the ability to record and play voice messages stating the location of the unit.
 - 3. The Elevator Emergency Intercom Unit shall be programmable from any touch tone telephone (including security codes) and shall have four telephone number (zero to twenty digits, including pause) auto dial capability, in addition to a programmable maintenance number. The Elevator Emergency Intercom Unit shall employ call progress monitoring to detect whether a call has been successfully placed in order to ensure timely call completion. The Elevator Emergency Intercom Unit shall have the option to automatically respond to far end call termination signals. When the receiving agent hangs up the Elevator Emergency Intercom Unit shall automatically place itself back on hook. The Elevator Emergency Intercom Unit shall have an automatic number identifier. The Elevator Emergency Intercom Unit shall have auxiliary output contacts that may be remotely or locally activated.
 - 4. The Elevator Emergency Intercom Unit shall have the capability to store a voice message. The message shall be played after the emergency button call is answered.

5. The Elevator Emergency Intercom Unit shall be powered from 5 to 24 VDC and shall be provided with a 120 VAC adapter. A rechargeable Nickel-Cadmium backup battery capable of operating the Elevator Emergency Intercom Unit for four hours shall be provided. The battery shall be trickle charged from the input power source. The Elevator Emergency Intercom Unit shall utilize a backup battery warning call feature. If the source of power is interrupted and the unit is on battery for fifteen minutes, the unit shall place a warning call. The unit shall automatically go off-hook and dial a separate maintenance number, wait for an answer and then notify the call party (i.e., by audio tones.).
6. The Elevator Emergency Intercom Unit shall be compatible with all features of the existing Vandal-Proof Products PR1150 supervisory system employed by the Authority. This system provides remote supervision, event logging, reports, and diagnose functions.
7. The Elevator Emergency Intercom Unit shall be mounted to the cab with a minimum of six tamper proof screws. The screws shall be alike those already utilized at the Authority. The Contractor shall provide four tamper proof screwdriver hex shank bits.
8. The Elevator Emergency Intercom Unit shall communicate via a Verizon Centrex dial tone. A maximum of three units shall be connected to a single Centrex telephone circuit. Each unit shall be accessed separately on the same telephone circuit via password codes. The Contractor shall be responsible for all wiring and connections. The Elevator Emergency Telephone shall be a model VPP1250 or approved equal.
9. The Contractor shall be responsible for updating all databases/software utilized in conjunction with the Elevator Emergency Intercom Unit system.

B. Mechanical Specifications

1. Faceplate Dimensions: 12" x 8" x 2.5" (" 0.5 ").
2. Front Panel: 12 gauge, 304 stainless steel. Minimum six mounting holes. Screws shall be tamper resistant, as approved by the Authority
3. Connector: 2 auxiliary outputs, 1 RJ-11, 1 Power.
4. Weight: approximately 5-7 pounds.
5. Operating Temperature: -20° C to +60° C.

C. Electrical Specifications

1. Telephone connection: RJ-11 modular jack.
2. Max Loop Resistance: 1500 Ohms (loop start operation).
3. Power: 5.5 to 25 VDC or derived from 110 VAC (power transformer shall be provided). For multiple unit installations, provide a bulk power supply to power all units.
4. REN: 1.1.
5. Signaling: tone or pulse.
6. Frequency Response: 300Hz to 3,000Hz.

7. FCC registered.
8. Outputs: Optically isolated, solid state, normally open contacts. Maximum DC resistance drop of 35 ohms at a current of 120 milliamperes.
9. Voice Message Length: minimum of 18 seconds

2.3 WIRE AND CABLE

- A. Provide four pair unshielded twisted pair communication cable from the station telephone terminal board to each elevator machine room. Provide connections from the elevator machine room terminal block to the elevator travel cable to the Elevator Emergency Intercom Unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Elevator Emergency Intercom Units in locations with the orientations as approved on the Contract Drawings.
- B. Install supporting equipment in cabinets and on racks, in the station communication room as shown on the Contract Drawings.
- C. Provide required software modifications to the existing supervisory software at the MBTA police headquarters (240 Southampton Street), and all additional monitoring locations.

3.2 TESTING

- A. Conduct electrical tests to demonstrate compliance with this Specification and with manufacturer's recommended test procedures as approved by the Engineer.
- B. After installation is complete, verify proper operation of all control as described herein. Notify the Engineer minimum of five days in advance of test. Engineer or authorized representative reserves the right to attend testing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16742

VARIABLE MESSAGE SIGN SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section specifies designing, furnishing and installing all of the equipment necessary to form a complete and operational Variable Message Sign (VMS) System. Railroad passenger information shall be displayed via Light Emitting Diode (LED) scrolling Variable Message Signs located on the South Acton Station platform area as specified herein and shown on the Contract Drawings.
- B. The work shall include removal of the existing VMS sign, control equipment and Communications Equipment Shelter (CES), and delivering it to the MBCR at 32 Cobble Hill Drive Somerville, MA 02143. All existing equipment shall be transported and delivered as described herein.
- C. The Variable Message Signs shall be controlled from the MBTA Railroad Passenger Information (RPI) System; the train information will be transmitted to the office, and then processed (via predictive algorithm) for train location against schedule and transmitted back out to the stations via the cellular network, providing data to update the messages on the Variable Message Signs.
- D. At each Variable Message Sign location provide and install an all weather loudspeaker for audio announcements corresponding to the visual message displayed on the Variable Message Sign. Provide all associated audio amplification equipment and loudspeaker distribution cabling for this function.
- E. Related Work: The equipment, materials and methods required under this Section shall be in accordance with the following:
 - 1. Section 01300 - SUBMITTALS
 - 2. Section 01400 - QUALITY ASSURANCE
 - 3. Section 01500 - CONSTRUCTION TEMPORARY FACILITIES AND TEMPORARY CONTROLS
 - 4. Section 16050 - BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK
 - 5. Section 16750 - COMMUNICATION EQUIPMENT SHELTER

1.2 SUBMITTALS

- A. The Contractor shall submit the following to the Engineer for approval:
 - 1. Manufacturer cut-sheets and functional descriptions for all Variable Message Sign System equipment and loudspeakers that the Contractor proposes to furnish.
 - 2. Site specific plans showing details of each Variable Message Sign enclosure location, mounting, cable and conduit routing, and sign display orientation.
 - 3. Location of Variable Message Signs as described herein.
 - 4. Point to point wiring diagrams for all equipment furnished under this Section.
 - 5. Two maintenance manuals for the Variable Message Signs and all equipment associated with the Variable Message Sign System.

6. Detailed Test Plans and Procedures, Test Report Forms and completed Test Results.

1.3 QUALITY ASSURANCE

- A. All equipment and materials provided shall conform to the requirements of Section 01400 – Quality Control and other applicable references as stated within this Specification.
- B. All materials and equipment shall be new, free from any defects, and suitable for the space provided and shall be approved by UL wherever standards have been established by that agency.
- C. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.
- D. All electrical components, unless otherwise specified herein, shall be rated to operate at power, voltage and current levels twenty percent above that level which the components will be subject to in normal service.
- E. All components, unless otherwise specified herein, shall be rated in accordance with Recommended Environmental Requirements described in AREMA Manual 11.5.1.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water corrosive substances, and physical damage.
- B. If stored in areas subjected to weather, cover devices to provide protection from weather, dirt, dust, corrosive substances and physical damage. Remove loose packing and flammable material.
- C. Any equipment, cables, and material damaged during delivery, storage, handling and construction shall be replaced with identical material, tested, and placed in service by the Contractor in accordance with these Specifications and as approved by the Engineer at no additional cost to the Contract.

1.5 COORDINATION

- A. Verify that Variable Message Signs are not obstructed by other station signage, structures and architectural elements.
- B. Coordinate the mounting and installation of the Variable Message Signs and loudspeakers with the sign support systems. Refer to details in the architectural and structural drawings and Section 05500 MISCELLANEOUS METALS.
- C. Coordinate the final installation and testing of the Variable Message Sign System with the MBTA and the operating railroad.

PART 2 - PRODUCTS

2.1 VARIABLE MESSAGE SIGNS

- A. The Variable Message Signs to be furnished under this Contract shall be Double Sided Light Emitting Diode (LED) type scrolling message signs. The LED VMS signs shall be Data Display Double Sided 128 x 16 Signs, or approved equal, and shall meet or exceed the following specifications:

1. Shall be double sided display type (master and slave) VMS's mounted at the platform locations shown on the Contract Drawings.
2. Shall have an RS-232 serial communications interface to receive VMS display messages and update data. Data transmitted shall conform to the ASCII character set standard.
3. Shall be fully compatible and interoperable with the existing GE Management System communications protocol.
4. Shall include flash programmable program memory for remote upgrades.
5. Shall be powered from an internal power supply and shall utilize a nominal input voltage of 120 Volts AC, 60Hz.
6. Shall include 2 x PSU 110 Volts AC, 60Hz.
7. Power consumption shall be 190 watts, maximum
8. The LED display color shall be Amber.
9. The LED pixel pitch shall be .45 inch.
10. The VMS display viewing angle shall be 70°.
11. Brightness shall be 1400mcd, minimum.
12. The VMS resolution shall be 128 pixels by 16 pixels
13. The VMS shall display messages in the following formats:
 - a. 2 lines x 21 characters x 3.6-inch character height and,
 - b. 1 line x 11 characters x 7.2-inch character height, selectable.
14. An ambient light level sensor shall be included to adjust the brightness of the VMS display as a function of the ambient illumination.
15. Typical sign weight including case shall be between 100 and 200 lbs.
16. The Variable Message Sign and Sign System shall meet the requirements of the Americans with Disabilities Act (ADA).

B. The Variable Message Sign Microprocessor Controller shall meet or exceed the following specifications, functions and features:

1. 384 Kbytes RAM, typical
2. 128 Kbytes EPROM for program storage
3. Shall include industrial grade components for extended temperature operation
4. Shall include watchdog protection
5. Shall include an address assignment setup switch bank
6. Shall include a 4 bit optically isolated DI/O
7. Shall include the following sign diagnostics:
 - a. Real time LED monitoring
 - b. Power supply monitoring
 - c. WYSIWYG function

- d. LED status indicators for power, watchdog, communications and LED's
- e. Time out function and fallback mode
- f. SNMP traps to report failures and alarms
- g. A relay to indicate sign malfunction

C. VMS Environmental and PC Board Fabrication Requirements

1. The Variable Message Sign and components shall operate at full performance while exposed to temperatures ranging from -20° F to +120° F.
2. The Variable Message Sign printed circuit boards shall be treated with a conformal coating.

2.2 VARIABLE MESSAGE SIGN ENCLOSURE AND SIGN ASSEMBLY

A. The Variable Message Sign Enclosures to be furnished and installed under this Contract shall meet or exceed the following performance and assembly requirements:

1. The VMS Enclosure shall be weather-tight, rated NEMA Type 3R or better, and shall be fabricated from extruded aluminum. It shall exhibit a high degree of longitudinal and torsional rigidity.
2. The VMS Enclosure shall be of a typical dimension of 65" long, 14" high and 15" deep.
3. The VMS Sign front screen shall be of one piece, fabricated of a scratch resistant polycarbonate material of a nominal thickness of 5 mm and shall include a coating on the outer face to reduce external reflections.
4. The VMS LED display shall be composed of modular, interchangeable display panels.
5. Enclosures shall be provided with hinged access covers for ease of maintenance.
6. Terminal strips used for DC power distribution shall be centrally arranged.
7. The VMS shall be constructed so as to reduce susceptibility to interference and radiation of spurious signals. External data cables shall be screened and power inputs filtered. A matrix shield shall be fitted to the rear of the display's front screen in order to reduce spurious emissions and provide immunity from interference.
8. A grounding stud shall be provided inside the VMS enclosure for attachment to earth ground. Safety earth bonding shall be used on all metal parts of the VMS assembly and connected to the grounding point. All other parts of the VMS circuitry shall be isolated from the ground point.
9. Incoming mains 120 VAC power shall be fully short circuit protected using fuses or internal circuit breakers.

2.3 VARIABLE MESSAGE SIGN SYSTEM COMMUNICATIONS AND CONTROL EQUIPMENT

A. The Variable Message Sign System communications and control equipment shall be rack mounted on a 19" equipment rack housed in the Communications Equipment Shelter (CES) specified herein and shown on the Contract Drawings. The Contractor shall furnish and install all necessary cabling, wiring and components to make this a fully functional Variable Message Sign System for simultaneous visual display and audio presentation of MBTA Railroad Passenger Information. The following Variable Message Sign System communications and control system equipment or approved equivalent products shall be furnished, installed, tested and placed into service:

1. 8-Port Serial Device Server – Provide one (1) Serial Device Server to control up to four signs and the Text to Audio Message Converter. The Serial Device Server shall be DIN rail mountable.

The Serial Device Server shall be an 8-port rack mount serial device server, shall include RS-232 signaling and shall include DB9 male connectors for the serial connections. The Serial Device Server shall be a Moxa Technologies Model NPort 5610-8-DT, or an approved equal.

