



STANDARD SPECIAL PROVISIONS

(English / Metric Units)

DATE: December 16, 2011

The 1988 *Standard Specifications for Highways and Bridges*, the 1995 *Standard Specifications for Highways and Bridges (Metric)* and the *Supplemental Specifications dated February 25, 2010 (combined English and Metric)* are amended by the following modifications, additions and deletions. These are standard special provisions and they shall prevail over those published in the Standard Specifications and the Supplemental Specifications.

The Specifications Committee has issued these Standard Special Provisions for inclusion into each project until such time as they are approved as Standard Specifications by the Board of Commissioners.

Contractors are cautioned that these Standard Special Provisions are periodically updated and may vary from project to project.

DIVISION I GENERAL REQUIREMENTS AND COVENANTS

SECTION 2.00 PROPOSAL REQUIREMENTS AND CONDITIONS

SECTION 2.00 PROPOSAL REQUIREMENTS AND CONDITIONS.

(page 7 English, page 1.9 Metric, page SUPPLEMENT C2010-3 thru 5) Replace this Subsection with the following:

2.01 Proposal Forms and Plans.

A. Prequalification Prior to Requesting Proposal Forms.

Subject to the requirements of Chapter 29, Section 8B of the Massachusetts General Laws, each prospective Bidder proposing to bid on any work, excepting the construction, reconstruction, repair or alteration of buildings, to be awarded by the Department or by a municipality under the provisions of Chapter 90, Section 34 of the Massachusetts General Laws must be prequalified in accordance with 720 CMR 5.00, "Prequalification of Contractors and Prospective Bidders for Statewide Engineering Field Survey Services", if the amount of the proposal added to the value of the uncompleted work already under contract with the Department will aggregate \$50,000 or more.

For work aggregating under \$50,000, prequalification requirements shall be at the discretion of the Department.

Except for projects for which prequalification is not required under 720 CMR 5.04(2), proposals for a project shall be limited to those bidders who have been prequalified by the Prequalification Committee in the specified class of work on or before the time of bid opening.

SECTION 2.00 (continued)**B. Issuance of Proposal Forms and Plans.**

All prospective Bidders who intend to bid on work to be awarded by the Department, may obtain the plans and specifications from the Department at the place specified in the Notice to Contractors.

For projects to be awarded under the provisions of Section 34, Chapter 90 of the Massachusetts General Laws, bidders may obtain plans and specifications from the applicable municipality at the place specified in the Notice to Contractors.

Contractors intending to bid on any project must first obtain "Request for Proposal Forms" (R-109 Form), from the Prequalification Office, which form must be completed and submitted to the Director of Prequalification for approval. Upon approval, the official bidder shall be entitled to receive official proposal documents. Other interested parties may receive an informational copy of the plans and specifications.

Official proposal documents shall contain plans and specifications showing the location and description of the contemplated work; an itemized proposal form listing the estimates of the various quantities of work to be performed and materials to be furnished; the time in which the work must be completed; and also a Notice to Contractors and special provisions for the particular project.

The Department is not responsible for loss of or damage to the official proposal documents after they have been mailed or given to the bidder. If loss or damage occurs, the bidder may request another copy. Modifications to any official proposal documents will be made through the Addendum process and posted on www.bidx.com and Comm-PASS. The bidder shall take responsibility for incorporating the revised data into the proposal upon notification from the Department. The bidder must provide an e-mail address to the Department for receipt of addenda notification.

2.02 Interpretation of Basic Estimate of Quantities.

All bids will be compared on the estimate of quantities of work to be done, as shown in the Proposal.

The parties expressly agree that these quantities are being set forth as a basis for the comparison of bids only and the parties also expressly agree that the actual amount of work may not correspond therewith. The Department expressly reserves the right to adjust said quantities in accordance with actual conditions as found to exist during the course of work.

Bidders agree to submit their estimate upon the following express condition, which shall apply to and become part of every bid received:

The work has been divided into items in order to enable the Bidder to bid on the different portions of the work in accordance with the Bidder's estimate of their cost, so that in the event of an increase or decrease in the quantities of any particular item of work the actual quantities executed shall be paid in accordance with the contract.

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 the completion of the work, except as provided in Subsections 4.06, 8.10 and 9.03.

2.03 Examination of Plans, Specifications, Special Provisions, and Site of Work.

The Department will prepare plans and specifications giving directions which will enable any competent mechanic or contractor to carry them out. The Bidder is expected to examine carefully the site of the proposed work, the proposal, plans, specifications, supplemental specifications, special provisions, and contract forms, before submitting a Proposal. The submission of a bid shall be considered prima facie evidence that the Bidder has made such examination of the site of the proposed work, plans, proposal, etc., and is familiar with the conditions to be encountered in performing the work and as to the requirements of the plans, specifications, supplemental specifications, special provisions, and Contract.

SECTION 2.00 (continued)**2.04 Preparation of Proposals.**

All bidders shall use Bid Express for submittal of bids. Bidders shall subscribe to the BidExpress on-line bidding exchange by following the instructions provided at www.bidx.com or by contacting:

Info Tech Inc.
5700 SW 34th Street, Suite 1235
Gainesville, FL 32608-5371
email:customer.support@bidx.com

In order to submit a bid, the Bidder shall have a digital identification (ID) issued by the Department on file with Info Tech Inc. and enabled by Info Tech Inc. This Digital ID represents the firm as an individual, partnership, corporation, limited liability company, or joint venture. By entering and submitting the Digital ID the authorized parties obligate the firm to the bid. Using this digital ID shall constitute the Bidder's signature for proper execution of the Proposal.

Electronic bid files are provided through the Bid Express on-line bidding exchange at <http://www.bidx.com/>. The bidder shall follow the