2. 24 Volt Power Supply – Furnish and install one (1) 24 volt power supply to power both the Wireless Cellular Modem and Serial Device Server. The 24 volt power supply shall be DIN rail mountable, Moxa Technologies Model DR-4524 Power Supply, 24 VDC, 45 watts with universal 85 to 264 VAC input; or an approved equal.
3. Wireless Cellular Modem – Furnish and install one (1) wireless modem to provide communications between the serial device server and the MBTA main servers. The wireless modem shall be a Blue Tree Wireless Data, Inc., Model BT-6600 Mobile Data Unit, or an approved equal.
4. Wireless Antenna – Furnish and install one (1) Wireless Antenna for connection to the Wireless Cellular Modem. The wireless antenna shall match the frequencies utilized by the cellular service provider and Wireless Cellular Router and shall be installed with a ground plane. The Wireless Antenna shall be an AP8500/18000 Dual Band Cellular/PCS as manufactured by AntennaPlus; or an approved equal.
5. Fiber Optic Mini Modem – Furnish and install Fiber Optic Mini Modems to allow for fiber optic communications between the Serial Device Servers and the Variable Message Signs. The Fiber Optic Mini Modems shall be designed to operate over 50/125 μ multimode fiber optic cable. The modems shall be Async Fiber Optic Mini Modem ME 605a as manufactured by Black Box; or an approved equal.
6. Uninterruptible Power Supply - Furnish and install (1) rack-mountable uninterruptible power supply sized appropriately to provide a minimum of 30 minutes of run time for the modem and the station serial server in the event of power failure. The UPS shall be APC brand or an approved equal.
7. Diagnostic Laptop Terminal – Provide one (1) ruggedized laptop computer for performing field diagnostics, service and troubleshooting the Variable Message Sign System. The laptop shall be equipped with the latest Windows based operating system and any required diagnostic software for RPI system debugging. The laptop shall have the latest hardware configuration at the time of procurement including the highest available Intel processor speed, highest available system memory, 160GB Solid State Drive Flash Module, CD ROM drive, 14.0" diagonal High-Definition LED Display (1366 x 768), Ethernet Card, Wireless Card with Bluetooth, appropriate I/O ports to perform all necessary service functions. A rugged Laptop Terminal case shall be included.

- B. In the event the Contractor requests approval to use a substitute brand of product from those named herein they shall certify that the product is appropriate for use with the overall system, integrates and operates reliably with all other components and will not compromise any other equipment manufacturer's warranties.

2.4 EQUIPMENT FOR AUDIO ANUNCIATION OF VMS MESSAGES

- A. General: At each Variable Message Sign location provide and install an all weather loudspeaker for audio announcements corresponding to the message displayed on the VMS. The loudspeakers shall be connected to an audio amplifier in the Communications Equipment Shelter. The line level audio input to the

amplifier shall be from an existing proprietary Text to Audio Message Converter provided by the operating railroad/MBTA.

B. Audio Amplifier Specifications

- | | | |
|-----|-----------------------|--|
| 1. | Audio Inputs | Two (2) high impedance balanced inputs for a 2-zone system |
| 2. | Input Connections | 3 pin Phoenix-type, per each audio input |
| 3. | Frequency Response | 70 Hz to 19 kHz (± 1 dB) |
| 4. | THD | $< 0.5\%$ |
| 5. | Output Power | 80 Watts per channel |
| 6. | Output Type | 70V and 100V constant-voltage outputs and 4-ohm outputs |
| 7. | AC Power | 120V 60 Hz |
| 8. | Operating Temperature | 0°C to 40°C |
| 9. | Volume Controls | One for each channel |
| 10. | Tone Controls | Base and Treble for each channel |

C. Loudspeaker Specifications

- | | | |
|----|-----------------------|---|
| 1. | Frequency Response | 65 Hz to 16 kHz (± 4 dB), or better |
| 2. | Loudspeaker Type | 8-inch two-way type, color black |
| 3. | Power Handling | 100 Watts |
| 4. | Horizontal Coverage | $90^\circ \pm 30^\circ$ |
| 5. | Vertical Coverage | $90^\circ \pm 30^\circ$ |
| 6. | Enclosure Material | All-weather copolymer (ABS or equivalent) with rustproof aluminum or stainless steel grill |
| 7. | Transformer Taps | 70V: 60W, 30W, 15W, 7.5W. 3.75W; typical |
| 8. | Operating Temperature | -25° F to +135° F |
| 9. | Mounting Hardware: | Shall include a C-style mounting bracket with stainless steel hardware to permit the speaker to be adjusted horizontally and vertically to provide the required audio coverage area |

D. Loudspeaker Cable Specifications

- | | | |
|----|---------------|--|
| 1. | Conductor: | 1 pair, 12 AWG, 19x25 Stranding, Bare Copper Material |
| 2. | Insulation: | PVC |
| 3. | Outer Shield: | None |
| 4. | Drain Wire: | None |
| 5. | Outer Jacket: | PVC (Color Black) |
| 6. | Application | Suitable for the application and location for which it is intended |

2.5 FIBER OPTIC CABLE

A. Multimode fiber optic cable shall be installed between the Fiber Optic Mini Modems located inside CES and the Fiber Optic Mini Modems located within the Variable Message Signs. A minimum six (6) strand 50/125 μ multimode fiber optic cable shall be installed to each sign.

B. Multimode Optical Fiber Specifications

1. The multimode fiber shall meet EIA/TIA-492AAAA-A-1997, "Detail Specification for 50- μ m Core Diameter/125- μ m Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers

2. Core Diameter: $50 \pm 3.0 \mu\text{m}$
3. Cladding Diameter: $125.0 \pm 2.0 \mu\text{m}$
4. Core Non-Circularity $\leq 5 \%$
5. Cladding Non-Circularity: $\leq 1.0 \%$
6. Core-to-Cladding Concentricity $\leq 1.5 \mu\text{m}$
7. Attenuation: $\leq 3.5 \text{ dB/km}$ at 850 nm and $\leq 1.5 \text{ dB/km}$ at 1300 nm.
8. Attenuation Uniformity: No point discontinuity greater than 0.2 dB at either 850 or 1300 nm.
9. Macrobend Attenuation: The attenuation due to 100 turn of fiber around a $75 \pm 2 \text{ mm}$ diameter mandrel shall not exceed 0.5 dB at 850 or 1300 nm.
10. OFL Bandwidth of $\geq 500 \text{ MHz}\cdot\text{km}$ @ 850 nm and $\geq 500 \text{ MHz}\cdot\text{km}$ @ 1300 nm

C. Multimode Fiber Optic Cable and Jacket Construction

1. The multimode fiber optic cable shall be designed for outdoor applications
2. The fiber optic cable jacket shall be PVC, color black.

2.6 EQUIPMENT RACK

- A. Communications equipment racks shall be furnished and installed inside CES.
- B. Equipment racks shall be 19" wide floor mounted types with EIA Standard 1 $\frac{3}{4}$ inch spaced single side drilled mounting holes.
- C. The rack support channels shall be of 16 gauge steel (minimum).
- D. The rack base shall have a minimum depth of 15" with bolt hole spacing of 12" minimum. Each rack shall be furnished with all hardware for securing it to the floor.
- E. Each rack shall be finished in gray enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Variable Message Signs and Loudspeakers
 1. Variable Message Signs shall be installed at the locations shown on the Contract Drawings mounted perpendicular to the platform, facing inbound and outbound directions. The sign enclosures shall be mounted in accordance with the manufacturer's recommendations and site specific detail plans submitted by the Contractor and approved by the Engineer.
 2. The Contractor shall install the signs providing a minimum vertical clearance of 6' 8" (maximum 10') from the surface of the platform and a minimum horizontal clearance of 8' 6" from center line of the nearest track providing unobstructed sign visibility.
 3. The Contractor shall run the power and fiber optic cables in galvanized rigid galvanized steel conduits to each sign enclosure. The Contractor shall provide all junction boxes, fittings, elbows, connectors, etc. necessary to make a complete installation.

4. The Fiber Optic Mini-Modem for VMS communications shall be installed within the Variable Message Sign at each location.
5. For each Variable Message Sign install a Loudspeaker next to the sign and orient the speaker so as to provide full, uniform audio coverage of the area in front of the VMS.

B. Cable

1. All conductors shall be identified by color and tag listing its function. All cable routing shall be approved by the Engineer. Wire ways for communications cables shall be provided with a section divider to isolate the data communications cable.
2. Fiber Optic Cable Termination
 - a. Fiber Optic Patch Panels
 - 1) 19" Rack-mount fiber optic patch panels shall be provided and installed for terminating the fiber optic cables in the locations on the contract drawings. The patch panels shall provide space for storing spare patch cables and documentation of the fiber optic certification tests. Patch panels shall have connector panels with LC-LC couplers. Multimode connector panels shall be provided as required.
 - 2) Stand alone fiber optic patch panels shall be provided and installed as required or as shown on the contract drawings.
 - 3) The Contractor shall provide all mounting hardware and back panels required to properly secure the Patch Panel to a standard rack structure. All fiber cables shall be properly labeled.

3.2 RAILROAD WORK

- A. The Contractor shall secure the services of the Massachusetts Bay Commuter Railroad (MBCR) communications department to perform work as indicated on the plans and described herein. This work shall be covered under the allowance item RAILROAD WORK.

3.3 TESTING

- A. The Contractor shall notify the Engineer at least five days in advance of the test of the Contractor supplied materials, so that the Engineer or his representative may be present at this test if he so elects. Upon completion of the test, a certified test report shall be submitted to the Engineer.
- B. Any system deficiencies observed under testing shall be noted in the certified test report. All deficiencies shall be corrected and system shall be retested. A sequential test report shall be submitted.
- C. Factory Testing - The Contractor shall factory test each electronic sign, prior to integration with the mounting assembly. Full functional testing shall be performed.
- D. Field Installation Testing – The Contractor shall test each component of the Variable Message Sign System including all communications, control and audio amplification and loudspeaker equipment to ensure that the equipment is properly installed and that all functions and features are operating as specified and intended in the Contract. The Contractor shall provide RF test instruments and shall measure and record the received signal strength of the cellular data service provider's signal at the output of the Wireless Antenna. The Contractor shall locate and orient the Wireless Antenna so as to achieve the maximum signal strength and signal-to-noise ratio, sufficient for reliable operation of the Wireless

Cellular Modem. The Contractor shall submit as-built drawings and maintenance manuals one week prior to final scheduled System Testing.

- E. System Testing - The Contractor shall coordinate with the MBTA and GE Transportation for integration of the South Acton Station Railroad Passenger Information system into the MBTA's Systemwide Commuter Rail Passenger Information System. The Contractor shall, with the assistance of the MBTA or their contractor, functionally test the complete system. The Contractor shall provide necessary staffing to correct any deficiencies that are observed with the Contractor's portion of the system during the system testing period. The Contractor shall notify the MBTA 30 days in advance of the system test so that the MBTA can make necessary arrangements for their testing staff.
- F. After the completion of all punch list items the Contractor shall provide as built drawings including all changes made during system testing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.
- B. An allowance is included in the schedule of bid prices to reimburse the Contractor for the work performed by the Operating Railroad MBCR in support of the VMS sign system installation. This allowance will cover the cost of MBCR work to include furnishing, installing, and testing of an audio message converter and AM radio transmitter and other ancillary equipment including all associated cables, connector's adapters, and testing of associated equipment provided by MBCR. The allowance shall also cover the cost for MBCR to attend all meetings and site visits in connection with this work.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS
0290.005	RAILROAD WORK	AN

END OF SECTION

SECTION 16750

COMMUNICATION EQUIPMENT SHELTER

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for procurement of a fully functional, safe and reliable Communication Equipment Shelter (CES) complete with Variable Message Sign (VMS) Control System and other equipment as described within these Specifications and shown on the Contract Drawings.
- B. The Contractor shall provide all required labor, materials, tools and equipment necessary for design, fabrication, delivery, installation and placing in service of a factory-wired CES complete with all materials and equipment. The Contractor shall provide all parts, products and materials that may not be specifically identified within the Contract Documents, but which are required to provide a fully functional CES.
- C. The work shall include transporting CES from the manufacturer's facility, all required earthwork, foundation, cable raceways, electrical power service, grounding, heating and ventilation.
- D. The work shall include termination of all external cables, connections, testing and placing in service electrical and communications systems.
- E. CES outside dimension shall be as shown on the Contract Drawings. The interior headroom shall not be less than seven (7) feet.
- F. The work shall include preparation of the final As-Built Drawings of the CES structure, communications rack, and power panel and equipment arrangement.

1.2 QUALITY ASSURANCE

- A. All equipment and materials provided shall conform to the requirements of Section 01400 – QUALITY ASSURANCE and other applicable sections of these Specifications.
- B. The Contractor shall be responsible for the correctness of all circuit wiring.
- C. Material, equipment and components procured for this Contract shall be produced under approved manufacturer's Quality Assurance Program.
- D. Prior to manufacturing, obtain Engineer's approval of each and every product submittal.
- E. Factory inspection and tests for the equipment contained within CES shall be conducted in accordance with the Contractor's Factory Test Procedure approved by the Engineer.
- F. Each component and unit shall be inspected at the point of manufacture and evidence of this inspection and acceptance shall be indicated on the item where practicable.

- G. All equipment shall operate in accordance with Class B wayside environmental requirements in accordance with AREMA C&S Manual Part 11.5.1.
- H. Inspect CES after it has been installed and correct any deficiencies. This inspection shall be conducted in conformance with the requirements of the Contractor's Installation Inspection Procedure as approved by the Engineer.
- I. The Contractor shall deliver, install and place CES in service in accordance with the approved Project CPM.

1.3 SUBMITTALS

- A. Prior to the manufacture and assembly submit and obtain approval of CES as a complete package. CES submittal shall include the following:
 - 1. Catalog cuts and descriptive literature for all equipment proposed to be contained inside CES. Submittals shall include part numbers for all products and equipment manuals.
 - 2. Shop Drawings showing the construction, proposed size, layout, grounding connection arrangement and detailed bills of material for the CES.
 - 3. One line schematic of the power supply system. Upon approval one line schematic shall be displayed inside CES, showing equipment and protective device ratings, wire and cable types and sizes.
 - 4. Drawings and descriptive information, including manuals for the proposed heating system.
 - 5. Drawings showing cable entrance details and details of wire/cable raceways.
 - 6. Factory Test and Inspection Procedures for the CES shall be submitted in accordance with approved delivery, installation and testing and placing in service schedule.
 - 7. CES manufacturing and delivery plan, including methods of protecting equipment and components, routing and storage destination information. The delivery plan shall include proposed means and methods of transporting CES and shall be approved prior to scheduling delivery.
 - 8. Submittal of CES shall include the following:
 - a. House structural details.
 - b. Detailed Bill of Material.
 - c. Rack layout including installation details.
 - d. Wall mounted equipment layout.
 - e. Conduit layout.
 - f. Cable entrance layout, materials and structures, retention devices, sealing material and method.
 - g. Cable tray including mounting and installation details.
 - h. Grounding arrangement, material and prime ground plate.
 - i. Foundations and fastening hardware.
 - j. Fans, heaters.
 - k. Fire extinguishing system.
 - l. Intrusion detection equipment and system layout.
 - m. Entrance/exit facilities including stairs and railing product and installation drawings.
 - n. Factory Inspection and Test Procedure.

- o. Field Inspection and Test Procedure.
- p. Completed test reports.
- q. Installation Procedure.
- r. Manufacturing and Delivery plan and schedule.
- s. Power distribution equipment.
- t. Laminated one line schematic of the power supply system for display inside CES.
- u. Local Distribution Panel layout and labeled circuit breakers.
- v. Equipment layout plans showing the proposed location of all equipment and cable routing.
- w. Fuses and other electrical components.
- x. Floor mats.
- y. Paint.
- z. House lighting.

1.4 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall deliver the CESs to construction site and unload CES to foundation unless otherwise directed by the Engineer.
- B. The Contractor shall obtain all necessary permits and arrange for convoy if required for transport and delivery at no additional cost to the Project.
- C. The contractor shall provide three (3) copies of the bill of lading to the Engineer at the time of delivery.
- D. All equipment shipped within each CES shall be properly fastened and braced to prevent damage during transit.
- E. The Contractor shall replace any equipment damaged in transit, storage, or caused by mishandling prior to acceptance of delivery by the Engineer at no additional cost to the Project.
- F. Prepare and utilize a template or any other device required to ensure that housing can be installed without fouling the track or other equipment.
- G. Obtain Engineer's approval of the date and time of delivery seven (7) calendar days in advance of shipping CES.
- H. Notify the Engineer 24 hours in advance of shipping CES from manufacturing facility and immediately after CES has left the facility. Provide anticipated arrival time within a two hour window. Inform the Engineer at once of any delay or other deviation from approved delivery schedule.
- I. Deliver CES complete with all previously approved as-built drawings, descriptive information, installation and maintenance manuals for all systems and equipment furnished.
- J. CES shall be inspected at the time of delivery by the manufacturer's representative and the Engineer for the obvious signs of damage. Replace any equipment damaged in transit or by mishandling, lost or stolen at no additional cost to the Project

1.5 WARRANTY

- A. Provide warranty on equipment and systems provided under this Contract, in accordance with Specification Section 00700, General Conditions, Article 2.08, Warranty of Work. Costs associated

with work, services, and materials to provide such warranty will be considered included in the Contract amount and no extra payment will be made. Proper operation of components associated with this Contract is required. Material repairs required during the delivery period will be considered part of the Contractor's work. This general requirement supersedes any lesser warranty or guarantee. In general, a two-year warranty – beginning with the receipt of each CES at the Authority's staging site is required.

1.6 REGULATORY ELECTRICAL REQUIREMENTS

- A. The Contractor shall comply with the electrical requirements of all national, state and local codes, laws and ordinances, and all rules and regulations of public administrative authorities having jurisdiction over the work where the requirements do not conflict with these Specifications.
- B. The latest published issues of the standards, codes, recommendations or requirements of the following listed organizations in effect at the date of the Notice-To-Proceed where the requirements do not conflict with these Specifications. In case of a conflict, the more stringent shall apply.

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
AWS	American Welding Society
ASTM	American Society for Testing and Materials
AREMA	American Railway Engineering and Maintenance of Way Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
MEC	Massachusetts Electrical Code
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
UL	Underwriter's Laboratories, Inc.

PART 2 - PRODUCTS

2.1 HOUSING

- A. CES housing shall be as manufactured by PTMW, Inc., PRECISION QUINCY Corp., SAFETRAN or approved equal.
- B. CES walls, doors, roof and floor shall be of modular construction and shall be CES shall be of modular construction of 12-gauge sheet steel, unless otherwise approved by the Engineer.
- C. The CES shall be weather-tight, dust-tight and insulated.
- D. Top, floors and walls shall be lined with fire resistant insulating material with a minimum insulation value of R-19 complying with a flame spread of 0-25 and a fire rating of 7 in accordance with ASTM E-84.
- E. Roof and side ventilation openings shall be provided and shall be equipped with screens.

- F. Access to underground cable through knock-out entrances shall be provided.
- G. Apparatus boards shall be three-quarter inch thick Medium Density Overlay plywood securely fastened to the wall(s) of each CES for mounting of equipment.
- H. Provide a door mounted fold away plan desk/shelf for 11x17 inch plans and metal plan pocket for 11x17 inch plans with drain opening.
- I. The exterior of the CES shall be powder coated. Each CES shall be furnished with 2 cans of exterior aluminum paint as specified herein.
- J. The free floor space shall be covered with black rubber matting permanently attached to the floor of CES.
- K. Provide permanently attached hoist bars or lifting plates to facilitate loading, unloading and moving CES.
- L. Each CES shall be furnished with stainless steel mounting hardware (nuts, flat and lock washers), and six (6) UHMW isolation plates to isolate the housing from foundation. Foundation threaded rods shall be stainless steel. One extra set of foundation hardware shall be included with each CES.
- M. The doors of the CES shall be hinged and gasketed to provide a dust-proof and airtight seal. Doors shall be provided with cast iron handles, welded to a three-point latching device that shall ensure the door cannot be locked until it is in the fully closed position. Doors shall be provided with a two-position retaining device to secure the open door up to 180 degrees.
- N. The entrance door locking device shall allow opening the door from inside if padlocked outside.
- O. Hinges shall be stainless steel separate castings fastened to the housing and door with stainless steel hardware (bolts, nuts, flat and lock washers). The hinges shall be equipped with stainless steel hinge pins and shall be lubricated by the manufacturer before the CES is shipped.
- P. CES structural drawings shall be stamped by a Professional Engineer registered in the state of Massachusetts.
- Q. Provisions shall be made to accommodate 50 feet of 48-strand fiber optic cable slack inside CES. The minimum operational bending radius of fiber optic cable shall not be less than 12 inches. Ties to restrain the cable shall be provided.
- R. The CES layout shown on the Contract Drawings shall be used for the layout of equipment. If the final layout modified by the Contractor to accommodate proposed equipment it shall be approved by the Engineer prior to manufacturing.
- S. Each CES shall include, but not be limited to, the following:
 - 1. Wall mounted carbon dioxide type class "BC" fire extinguisher.
 - 2. Thermostat controlled ventilation fan mounted at the highest point of the housing.
 - 3. Wall mounted heater unit controlled by thermostat
 - 4. Intrusion alarm magnetic contacts installed at each door and wired to the equipment rack for indication to the MBTA's CROCC.

5. Intrusion alarm reset pushbutton installed and wired on the equipment rack.
6. Heat and smoke detection equipment in accordance with the latest edition of NFPA 130. The heat and smoke detection equipment shall have provisions for indication to the MBTA's CROCC.

2.2 FOUNDATION.

- A. Pre-cast concrete foundations shall be in accordance with recommendation of AREMA C&S Manual, Part 14.4. The pre-cast concrete foundations shall be designed to support CES and shall be as manufactured by Dixie Precast, Inc., Permacrete Products Corporation, or approved equal.
- B. Reinforcing steel shall be placed not less than one inch from outside surface.
- C. All products shall be cast in rigid steel molds and vibrated enough to consolidate around steel reinforcing without aggregate separation.
- D. All exposed edges are to be chamfered 1/2".
- E. Bolts, nuts and washers shall be stainless steel.

2.3 CES UTILITIES & AUXILIARY POWER

- A. Each CES shall be provided with lighting and appliance branch circuit panel board as described in these Specifications.
- B. Each CES shall be provided with fluorescent lights to provide illumination of 30 foot-candles or higher at floor level. The lighting shall be operated from a wall switch placed near the entrance.
- C. Duplex outlets 120VAC 15A with ground fault interrupter (GFCI) wired to the CES breaker panel shall be provided as shown on the Contract Drawings.
- D. Four (4) grounding studs for ground connection shall be provided at each corner of the CES.

2.4 ENVIRONMENTAL REQUIREMENTS

- A. The heating and ventilating units inside the CES shall be controlled by thermostat with manual override ("auto" or "on"). Heating units shall be sized based on 4 watts per cubic foot of area of the CES. Openings for fan exhaust shall be sealed against penetration of moisture and outside air.

2.5 UTILITY BRANCH CIRCUIT WIRING

- A. Branch circuit wiring for the CES utilities shall conform to the requirements of the Massachusetts Electric Code (MEC) and shall be installed within Electrical Metallic Tubing (EMT). Wire sizes, EMT conduit and liquid tight flexible conduit shall be sized in accordance with the MEC.

2.6 RACKS

- A. The Contractor shall furnish and install sectional type rack inside CES for termination of external cable and for mounting of equipment.

- B. All racks shall be 19-inch wide weldments and shall be constructed of 14-gauge (minimum), cold rolled steel, powder coated prior to installation. The panel mounting angles shall be constructed with the standard EIA hole spacing.
- C. The racks shall be installed with shock mounts and secured to 12 gauge minimum cold rolled steel bases. The rack base shall be the same width as the racks, with a height of three and one-half inches. The mounting hardware shall be stainless steel.
- D. The racks shall be installed with all necessary fittings and fastening material. The racks shall be electrically insulated from ground, each other, wire trough and supports and shall be connected to each other by ground connection only. Ground connection strap shall be removable for isolation and troubleshooting.
- E. Grounding posts and ground jumpers shall be furnished with each rack. Grounding posts shall be of the bolted type to permit isolation of the rack for testing by removal of the ground wire connections.
- F. A rack identification in a minimum one inch tall letters shall be stenciled at the top of the front and rear of the frame of each rack. Vertical coordinate lettering shall be stenciled from top to bottom.
- G. All equipment shall be installed using approved mounting and fastening materials. All interconnecting cables, wiring, connections to power sources shall be installed as shown on the approved plans, including interconnections to self contained, rack mounted equipment units.
- H. Wires and cables shall be installed in a neat, workmanlike manner. Wires and cables in ducts shall be laid therein and not pulled in. Wires and cables shall be installed with a minimum amount of crossover in the duct and shall not be pulled tightly around bends. All exposed wires and cables entering or leaving instrument racks shall be protected from abrasion and sharp edges. At least 6" of slack shall be provided for each interconnecting cable or wire.
- I. An identifying nameplate shall be provided for each instrument furnished as part of CES. Proposed nameplate material shall be submitted for approval.
- J. Support bars shall be provided for each row and be of sufficient strength to support the manufacturer's equipment to be mounted thereon without flexing due to the pressure exerted during wiring termination.
- K. The terminal and power panel shall be located on the upper portion of the rack for connecting wires and cables. The panel material shall be fire retardant.
- L. All protective components shall be sized and rated to protect the equipment and provide safe operation.
- M. All equipment and components mounted on racks shall be accessible for testing or replacement without removal of other components. If removal of other components or subassemblies is required, they shall be of the plug-in type.

2.7 POWER SUPPLY SYSTEMS

- A. The Contractor shall provide power supply and distribution equipment required for supplying 120 VAC power to CES in accordance with Section 16050 Basic Materials and Methods for Electrical Work and other applicable sections of these Specifications.

2.8 HARDWARE

- A. All mounting hardware shall be stainless steel, except as otherwise approved by the Engineer.

2.9 GROUNDING OF EQUIPMENT

- A. CES grounding shall be in accordance with Specification Section 16450 – Grounding and shall be as follows:
- B. The grounding system shall preclude any closed loop grounding arrangement.
- C. All racks shall be connected to a prime ground plate by No. 6 AWG copper connector without any intermediate termination. Grounding studs shall be provided on each rack to allow for easy individual disconnection of any rack from the grounding system.
- D. A prime ground bus plate furnished and installed inside CES shall be of sufficient size to make all grounding connections. This prime ground bus plate shall be mounted on insulating stand-offs on a wall of the instrument house as shown on the Contract Drawings. Ground plate shall be made of hard drawn pure copper having a minimum conductivity of 98 percent per ASTM B187. The bus plate shall have no sharp edges and shall be connected to ground studs.
- E. Ground conductors shall be separated from other conductors. Where AC power conductors exist, the equipment ground conductors shall be bundled with them.
- F. All insulated ground wires shall have green insulation.
- G. The Contractor shall provide four ground connections of ground loop to CES.
- H. Paint and Finish
 1. All parts that require painting shall be painted in accordance with the recommendations of the AREMA C&S Manual Part 1.5.10.
 2. The surfaces of equipment and material not accessible after mounting shall be painted with a final finish coat applied prior to installation.
 3. Where no requirements for painting are shown or indicated on the approved plans or Specifications, application of three coats of paint by the dip method may be used, subject to MBTA approval.
 4. Surfaces to be painted shall be carefully prepared, and only approved materials of the highest quality shall be used to provide a durable rust-resistant finish.
 5. Sheet aluminum surfaces shall not be painted. Unless otherwise directed by the Specification, FRE conduit shall not be painted.
 6. Contractor shall touch up paint upon delivery on CES.

PART 3 - EXECUTION

3.1 TESTS

- A. All of the systems and equipment contained within the CES shall be factory tested according to Test Procedures as approved by the Engineer.

- B. All of the systems and equipment contained within the CES shall be factory tested in accordance with the approved Factory Test Procedures and other applicable references of this Specification.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith shall be included in the total Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION

SECTION 16840
CLOSED CIRCUIT TELEVISION SYSTEM

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

- A. This section specifies the expansion of the MBTA Closed Circuit Television (CCTV) System at South Acton Station. The existing MBTA CCTV system is a real time IP video system utilizing IP based cameras and legacy analog cameras that are encoded for transmission over the MBTA's IP network. The Video is viewed throughout the MBTA system using the VidSys VidShield/RiskShield (Vidsys) Physical Security Integration Management (PSIM) software client.
- B. The CCTV system to be installed at the South Acton Station shall be an extension of the existing MBTA CCTV system connected utilizing commercial telecommunications facilities. The South Acton Station's CCTV system shall be fully compatible and interoperable with the existing MBTA CCTV IP distribution network and VidSys VidShield/RiskShield (Vidsys) Physical Security Integration Management (PSIM) software client.
- C. The CCTV system utilizes the MBTA's Security Wide Area Network (SWAN) and MBTA's Wide Area Network (WAN) as a means of transmitting IP video to various locations throughout the MBTA system for viewing and recording. This system expansion shall incorporate IP fixed cameras, IP Pan/Tilt/Zoom (PTZ) cameras, Network Video Recorders (NVRs)/Video Management Systems (VMSs), the Vidsys software, network switches, and any other hardware or software required to transmit/receive video over an IP network for a complete and functional system.
- D. The Vidsys software client allows MBTA personnel to access live and recorded video streams from any camera, encoder, DVR, or NVR on the system and to create and store video clips and snapshots locally. The Vidsys client is currently installed on multiple computer workstations within the six (6) Hub Centers, Operations Control Center, and on individual computer workstations throughout the MBTA network.
- E. This contract requires the Contractor to coordinate with the MBTA Communications Department and MBTA's CCTV Maintenance Contractor (MCMC) via the MBTA project manager to inform them of and schedule work associated with integrating alarms and video streams with the existing Vidsys head end system.
- F. The CCTV system shall permit CCTV camera video from the elevator and head house cameras to be shared with the Town of South Acton. The Contractor shall comply with all MBTA policies and procedures regarding sharing of MBTA CCTV surveillance video with South Acton Public Safety Organizations and shall incorporate IP network security measures as required by the MBTA.
- G. The Contractor shall fully integrate all of the new cameras and video streams into the Vidsys system and this shall require the Contractor to geospatially place icons onto new and existing system maps. The icons shall allow access to the camera's controls and video streams. The functionality shall match that of the existing integrated cameras. All camera device monitoring shall be activated and tested, this shall include but not be limited to; status, loss of video, faults, failures, alarms, and all tampering related events and alarms.

- H. All CCTV cameras and other endpoint devices shall be entered into the Vidsys system with nomenclature submitted to and approved by the MBTA, and shall include GPS coordinates of each endpoint. The Contractor shall utilize GPS coordinates accurate to 3-feet or locate the endpoints on map based graphics in their exact real world positions. All maps required to properly represent the endpoint locations shall be in scaled format and may utilize existing MBTA CAD contract drawings. It's the Contractors responsibility to convert/import/translate the CAD drawings into a format that is applicable for the project; all extraneous information shall be removed from CAD drawing for a clear representation of the equipment installation.
- I. The Contractor shall configure all CCTV cameras and encoders to be set up to dual stream H.264 images. One stream shall have a resolution of 720p (4 CIF for encoded analogs), and a frame rate of 7.5 fps or greater for NVR recording; and the other stream shall have a resolution of 720p (4 CIF for encoded analogs), and a frame rate of 15 fps or greater for live viewing. Before CCTV camera and encoder set-up, the Contractor shall verify all camera settings with the Engineer or an MBTA representative. All live streams shall be multicast streams sent directly from the camera to the clients, the VMS/NVR shall facilitate the connection, but the stream shall not be routed or trans-coded through the NVR hardware in order to limit network usage and avoid the installation of extra server hardware. All recorded streams shall be via multicast streams from the camera to the multiple NVR recording locations in order to limit network usage. The compression on a camera shall not exceed 30% unless approved by the Engineer.
- J. The CCTV system is currently in use by MBTA personnel and is considered a critical system for MBTA Operations and security. All system improvements and changes must be coordinated in advance so as to not impact operations. This may require the Contractor to perform installation, testing, upgrades or system outages at off-peak times.
- K. For the purpose of Configuration Management, the Contractor must inform the MBTA of the length of time the contractor will be making any system modifications. The dates and length of downtime of the system must be submitted in writing on the Contractor's letterhead to the Communications Department and the MBTA's MCMC via the MBTA project manager, and must be approved by those groups. The Contractor shall complete all background maps, plan all alarms, and submit all licenses prior to doing any work on the MBTA's VidSys system. The Contractor must submit, at least 30 days in advance, for a two week window in which to complete all work on the MBTA's VidSys system; the Contractor may submit for additional time, but time may be limited due to other active contracts needing access to the system. The Contractor must complete a backup of the system prior to working on the system. The Contractor shall label the backup media with the contents, date, and time of the backup. The Contractor must maintain this backup for at least 120 days after the updated software is put into use. It is the Contractor's responsibility to have the system back online
- L. The Contractor shall provide all configuration/setup/programming of new and existing video system components identified in this specification section for a complete working system. Device configuration settings shall be submitted to the Engineer and the MBTA for approval prior to installation.
- M. The Contractor shall perform visual adjustments of each camera on installation to account for lighting conditions, desired view, and other environmental conditions. The Contractor shall also perform a final camera tuning and field of view adjustment to all cameras installed under this project 30 days after the video system has been installed; cameras have been positioned, and have been recorded.
- N. The Contractor shall have present during the duration of the Contract a certified network engineer with a minimum of 5 years experience in networking of large-scale wide area network

projects to be involved with all aspects of system integration of networked devices. The Contractor must submit this key person's resume for approval by the MBTA within 30 days from Notice to Proceed. No work shall be allowed to proceed with components having a network interface if this key person is not involved, this person shall be on-site at all times when network integration is taking place. Failure to have this person on-site shall cause the MBTA to immediately stop work until this person is on-site, at the Contractor's expense. Shall this person no longer work for the Contractor, the Contractor shall immediately inform the MBTA and a replacement shall be submitted at that time

- O. The Contractor shall have on site a person who is certified by the manufacturer of the individual subsystems (NVR, Lenel, and VidSys) for all work on these systems. The Contractor must submit each person's resume for approval by the MBTA within 30 days from Notice to Proceed. No work shall be allowed to proceed on these systems if a certified person is not involved, this person shall be on-site at all times when work on these systems is taking place. Failure to have this person on-site shall cause the MBTA to immediately stop work until this person is on-site, at the Contractor's expense. Shall this person no longer work for the Contractor, the Contractor shall immediately inform the MBTA and a replacement shall be submitted at that time.
- P. All Licenses necessary for NVR, VidSys, Lenel, and any other integration shall be supplied by the Contractor for all CCTV, Access Control, or other installed equipment and for existing equipment as described in these specifications or on the Contract Drawings.
- Q. The Contractor shall configure SNMP traps, messages, and alerts in the MBTA's existing management platform for failure situations including but not limited to power failures, hard drive failures, connectivity failures, and battery failures as applicable on all installed equipment.
- R. The MBTA currently has an existing NiceVision version 10.x system with over 1000 active channels and 250 DVRS and NVRS located throughout the system. The Contractor's work for this contract shall have no impact to any of this existing equipment. All existing cameras and recording devices currently operating on the system shall remain operational with the addition of cameras and recording systems added per this contract. If any additional hardware, software, licenses, programming, configuration, setup and testing is required to install the new equipment per this contract while maintaining the existing NiceVision equipment, they shall be provided by the Contractor at no additional cost to the MBTA. Extensive coordination will be required with the MBTA to ensure that there is minimal downtime in the existing camera live viewing, recorded viewing, and recording functions.

1.2 SUBMITTALS

- A. Prior to approval of the CCTV system hardware and software components, the Contractor shall submit the proposed equipment vendors qualifications and a written statement from the vendors acknowledging that the hardware and software to be supplied shall meet all functionality as required within this specification.
- B. The Contractor shall submit a typical site block diagram indicating hardware and software components that shall be installed at all locations.
- C. The Contractor and vendor shall be prepared to demonstrate the equipment functionality within two weeks of submission and prior to vendor/equipment approval. The contractor shall plan to demonstrate how this proposed equipment meets or exceeds all functional/performance requirements of the proposed vendor solution.

- D. If the VMS chosen by the vendor is not one currently in use by the MBTA, then the Contractor shall, within two weeks of NTP, demonstrate to the Engineer the dual and simultaneous recording capabilities of the system via a single multicast stream from the camera and demonstrate that the clients can view a separate live multicast stream sent from the camera. This demonstration shall take place at a location in the metro Boston area. The demonstration will require that recording occurs simultaneously of two cameras, one viewing a digital clock with a readout in hours; minutes; and seconds and the other viewing the client computer, an Ethernet failure will be simulated on the primary recording and management servers for ten minutes, recording and management servers will then be reconnected, and the video recorded during the ten minute failure will then be viewed to ensure that there was no loss of video. During the ten minute simulated failure, the live video from the cameras will be brought up on the screen through the VMS client to be viewed. The same connection loss scenario will then be tested for the loss of connectivity to the secondary server. There shall be at least two clients active in the room and the camera settings in the cameras setup page and in the VMS/NVR management interface shall be viewed to ensure proper multicast setup.
- E. Submit descriptive literature, including manufacturer specification sheets, for all CCTV equipment and software functionality and materials proposed for use in accordance with the requirements of this Section for approval prior to fabrication, assembly, installation and testing.
- F. Also, submit the following to the Engineer for approval: Network diagram of complete system, illustrating proposed configuration and interconnections. The Network diagram shall include detailed network architecture of all related IP devices, IP schema, device bandwidth, configuration and routing requirements.
- G. Prior to ordering any equipment as required under this Section, submit six (6) copies of the following to the Engineer for approval:
1. Full technical data and manufacturer cut sheets for all equipment.
 2. Site specific plans showing details of the following:
 - a. Camera enclosure location and mounting details.
 - b. Cable and conduit details.
 - c. Light intensity ranges throughout the surveillance areas (determined by actual field tests).
 - d. Camera field of vision.
 - 1) Submit schematic and wiring diagrams complete with terminal numbers.
 - 2) Submit NVR storage recording calculations, in days and hours, based on motion sensing configuration. Define camera image motion zones and activity levels.
 - 3) Submit procedures for programming and troubleshooting.
 - 4) Submit full interconnect diagram for overall system, including interface connections to existing equipment.
 - 5) Submit configuration plan for camera/NVR access levels.
- H. Supply maintenance instruction manuals to the Engineer including information regarding installation and maintenance as follows:
1. Operational Description and Procedures
 2. Troubleshooting and Routine Test Procedures
 3. Adjustments and Alignment Procedures

4. Wiring Diagrams, Tables and Schematics

- I. Prior to installing any equipment, submit to the Engineer for approval six (6) copies of a detailed test procedure intended to ensure all components of the system are functioning properly, in accordance with these Specifications and the Contract Drawings. The tests performed shall include the tests outlined in Paragraph 3.3 of this Section. The detailed test procedure shall include a description of all test equipment to be used and specific measurements and/or pass/fail criteria for each test.
- J. Factory Tests: Submit at completion of factory testing, including program software, six certified copies of test results.
- K. Test Procedures and Reports: Full details shall be submitted of the scheduled tests and the expected duration of all test procedures. Samples of all test report forms, and full details of the methods that the raw test data is to be reduced, shall be approved before commencement of system testing to be furnished under this Contract.
 - 1. The test report shall identify the name of manufacturer, model numbers, serial numbers, and the last date of calibration of test instrumentation. Documentation shall be furnished to verify that test instruments have been calibrated not more than nine months prior to the tests. If a test instrument does not require calibration, it shall be highlighted in the report.
 - 2. The test report shall include a list of attendees.
 - 3. Certified test results for the system components tests shall be submitted within 30 days after the completion of each test. No equipment shall be released for shipment until certified test data is approved by the Authority. Copies of approved test procedures, raw data measured results, calculations and all data derived from tests shall be included as part of report. All test data shall be bound in one report. The test report shall be indexed and cross-referenced in an easily understood manner.
- L. Certificate of Compliance: Submit a certificate of compliance that all components furnished meet the requirements specified herein.
- M. Operation and Maintenance Manuals shall be submitted as listed below:
 - 1. The Contractor shall furnish an operation and maintenance manual for each piece of equipment, unless otherwise specified herein. The manual shall be provided in both hardcopy and on compact disk. The MBTA Communications Department prior to submittal shall approve the software utilized. The following identification shall be inscribed on the cover: the words "OPERATING AND MAINTENANCE MANUAL", the name and location of the project, the name of the Contractor, and the contract number. The manual shall include the names, addresses, and telephone numbers of each subcontractor furnishing or installing equipment. In addition, include the local representatives for each item of equipment. The manual shall have a table of contents and index. The manual shall be assembled to conform to the table of contents, including tab sheets placed before instructions covering the subject. The instruction sheets shall be legible with large sheets of drawings folded in. The contents of the manual shall also be available on-line by means of a help screens.
 - 2. The Contractor shall submit to the Engineer for approval three copies of the preliminary operation and maintenance manual at least 30 days prior to shipment of first relevant unit. After approval of the preliminary submittal and having made all necessary corrections and amendments as required, the Contractor shall supply the Engineer with six additional

copies of the approved dated operation and maintenance manuals. One set of master camera-ready copy shall be included as one of the six copies to permit additional copies to be made. The master camera-ready copy shall be clearly marked as such on the outside. One manual shall be provided on compact disk. The MBTA Communications Department prior to submittal shall approve the software utilized. The manual shall provide a clear explanation of the theory, operation, and maintenance of the equipment accompanied by photos and schematic, wiring and mechanical assembly diagrams, as required. The manual shall be indexed and cross-referenced in an easily understood manner. The manual shall be loose leaf bound and shall include the following information:

- a. Operating instructions.
- b. Troubleshooting and fault isolation procedures for on-site level repair.
- c. System equipment removal and replacement procedures.
- d. A list of the replaceable components.
- e. A test procedure to verify the adequacy of repair work.
- f. A preventive maintenance schedule and instructions for the replacement of any electrical equipment.
- g. A preventive maintenance schedule for inspection, removal, and replacement for each component.
- h. A list of special tools provided by the manufacturer.
- i. A list of recommended tools and test equipment as required performing all maintenance tasks.
- j. Recommended spare parts list for one year's operation.
- k. Interchangeable parts list-showing parts common to items of equipment.
- l. Equipment manufacturers' descriptive literature including catalog cuts.
- m. As-built working drawings.
- n. System component approved factory test reports.
- o. The latest service bulletins with dates that describe service procedures.
- p. Camera configuration, troubleshooting, fault diagnostics and default settings.
- q. The NVR software programming, troubleshooting, fault diagnostics and shutdown procedures.
- r. All software screens to be utilized for graphic representation of physical locations of equipment installation.
- s. Update Operations Manual for CCTV system software modifications provided under this Contract.

1.3 REGULATORY REQUIREMENTS

- A. Comply with all applicable requirements of the following:
 1. National Electrical Code
 2. Massachusetts Electrical Code
 3. EIA/TIA
 4. IEEE

1.4 RELATED SECTIONS

- A. See Specification Section 01010 SUMMARY OF WORK

- B. See Specification Section 16050 BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Furnish all items of the material, design, sizes and ratings shown on the Contract Drawings and herein specified.
- B. All CCTV cameras, NVRs, and video encoders installed under this contract shall be integrated and fully functional with the Vidsys software and the integration shall be approved by VidSys. If the Contractor wishes to use a CCTV camera that meets the specifications and is not currently integrated into the VidSys software, then they must have the camera integrated and the integration approved by VidSys at no additional cost to the contract and without any contract time extension.
- C. All CCTV Cameras and CCTV Encoders installed under this contract shall be integrated into the proposed or existing NVR. If the Contractor wishes to use a CCTV Camera and/or CCTV Encoder that meets the specifications and is not currently integrated into the NVR or VidSys, then they must have the CCTV Camera and/or Encoder integrated at no additional cost to the contract and without any contract time extension.
- D. Any CCTV camera, NVR, and video encoder installed under this contract must be an open device and the manufacturer must provide an SDK to other device and software manufacturers to allow the integration of the device.
- E. The Contractor is responsible for all software and licensing necessary for achieving the described functionality.
- F. All firmware and software shall be updated to the newest version prior to the close of the project.

2.2 MATERIAL

- A. All material shall be new and unused commercial off the shelf products and the workmanship shall be in accordance with the highest standards of the electronic equipment industry. Bids will be accepted only for new and current equipment. Equipment discontinued by the manufacturer shall not be accepted. All components shall be UL listed.
- B. Equipment purchased under this Section shall comply with applicable EIA standards and the manufacturer's warranties against material and workmanship.
- C. Supply all equipment capable of meeting the performance requirements within the MBTA railway system environment, subject to temperature, electromagnetic interference, humidity, vibration, and light conditions typically encountered.

2.3 MANUFACTURER/CONTRACTOR EXPERIENCE

- A. Manufacturers supplying IP video encoding, decoding and recording equipment shall have a minimum five years experience in the IP video market. Manufacturer shall have experience in design and implementation of systems of this size and complexity.

- B. Upon award of Contract the manufacturer shall agree to support all installed equipment and software for a minimum 5 years after system acceptance. This shall be submitted in a formal letter to the MBTA from the manufacturer.
- C. The Contractor installing the IP video equipment must have experience in IP video technology and must have prior experience in implementing an IP video network of similar complexity and size.

2.4 CCTV CAMERA MOUNTS

- A. All CCTV camera mounts shall be designed by the manufacturer for the sole purpose of mounting the CCTV camera.
- B. All CCTV camera mounts shall be type as stated on the Contract Drawings. Camera mounts that are listed at To Be Determined in field will be decided on a site walk with the Engineer and the Contractor.
- C. Any non standard camera mount must be submitted for approval.

2.5 PTZ IP CCTV CAMERA

- A. The PTZ IP CCTV Camera to be provided under this Section shall meet or exceed the following requirements:
 - 1. The PTZ IP Camera shall be certified by the manufacturer to be fully compatible with the Network Video Recorder specified elsewhere in the Section.
 - 2. The PTZ IP Camera shall include motion detection and auto-tracking to automatically track a moving object or person.
 - 3. The PTZ IP Camera shall be of a day/night (color/B&W) type for viewing scenes at very low light levels.
 - 4. The PTZ IP PTZ Camera shall include an optically Wide Dynamic Range to compensate for a wide range of ambient lighting conditions within a camera's field of view.
 - 5. The PTZ IP Camera shall be able to output both MPEG-4 (or H.264) and MJPEG (or JPEG) video streams simultaneously.
 - 6. The PTZ IP Camera shall feature an image stabilization system to reduce video image shaking at high zoom levels.
 - 7. The PTZ IP Camera shall feature "auto-flip" to permit smooth tracking of individuals as they pass beneath the camera.
 - 8. The PTZ IP Camera shall include a minimum of eight (8) programmable privacy zones to electronically block selectable portions of the cameras field of view. Privacy blocking shall automatically adjust itself as a function of pan, tilt and zoom controls.
 - 9. The Contractor shall provide and install all required camera mounting brackets, pendant mounts, adapters and associated hardware to mount the PTZ IP Cameras at the location(s) shown on the Contract Drawings.
 - 10. General Construction

- a. Impact resistant ruggedized housing
 - b. Clear polycarbonate dome
 - c. Tamper and impact resistant CCTV Camera assembly
11. Electrical
- a. RJ-45 connector for 100Base-TX Ethernet
 - b. Input voltage:
 - 1) 24 VAC, or
 - 2) High Power over Ethernet
 - 3) Include 60 Watt (or as required) High Power over Ethernet Power Injector
 - 4) High Power PoE Power Injection Equipment may be integrated with the PoE Ethernet Extender Over Coaxial Cable transmission equipment.
12. Camera Imaging System
- a. Imaging Sensor: 1/4 inch CCD
 - b. Image Resolution: VGA (640 x 480), minimum
 - c. Zoom Lens: 3.4 – 119.0 mm, or longer
 - d. Digital Zoom: 12x, or greater
 - e. Iris: Automatic iris control
 - f. Camera Presets: 99, minimum
 - g. Pan and Tilt Movement
 - 1) Panning Range 360°, continuous
 - 2) Tilting Angle 5° above horizontal, minimum
 - h. Minimum Illumination (No Image Enhancement, AGC On):
 - 1) Color: 0.66 lux for 30 IRE
 - 2) Black & White: 0.166 lux for 30 IRE
13. The PTZ IP Camera assembly shall meet or exceed the following environmental requirements:
- a. Operating Temperature: -40°F to +122°F
 - b. Environmental Rating: IP66
14. Networking Requirements:
- a. The PTZ IP Camera shall include Unicast and Multicast streaming.
 - b. The PTZ IP Camera shall support the following protocols: TCP/IP, UDP, IGMP, ICMP, ARP, RTP, SMTP, HTTP, FTP, and DHCP.
 - c. The PTZ IP Camera shall be fully compatible with the Ethernet Switch and Network Video Recorder to which it shall be connected.
 - d. The PTZ IP Camera shall have a built-in web server for remote viewing and control.
 - e. The PTZ IP Camera shall be password protected.
 - f. The PTZ IP Camera shall be fully compatible with the Ethernet Switch, Network Video Recorder, and Vidsys.
- B. The PTZ IP Camera shall be an:
- 1. Axis Q6032-E,
 - 2. JVC VN-686WPBU, or engineer approved equivalent.

2.6 ELEVATOR IP CCTV CAMERA

- A. The Elevator IP CCTV Camera to be provided under this Section shall meet or exceed the following requirements:
1. The Elevator IP Camera shall be certified by the manufacturer to be fully compatible with the Network Video Recorder specified elsewhere in the section.
 2. The Elevator IP Camera shall output multiple video streams using different codecs simultaneously.
 3. The Elevator IP Camera shall stream both H.264 and MJPEG, minimum.
 4. The Elevator IP Camera shall include a Web User Interface
 5. The Elevator IP Camera shall support bi-directional audio.
 6. The Elevator IP Camera shall come standard with intelligent motion detection which allows the camera to alarm on motion. This on-camera motion detection will be used to trigger recording. The Elevator IP Camera shall also come standard with a camera tampering analytic to detect situations such as a moved camera or a spray painted or covered lens; this analytic shall be set up and shall trigger an alarm in VidSys via the VMS/NVR use by the Contractor. These analytics shall not require the installation of any additional hardware and shall not incur any licensing costs.
 7. The Contractor shall provide and install all required camera mounting brackets, adapters and associated hardware to mount the Elevator IP Cameras at the location(s) shown on the Contract Drawings.
 8. The Elevator IP Camera shall stream 30 FPS at 1280 x 720 with H.264 encoding.
 9. The Elevator IP Camera shall simultaneously stream two 15 FPS multicast streams at 1280 x 720 with H.264 encoding.
 10. General Construction
 - a. Impact resistant housing, IK10 rated or aluminum, minimum
 - b. Clear polycarbonate dome
 - c. Vandal resistant CCTV Camera assembly
 11. Electrical
 - a. RJ-45 connector for 100Base-TX Ethernet
 - b. Input voltage: PoE (IEEE 802.3af) Class 1, 3 to 8 watts at camera; nominal
 - c. Camera and heater shall be fully operational to the Operating Temperature listed elsewhere in this specification on IEEE 802.3af PoE.
 12. Imaging System
 - a. Iris Fixed or Automatic iris control
 - b. Imaging Sensor: 1/3 inch or 1/4 inch
 - c. Image Resolution: 720p (1280 x 720, 30 FPS), minimum
 - d. Angle of View (Horiz.): 80° to 90° field of view, nominal
 - e. Lens Aperture F1.8 – F2.0, nominal
 13. Minimum Illumination (No Image Enhancement, AGC On)
 - a. Color: 0.5 lux for 50 IRE, nominal

14. Camera Angle Adjustment
 - a. Panning Range: $\pm 10^\circ$ to $\pm 30^\circ$, nominal
 - b. Tilting Range: 0° to 90° , nominal

 15. The Elevator IP Camera assembly shall meet or exceed the following environmental requirements:
 - a. Operating Temperature 14°F to $+122^\circ\text{F}$
 - b. Environmental Rating IP66

 16. Networking Requirements:
 - a. The Elevator IP Camera shall include Unicast and Multicast streaming.
 - b. The Elevator IP Camera shall support the following protocols: TCP/IP, UDP/IP, IPv4, IPv6, HTTP, HTTPS, Unicast, Multicast (IGMP), UPnP, DNS, DHCP, RTP, and NTP
 - c. The Elevator IP Camera shall be fully compatible with the Ethernet Switch, Network Video Recorder, and Vidsys.
- B. The Elevator IP Camera shall be an:
1. Axis M3114-R,
 2. Samsung SNV-5010, or Engineer approved equivalent.

2.7 POE ETHERNET EXTENDER OVER COAXIAL CABLE

- A. The PoE Ethernet Extender Over Coaxial Cable (PoE Ethernet Extender) shall utilize a CAT6 to coaxial cable media converter and signal processing system to enable Ethernet signals to be transmitted in excess of 1200 feet from the PoE Ethernet Switch location in order to provide network access and PoE power to the cameras specified on the Contract Drawings that are out of range of standard Ethernet or that cannot be connected directly using CAT6 cable (such as the Elevator IP CCTV Cameras).

- B. The PoE Ethernet Extender shall be a two piece system consisting of a CAT6 Ethernet to coaxial cable media converter located in the Communications room and a similar coaxial cable to CAT5e Ethernet media converter located in the a water-tight junction box near the Elevator IP CCTV Camera and at other camera locations as shown on the Contract Drawings

- C. The PoE Ethernet Extender shall only be powered on the MBTA Communications room end. The matching PoE Ethernet Extender media converter, located in the water-tight junction box adjacent the camera, shall receive its power over the RG-6 coaxial cable and deliver that power to the IP camera over CAT6 cable.

- D. The PoE Ethernet Extenders located in the MBTA Communications room shall be mounted on a new rack mount shelf or rack mount chassis in the MBTA Communications room.

- E. The PoE Ethernet Extender shall provide PoE power to the IP Elevator CCTV Camera, shall be fully compatible with the CCTV Camera, and shall be completely transparent to the Ethernet protocol.

- F. The PoE Ethernet Extender shall meet or exceed the following specifications:

1. Ethernet Speed: 100Base-T/10BaseT full-duplex, selectable via dip switch or auto-negotiation
2. Data Connectors: RJ-45
3. Power Source: Shall be powered via POE or an external power supply; but only at the Communications Room end, not at the CCTV camera end.
4. Power Supply Requirements The Contractor shall provide and install the vender recommended external power supply to the POE Ethernet Extender in the Communications Room order to ensure sufficient current to power the remote connected CCTV cameras.
5. Operating Temperature: 14°F to 104°F, nominal
6. Transmission Distance: > 1200 feet

2.8 RG-6 COAXIAL CABLE

- A. All RG-6 cable shall be suitable for indoor, outdoor, aerial lashing and buried conduit applications to support communications of Megapixel IP CCTV camera, multi-stream Megapixel IP CCTV camera, and PTZ camera installations.
- B. All RG-6 cable shall be plenum rated and be certified to meet the UL NFPA 262 Flame Test.
- C. All RG-6 cabling and connections shall be labeled; and the labeling shall be consistent with the approved shop drawings for type, location and service.
- D. All RG-6 network cables shall meet or exceed the following specifications:
 1. Shall be RG-6/U Type with an 18 AWG solid .040 inch bare copper center conductor
 2. Shall include outer shields of 65% Tinned Copper Braid and 100% Aluminum Foil – Tape – Aluminum Foil.
 3. The RG-6 cable insulation material shall be FFEP – Foam Fluorinated Ethylene Propylene and the outer jacket material shall be Fluorinated Ethylene Propylene, typical.
 4. Electrical Characteristics:
 - a. Impedance 75 ohms
 - b. Inductance 0.09 μ H/foot, nominal
 - c. Capacitance Conductor to Shield 16.5 pF/foot, nominal
 - d. Conductor DC Resistance 6.4 ohms/1000 feet, nominal
 - e. Outer Shield DC Resistance 5.1 ohms/1000 feet, nominal
 5. Shall be 100% sweep tested 5 MHz to 450 MHz
 6. Jacket color shall be Black.

2.9 CATEGORY 6 (CAT6) NETWORK CABLE

- E. All CAT6 network cable shall be suitable for indoor and outdoor, aerial lashing, and buried conduit applications to support communications of Megapixel IP CCTV camera, multi-stream Megapixel IP CCTV camera, and PTZ camera installations.
- F. All CAT6 network cables shall be plenum rated.
- G. All CAT6 network cabling and connections shall be labeled as shown on approved shop drawings for type, location and service.
- H. All CAT6 network cables and components installed shall comply with the following:
 - 1. All CAT6 network cabling systems shall have EIA/TIA 568B Series standard pin/pair termination assignment. All conductors provided shall be properly and consistently terminated at both ends throughout the entire system.
 - 2. ANSI/TIA/EIA-568-A
 - 3. IEEE 802.3af DTE Power and MDI Verified
 - 4. IEEE 802.ab Gigabit Ethernet Verified
 - 5. ETL Verified
 - 6. CSA Certified
 - 7. FCC part 68.5, subpart F compliant
 - 8. IEC-60603-7-4 compliant
 - 9. ISO 11801 2nd Edition, Class D Compliant
- I. Cable Physical Characteristics:
 - 1. Jacket: PVC (Plenum Rated)
 - 2. Jacket Color: Green
 - 3. Insulation: Polyolefin
 - 4. Conductors: #24 AWG Solid Bare Copper, or greater
 - 5. Composition: 4 Pair #24 AWG UTP with Core Separator
 - 6. Operating Temperature: -30 to 140 °F
 - 7. Cable O.D. (Max): 5.0mm +/- .3 mm
 - 8. Voltage Rating: 300 Volts RMS

2.10 CATEGORY 6 (CAT6) PATCH CABLES AND WORKSTATION CORDS

- A. Patch cables and workstation cords shall be factory pre-connectorized, TIA/EIA Category 6 Extended Frequency (UL Category 6E), 4 UTP, 8-position modular jack, utilizing stranded conductors.
- B. Patch cables and workstation cords shall be able to withstand at least a minimum of 2000 jack mating cycles without any transmission degradation.
- C. Workstation cords shall be a minimum of 15-feet in length.

2.11 CAT6 RJ45 END CONNECTORS

- A. All RJ45 End Connectors shall be in compliance with the TIA-568B standards.
- B. All RJ45 End Connectors shall be designed for solid conductor CAT6 UTP.
- C. All RJ45 End Connectors shall accommodate #24 AWG thru #26 AWG conductors.
- D. All RJ45 End Connectors shall have 50 micro inches of gold plating on the contacts.
- E. All RJ45 End Connectors shall have a plastic housing and a plastic insert with stepped entry for individual wires.
- F. All RJ45 End Connectors shall be RoHS compliant.
- G. All RJ45 End Connectors shall be specifically manufactured for the UTP cable to which they will attach.

2.12 24 PORT UTP CATEGORY 6 PATCH PANEL

- A. The 24 Port UTP Category 6 (CAT6) Patch Panel shall meet or exceed the following specifications:
 - 1. 1U EIA standard 19-inch cabinet
 - 2. 110 terminations in the rear of the panel
 - 3. TIA/EIA-T568-B.2 CAT6 connecting hardware specifications
 - 4. RJ45 8P8C modular jacks
 - 5. 50 μ gold-plated contacts
 - 6. Black electrostatic powder-coated steel
 - 7. Accommodates top, bottom or side cable entry
 - 8. Write-on designation label with clear holder
 - 9. UL Certified

2.13 24 PORT FIBER OPTIC PATCH PANEL

- B. The 24 Port Fiber Optic Patch Panel shall meet or exceed the following specifications:
 - 1. Shall include connector panels to terminate 24 strands of fiber.
 - 2. Shall include splice trays for splicing optical fibers and optical fiber pigtails.
 - 3. Shall include SC-SC adapters.
 - 4. Shall include fiber cable management.
 - 5. Shall accommodate top, bottom or side cable entry.
 - 6. Shall include write-on designation label with clear holder
- C. Fiber Optic Duplex Jumpers shall meet or exceed the following specifications:
 - 1. Shall incorporate SC-type connectors to match the connector adapters on the Fiber Optic Patch Panel connector panels.
 - 2. Shall utilize singlemode optical fiber.
 - 3. Shall utilize tight buffer construction.
 - 4. Fiber Optic Duplex Jumpers shall be a minimum of 1 meter long and shall be sized to provide a one foot coil at each connector end when installed.
 - 5. Fiber Optic Duplex Jumpers shall be provided in the quantities required to complete optical connections to all equipment and to complete all required optical circuits.

2.14 12 STRAND SINGLE MODE FIBER OPTIC CABLE

- A. The Contractor shall provide all labor, materials, tools, field-test instruments and installation equipment required for the complete installation of a new outdoor 12 strand single mode fiber optic cable in new conduit as shown in the Contract Documents connecting the Town Comm Closet to the existing Town Communications Manhole.
- B. The Contractor shall install labels on the cable at each manhole or hand hole using permanent water proof tags describing the terminating locations.
- C. Fiber Optic Cable - General
 - 1. Fiber optic cable shall be of a loose tube buffer type; containing 12 strands of single mode optical fiber.
 - 2. The fiber optic cable shall be suitable for the use to which it is intended and shall be compatible with any other existing fiber segments to which it will be spliced or connected
 - 3. The fiber optic cable shall be suitable for the locations to which it is intended to be installed.
 - 4. The fiber optic cable shall meet the following requirements:

- a. Maximum Tensile Loads:
 - i. Short-Term: 2700 N (600 lbf)
 - ii. Long-Term: 810 N (180 lbf)
- b. Temperatures:
 - i. Storage: -40° to +70°C (-40° to +158°F)
 - ii. Installation: -30° to +60°C (-22° to +140°F)
 - iii. Operation: -40° to +70°C (-40° to +158°F)
- c. Approvals and Listings: National Electrical Code® (NEC®) OFN-LS, CSA OFN FT-4-ST1, IEEE-383 flame test
- d. Approved Installations: Outdoor aerial and duct, suitable for wet areas.
- e. Design and Test Criteria ANSI/ICEA S-104-696

D. Single Mode Optical Fiber (9/125 μm) Specifications

- 1. The optical fibers shall be enhanced to provide full spectrum performance between the 1260 nm to 1650 nm wavelength spectrum.
- 2. The optical fibers shall comply with ITU Recommendation G.652.D defining full spectrum, low water peak fiber.
- 3. The optical fibers shall comply with the following standards:
 - a. IEC International Standard 60793-2-50 Type B.1.3 Optical Fiber Specifications
 - b. Telcordia GR-20-CORE
 - c. ANSI/ICEA S-87-640
 - d. RUS 7CFR 1755.900
- 4. The optical fibers shall have the following attenuation characteristics, or better:
 - a. Attenuation at 1310 nm 0.33 – 0.35 dB/km.
 - b. Attenuation at 1383 nm 0.32 – 0.35 dB/km.
 - c. Attenuation at 1460 nm 0.25 dB/km.
 - d. Attenuation at 1550 nm 0.19 – 0.21 dB/km.
 - e. Attenuation at 1625 nm 0.20 – 0.23 dB/km.

E. Fiber Optic Cable Construction Specifications

- 1. The Fiber Optic Cable shall be an accepted product of the United States Department of agriculture rural Utilities Service (RUS) 7 CFR 1755.900 (PE-90) and meet the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-2006
- 2. The Fiber Optic Cable shall be of a Double Jacket Type with the following material specifications:
 - a. Jackets shall be polyethylene (PE) or polyvinyl chloride (PVC) depending upon the location and type of installation and applicable code requirements.

- b. Cable shall include water swellable tape and yarn.
3. Optical fibers shall be placed inside a loose buffer tube.
4. The buffer tube shall contain up to 12 fibers.
5. The fibers shall not adhere to the inside of the buffer tube.
6. Each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding".
7. The fibers shall be colored with ultraviolet (UV) curable inks.
8. Buffer tubes shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding".
9. In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into a gel filling material, if present.
10. The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.900.
11. The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod to provide tensile strength and prevent buckling. The central member shall be overcoated with a thermoplastic material when required to achieve dimensional sizing to accommodate buffer tubes and fillers.
12. Each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents.
13. The cable jacket shall be free of holes, splits and blisters.
14. The cable jacket shall contain no metal elements and shall be of a consistent thickness.
15. Cable jackets shall be marked with the manufacturer's name, month and year of manufacture, sequential meter or foot markings, a telecommunications handset symbol as required by Section 350G of the National Electric Safety Code, fiber count and fiber type. The print color shall be white.

F. Fiber Optic Cable Performance Specifications

1. When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable," a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for one hour without leakage through the open cable end.
2. When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable," the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 70-degrees C.
3. All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel.

G. Fiber Optic Cable Connectors for Singlemode Fiber Optic Cable

1. Fiber optic connector type shall be SC. The attenuation per mated pair shall not exceed 0.75 dB (individual) and 0.5 dB (average). The connectors shall sustain a minimum 200 mating cycles per EIA/TIA-455-21 without violating specifications
2. Shall be Anaerobic cure epoxy type connectors with ceramic housings.
3. The connectors shall meet the following performance criteria:

<u>Test</u>	<u>Procedure</u>	<u>Maximum Attenuation Change (dB)</u>
Cable Retention	FOTP-6	0.2 dB
Durability	FOTP-21	0.2 dB
Impact	FOTP-2	0.2 dB
Thermal Shock	FOTP-3	0.2 dB
Humidity	FOTP-5	0.2 dB

H. Fiber Optic Cable Packaging Requirements

1. The completed cable shall be packaged on non-returnable wooden reels.
2. Top and bottom ends of the cable shall be available for testing.
3. Both ends of the cable shall be sealed to prevent ingress of moisture.
4. Each cable reel shall have a weather resistant reel tag attached identifying the reel and cable. The reel tag shall include at a minimum the following information:
 - a. Cable number
 - b. Gross weight
 - c. Cable length
 - d. Date cable was tested
 - e. Cable length markings - Top (inside end of cable) and Bottom (outside end of cable).
5. Each cable shall be accompanied by a cable data sheet that includes at a minimum the following information:
 - a. Cable number
 - b. Customer name
 - c. Shipped length
 - d. Measured attenuation for each fiber (for lengths greater than 1000 meters)

2.15 RACK MOUNT UNINTERRUPTIBLE POWER SUPPLY (UPS)

- A. The Uninterruptible Power Supply shall be connected to the equipment as indicated on the Contract drawings including the vertical, full height AC power strips installed in the Station Two Post Rack

- B. The Uninterruptible Power Supply shall provide backup power for all connected equipment at each identified equipment rack and equipment enclosure location as shown on the Contract Drawings.
 - 1. The UPS shall be sized per the connected equipment at each site to provide 100% of the backup power required to power all devices at full load for 7 Minutes.
 - 2. Full load shall include all installed Video Encoder chassis' as if each were fully populated with the maximum number of video encoder cards.
 - 3. Full load shall include all Power over Ethernet (PoE) Switches as if each were fully populated with all PoE ports connected to CCTV cameras.
- C. The UPS shall meet or exceed the following requirements:
 - 1. Shall be designed for 19" equipment rack mounting
 - 2. Shall have an input of 120 – 208 VAC and an output of 120 VAC
 - 3. Shall include hot swappable batteries
- D. The UPS shall include an integrated SNMP power management system to monitor the equipment and to provide status and alarm conditions. The Contractor shall program the power management system and connect the UPS to the network to provide status monitoring of the UPS and associated battery bank utilizing the MBTA monitoring system. The UPS monitoring shall include the following status measurements and alarms at a minimum:
 - 1. Loss of utility AC power
 - 2. Restoration of utility AC power
 - 3. Low battery
 - 4. UPS fault
 - 5. Battery Failure
- E. The Contractor shall provide and install ancillary UPS power distribution equipment as required by Code and MBTA specifications and practices. This shall also include all materials and cabling to provide a complete installation, and shall include:
 - 1. Two (2) full vertical height AC power distribution strips in each equipment rack.

2.16 HARDENED RACK MOUNT POE ETHERNET SWITCH

- A. All hardened Rack Mount PoE Ethernet Switches shall meet or exceed the following criteria:
 - 1. Shall mount in a 19" equipment rack.
 - 2. Shall provide Power over Ethernet (POE) on all copper ports.
 - 3. The Rack Mount PoE Ethernet Switch ports shall include the following.
 - a. Minimum (24) auto-sensing 10/100 POE ports

- b. 1 RS-232C DB-9 console port
 - c. 2 open 10/100/1000 SFP Ports (for use with 1000LX GBIC transceivers)
 - 1) Contractor shall furnish and install 1000LX GBIC transceivers
4. The PoE Ethernet Switch shall meet the following performance requirements:
 - a. Latency: 6 μ s
 - b. Throughput: up to 11.9 million pps
 - c. MAC address table size: 4,000 entries
 5. The PoE Ethernet Switch shall meet the following environmental requirements:
 - a. Operating temperature: -40°F to 185°F (-40°C to 85°C)
 - b. Operating relative humidity: 5% to 95% non-condensing
 6. The PoE Ethernet Switch shall meet the following electrical requirements:
 - a. Input Voltage: 48 VDC
 7. The PoE Ethernet Switch shall meet the following safety requirements:
 - a. UL Listed (UL60950), cUL, CE, Emissions meet FCC Part 15, Class A.
 - b. IEC 61850 EMC and Operating Conditions Class C for Power Substations
 - c. IEEE 1613 Class 2 Environmental Standard for Electric Power Substations
 - d. NEBS L3 and ETSI compliant
 - e. NEMA TS-2 and TEES for traffic control equipment Standards and Protocols
 8. The PoE Ethernet Switch shall meet the following device management standards:
 - a. RFC 1591 DNS (client)
 - b. HTML and telnet management
 9. The PoE Ethernet Switch shall meet the following network management standards:
 - a. RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events)
 - b. SNMPv1/v2/v3
 10. The PoE Ethernet Switch shall use the following IP Multicast Standards:
 - a. IGMPv1, IGMPv2, IGMPv3
 11. The PoE Ethernet Switch shall have the following security features:
 - a. IEEE 802.1X Port Based Network Access Control
 - b. RFC 1492 TACACS+
 - c. Secure Sockets Layer (SSL)
 - d. SSHv1/SSHv2 Secure Shell
 12. The PoE Ethernet Switch shall meet the following protocols and industry standards:
 - a. IEEE 802.1D MAC Bridges
 - b. IEEE 802.1p Priority
 - c. IEEE 802.1Q VLANs
 - d. IEEE 802.1w Rapid Reconfiguration of Spanning Tree
 - e. IEEE 802.3af Power over Ethernet
 - f. IEEE 802.3x Flow Control
 - g. RFC 854 TELNET
 - h. RFC 951 BOOTP
 - i. RFC 2030 Simple Network Time Protocol (SNTP) v4
 - j. RFC 2131 DHCP

- B. The Contractor shall coordinate with the MBTA for settings and IP addressing of the PoE Ethernet Switches and all networked equipment.
- C. The Hardened Rack Mount PoE Ethernet Switch shall be a:
 - 1. GarrettCom MNS 6K32FC, or Engineer approved equivalent

2.17 1000LX SFP

1000LX SFPs provided shall meet or exceed the following specifications:

- A. Shall be a Small Form-factor Pluggable (SFP) Gigabit LX transceiver that provides a full-duplex Gigabit Connection up to 10 km.
- B. Shall be officially supported by the switch manufacturer.
- C. Single or multimode type shall be provided based on fiber type data is being transferred over.
- D. Ports:
 - 1. (1) LC 1000Base-LX port (IEEE 802.3Z Type 1000Base-LX) Duplex: full only
- E. Physical
 - 1. Dimensions: 2.24(d) x 0.54(w) x 0.486(h) in. (5.69 x 1.37 x 1.23 cm)
 - 2. Weight: 0.04 lb (0.02 kg)

2.18 POE ETHERNET SWITCH POWER SUPPLY

- D. POE Ethernet Switch Power Supply installed under this section shall meet or exceed the following:
 - 1. Power Input: 120VAC
 - 2. Power Output: 48VDC, 480 Watts
 - 3. Efficiency: 89%, minimum
 - 4. Mounting: Rack mount
 - 5. Operating Temperature: -13 to 158 °F
 - 6. Maximum Dimensions: 9” width x 5” height x 5” depth
 - 7. Standards: UL508, UL60950, EN61000-6-2, EN61000-6-2
 - 8. MTBF: 90,000 Hours
 - 9. Warranty: 3 Years

2.19 ETHERNET MEDIA CONVERTER

- A. The Ethernet Media Converter installed under this section shall meet or exceed the following General Requirements:
 - 1. Shall be a temperature hardened industrial grade Ethernet Media Converter designed to be installed in an unconditioned environment
 - 2. Shall provide fiber optic transmission of 10/100/1000 Ethernet signals over singlemode fiber optic cable.
 - 3. Shall be din rail or equipment rack mountable.
- B. The Ethernet Media Converter installed under this section shall meet or exceed the following Technical Requirements:
 - 1. Data Type: Ethernet 10/100/1000 Mbps, IEEE 802.3 compliant.
 - 2. Operating Mode: Full Duplex, Auto MDI/MDI-X crossover
 - 3. Data Input Connector: RJ-45
 - 4. The Contractor shall provide and install SFP transceivers as required for connection to singlemode optical fiber.
- C. An Ethernet Media Converter shall be installed at the following locations and include the following patch cables:
 - 1. The Town Comm Closet at South Acton Station
 - 2. The Town of Acton Public Safety Building
 - 3. Include all CAT6 and fiber optic patch cables required to complete the Ethernet circuit end-to-end.

2.20 STATION TWO POST RACK

- A. Station Two Post Rack shall be installed in Locations within the station where a rack installation is indicated and shall be used to hold switches, patch panels, power supplies, battery cabinets, and other equipment.
- B. The Station Two Post Rack shall include a vertical cable duct designed for installation on the Station Two Post Rack for management of cables between rack equipment and of incoming cables from conduits.
- C. The Station Two Post Rack shall have feet with holes for concrete anchors and other floor attachments which shall be used by the Contractor to affix the rack to a new 3” high concrete pad to be installed by the Contractor.
- D. The new 3” concrete pad shall be a minimum of 22” by 22” and shall increase in size as necessary to accommodate the rack footprint. The new 3” concrete pad shall be securely anchored to the existing floor.
- E. Station Two Post Racks installed shall meet or exceed the following specifications:

1. TIA/EIA Compliant
2. Weight Capacity: 1600 lbs
3. Construction: Steel
4. Power Distribution: Vertical Power Distribution Unit
5. Cable Management: Vertical Cable Duct
6. Color: White Power Coated
7. Equipment Width: 19"
8. Racking Height: 84"
9. Rack Threading: 10-32

2.21 VERTICAL POWER DISTRIBUTION UNITS

- A. Vertical Power Distribution Units shall be used to power all equipment in open frame equipment racks at the station.
- B. Vertical Power Distribution Units shall take two (2) 20 Amp circuits as input and shall have alternating color coded outlets indicating which circuit it is being fed from.
- C. Vertical Power Distribution Units shall have a built-in ammeter for each circuit and an LCD display for each circuit indicating circuit utilization in Amperes.
- D. Contractor shall label Vertical Power Distribution Units indicating the panel that is feeding it.
- E. The Contractor shall provide a junction box with locking outlet at the base of the open frame racks for connection to the Vertical Power Distribution Units.
- F. Vertical Power Distribution Units shall meet or exceed the following specifications:
 1. Length: 71"
 2. Width: 3", max
 3. Height: 1.5", max
 4. RMU: 0
 5. Input Plug Type: NEMA L5-20R
 6. Input Voltage: 120VAC, single phase
 7. Output Plugs: 32 (16 from each 20 Amp input, color coded)
 8. Output Plug Type: NEMA 5-15/20R
 9. Output Voltage: 120VAC
 10. Certifications: UL-60950-1

2.22 COMMUTER RAIL STATION NVR HARDWARE

- A. The NVR hardware installed shall meet or exceed the following specifications:
 1. Operating System: Windows Server 2008 R2 Standard
 2. Processor: Intel Xeon E3-1220 8MB, quad core

- | | |
|--------------------|--|
| 3. RAM: | 4 X 2GB DDR3-1066 |
| 4. Hard Drives: | 4 X 1TB Hot-Swap, 7200 RPM, in Raid 5 |
| 5. Network Ports: | (2) Gigabit Ethernet |
| 6. Power Supplies: | Dual, redundant |
| 7. Unit size | 1 Rack Mount Unit |
| 8. Warranty: | 3 years, next business day onsite, parts and Labor |

2.23 NETWORK VIDEO RECORDERS (NVRs)

- A. The MBTA currently has installed Genetec and Geutebruck Video Management Systems (VMS). The Contractor shall expand the existing Genetec or Geutebruck systems. The connector for these systems to VidSys is installed and cameras from both of these systems are currently displaying through VidSys.
- B. The NVR software shall be installed on the new NVR Hardware, shall record all images from CCTV Cameras, and it shall connect viewing clients to live and/or recorded streams.
- C. The NVR shall be a part of a VMS and will be managed by management servers as necessary. The NVR shall appear to Operators to be seamlessly integrated with the entire CCTV System.
- D. The Contractor is to provide all software and licensing necessary for the connection and recording of all Cameras to the NVR/VMS.
- E. The Contractor is to provide all software and licensing necessary for all installed CCTV Cameras, Encoders and NVR instances and the connection of those items to the VidSys Server and Clients.
- F. The NVR shall be configured to record all channels on motion only. It shall also record the 30 seconds prior to the beginning of motion detection and 30 seconds after all motion has ended. The motion recording shall be set up on the camera, and shall use the CCTV camera's built-in motion detection features; the motion detection shall not occur on the CCTV Video Server or any separate video analytics server. The MBTA may select certain critical channels to be on 24 hour recording.
- G. The amount of days of video retention for video from a specific camera shall be selectable in the NVR software so that different cameras on the same NVR can have different storage time lengths.
- H. The following requirements are for reference to help the Contractor understand the functionality and available functions of the existing VMS systems:
 - 1. The NVR shall allow connections to video analytics software packages and shall use the metadata to trigger alarms.
 - 2. The NVR manufacturer shall guarantee backward compatibility for three software versions.
 - 3. The NVR shall be configured to receive all tamper alarms from the CCTV camera and pass them to VidSys. The tamper detection shall be set up on the camera, and shall use the CCTV cameras' built-in tamper detection features.

4. Management Server Hardware Specifications:
 - a. Processor: (2) Quad Core Xeon E5620
 - b. Memory: 24GB, 6x4GB, 1333MHz
 - c. Storage: (3) 1TB, 7.2K RPM, Hot Swap, SATA or SAS
 - d. Networking: (2) Dual Port Gigabit NIC, teamed for redundancy
 - e. Power Supply: Redundant
 - f. Operating System: As recommended by the NVR software manufacturer
5. Two Management Servers shall be placed on the network. If the primary management server fails or loses connectivity, the secondary shall immediately take over the duties of the primary server. Upon reestablishment of connection by the primary server, the secondary shall resync with the primary and it shall be restored to control.
6. The NVR shall pass any tamper alarms, camera covering, camera tamper, motion, analytic, and all other alarms to the VidSys system for display, statistics and/or use in alarming algorithms.
7. The NVR shall store video from digital video sources in MPEG4, MJPEG, and H.264 codecs. H.264 shall be utilized in this project. The video shall be accessible in near real-time.
8. All NVRs shall have their time synchronized with Network Time Protocol. The time on all NVRs shall be synchronized with the management servers within the system and shall update a minimum of 3 times a day and shall not have an effect on network traffic.
9. Live streams sent from the CCTV Cameras shall not be processed through and NVR. Clients that request a live stream shall simply be connected by the VMS to the live view multicast stream from the CCTV Camera. Live view streams for viewing in VidSys shall also be connected in the same way.
10. The following are redundancy and failover feature requirements of the NVR/VMS.
 - a. The VMS shall allow CCTV Cameras to be seamlessly recorded to multiple NVRs via a single multicast stream from the camera.
 - 1) If one of the NVRs fails, it shall not interfere with the recording to the second NVR and the VMS shall keep track of the location of recorded video for seamless access to the recorded streams from the VMS, VidSys, or any other integrated client.
 - b. The VMS shall allow for an unlimited number of management servers to be placed throughout the network to take over in the case of any network failures that leave portions of the network detached from the primary server. The local management server shall manage the systems it has connectivity to until the network connection to the primary is reestablished, at which time it shall resync with the primary server and relinquish control.
11. Product Description
 - a. The Video Management System software shall be a fully open architecture distributed solution, designed for multi-site and multiple server installations requiring 24/7 surveillance with support for devices from different vendors and fully scalable for future growth. The Video Management System shall offer centralized management of all devices, NVRs, servers and users and shall utilize a flexible rule-based system driven by schedules and events.

- b. The Video Management System software shall not place limits on the number of simultaneous video feeds, or on the number of NVRs to be connected to the VMS.
 - c. The Video Management System shall incorporate fully integrated video matrix switching functionality for distributed viewing of any camera in the system from any computer with the Client Viewer and/or Monitor application installed.
 - d. The Video Management System shall include a Software Development Kit (SDK) that shall permit the integrating of the system with 3rd-party software. The SDK shall enable the user to retrieve live and recorded video in several ways:
 - 1) In raw data format,
 - 2) As a window to be resized and shown embedded in another application.
 - 3) Create plug-in components for the Video Client Software.
 - 4) Control the operation of Matrix Monitor.
 - 5) Upon receipt of alarm and event information
 - e. All on-camera Video Analytics behavior detection functionality shall be fully operational in the event that the camera is disconnected from the security network or the primary and backup servers are disconnected from the security network. All alarms generated while disconnected from the network shall be stored and then delivered to the appropriate recipient when the network connection is restored.
 - f. The Video Management System shall include a stand-alone Viewer application to be included with video exported from the Client Viewer application. The Viewer application shall allow recipients of the video to browse and playback the exported video without installing separate software on their computers.
 - g. The video management system shall allow for recorded camera feeds to be viewed at reduced frame rates based on user privileges level to manage viewing bandwidth.
 - h. The Video Management System shall provide a unique loss of video alarm from each camera connected to the system.
12. Video Administration Software
- a. The Video Administration Software shall provide a feature-rich administration client for system configuration and day-to-day administration of the system.
 - b. The Video Administration Software shall be installed on the VidSys Client Workstations dictated by the MBTA, with access via Administrator privileges.
 - c. The Video Administration Software Graphic User Interface (GUI) shall typically consist of three or four panes. The panes shall be dynamic and change depending on the task.
13. Management Servers
- a. The Management Server shall store the system's configuration in a relational database, either on the management server computer or on a SQL Server on the network.
 - b. The Management Server shall manage all user authentication and user rights.
 - c. The SQL Server shall store all of the system settings created by the Video Administration Software.
 - d. The Management Server shall maintain a continuous log of server status messages accessed from the status Icon in the system tray.

14. Device Monitoring

- a. The system shall monitor the operational status of all devices connected to the system in normal and alarmed states:
 - 1) All network devices shall be monitored as to the current status.
 - 2) All cameras shall be monitored to verify that they are functional and streaming video and an alarm shall be displayed upon loss of video or signal transmission.

2.24 SPARE PARTS

- A. The Contractor shall supply the following spare parts upon completion of the project:
 1. One (1) Elevator IP Camera

PART 3 - EXECUTION

3.1 GENERAL

- B. Installation of all CCTV System shall be in accordance with manufacturer's recommendations, approved shop drawings, and as shown on the Contract Drawings.
- C. All systems and components taken out of service under this contract shall be turned over to the MBTA to be placed in spare parts inventory. Accompanying all turned over equipment shall be a status report of the condition of the device.
- D. All wiring shall be neatly installed and wire ways shall be utilized wherever possible. All wiring shall be identified at both ends by wire markers.
- E. Furnish and install a complete and operable CCTV System.
- F. The Contractor is responsible for system start-up, testing and network testing; installation of required interconnections for a fully functional system.
- G. The Contractor is responsible for Incidentals and appurtenances necessary to complete the work as specified herein and as shown on the Contract Drawings.
- H. The Contractor shall program all cameras in-house. The Contractor shall not order equipment already addressed, as network IP addresses and the MBTA's IP schema is security sensitive information that shall not be disseminated.
- I. Contractor shall provide one paper set of as-built drawings for the South Acton Station CCTV System. Contractor shall deliver one Mylar set to 500 Arborway and one copy on Compact Disk in the latest version of AutoCAD.

3.2 INSTALLATION

- A. Install CCTV cameras in locations with the orientations as approved on the Contract Drawings. All conduits to each device shall be properly sized GRSC.

- B. Install supporting equipment in cabinets and on racks, in the MBTA Comm Room as shown on the Contract Drawings.
- C. Cabling to all CCTV cameras shall be CAT6, and cable lengths shall not exceed 328 feet, unless a POE Ethernet Extender over Coaxial Cable is utilized.
- D. Connection of the Elevator IP CCTV Cameras to the POE Ethernet Extender over Coaxial Cable equipment shall be as follows:
 - 1. Locate the RG-6 coaxial cable to use within elevator traveling cable and prepare the cable for attachment to the PoE Ethernet to Coaxial Cable Camera Unit by attaching a BNC type connector to both the Elevator Control Room end and the Elevator Cab end of the RG-6 coaxial cable.
 - 2. In the Elevator Control Room attach the incoming RG-6 coaxial cable from the MBTA Communications room to the RG-6 coaxial cable in the elevator traveling cable using a single straight BNC type 'barrel' fitting. Do not use a BNC 'T' fitting.
 - 3. At the Elevator Cab location securely mount the PoE Ethernet Extender over Coaxial Cable Camera Unit adjacent the termination point of the elevator traveling cable. Attach the connectorized RG-6 coaxial cable within the elevator traveling cable to the BNC jack on the PoE Ethernet to Coaxial Cable Camera Unit. If a direct connection is impractical, utilize an RG-6 jumper cable to make the connection using a single straight BNC "barrel" fitting. Do not use a BNC "T" fitting.
 - 4. Connect CAT6 cabling to the RJ45 jack on the PoE Ethernet to Coaxial Cable Camera Unit and route it to the location of the Elevator IP CCTV Camera and connect to the RJ45 jack. All transmission equipment and cabling shall be secured and routed away from any public access or view.
- E. The Contractor shall label each CCTV component with a label containing the following items:
 - 1. 'MBTA'
 - 2. The three letter location designation
 - 3. The device ID
 - 4. A bar code

The MBTA will provide the Contractor with a label template to be used for creation of the camera labels. The MBTA will provide the Contractor with a unique barcode number range to use on the project. The Contractor must add the barcode number used on each camera to the equipment tables provided in the as-built documentation. The labels shall be white weatherproof labels and withstand rain, sleet, snow, and temperatures of -20° F to 160° F.

3.3 TESTING

- A. Conduct electrical tests to demonstrate compliance with this Specification and with manufacturer's recommended test procedures as approved by the Engineer.
- B. The Contractor shall supply all test equipment and software for all system tests.
- C. CAT5e and CAT6 cable shall be tested after termination to ensure that the cable was not damaged during pulling and that it was properly terminated. The Engineer reserves the right to attend or send a representative to any cable testing that is performed.
- D. A Wiremap test shall be performed on all CAT5e and CAT6 cables with a commercial off the shelf wiremap tester. The wiremap test shall ensure continuity of wires, absence of shorts, grounding, or any other wire pulling or termination problems or errors.

1. Specification sheets of the wiremap tester and test procedure shall be submitted to the Engineer for approval prior to the beginning of testing.
 2. All tests shall be recorded with a description of which cable is being tested, a pass or fail, the reason for failure, the corrective action taken, the date, the time, and the technicians performing the test. Tests shall be re-run after the corrective action is taken. The test reports shall be submitted to the Engineer for approval.
- E. An Ethernet bandwidth test shall also be performed on all CAT5e and CAT6 cables with commercial off the shelf handheld Ethernet bandwidth testers that perform RFC 2544 compliant tests at one Gigabit. The Ethernet bandwidth tester shall also be capable of saving test reports to internal or removable storage to be printed or made into a PDF. The test setup shall use one tester on each end of the cable and shall test bi-directionally.
1. Specification sheets of the Ethernet bandwidth testers and test procedure shall be submitted to the Engineer for approval prior to the beginning of any testing.
 2. All tests shall be recorded with a description of which cable is being tested, the cable length as measured by the Ethernet bandwidth testers, the measured bandwidth, the Bit Error Rate, the date, the time, and the technicians performing the test. The test reports shall be submitted to the Engineer for approval.
- F. After installation is complete, the Contractor shall verify proper operation of all system software control functions and video streams as described herein, to test all functionality of the CCTV System. The Contractor shall develop and submit a test plan for review by the Engineer 30 days prior to testing, the test plan shall contain performance and failure testing of all levels and all components within the system. The test plan shall include integration of the CCTV system into the MBTA WAN. Notify the Engineer minimum of 14 days in advance of test. Engineer or authorized representative reserves the right to attend and approve testing.

3.4 TRAINING

- A. The Contractor shall provide training documentation for all systems installed under this contract. A training syllabus must be submitted for approval 90 days prior to training. All training manuals and documentation shall be submitted and approved 60 days before training is scheduled. Training documentation shall cover enough detail to allow MBTA Operators, Administrator and Maintenance personnel to fully operate and maintain the system and all components supplied under this contract.
- B. The Contractor shall provide separate CCTV System training classes to Operators, Administrators and Maintenance personnel. The training classes shall provide comprehensive and systematic CCTV System training in classroom environment.
1. The training classes for Operators and Administrators shall be performed 14 days prior to the systems being placed into service.
 2. Training for Maintenance personnel shall be performed 14 days prior to the first CCTV system's installation and substantial completion and shall cover all equipment and software supplied under this specification. The Contractor shall supply non-contract equipment for hands-on training. Maintenance training shall include a site walk and identification of all installed components.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. No separate measurement or payment will be made for work required under this Section. All costs in connection therewith shall be included in the Contract Lump Sum price for Item 0130.130 - CONSTRUCT PASSENGER STATION FACILITIES.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
0130.130	CONSTRUCT PASSENGER STATION FACILITIES	LS

END OF SECTION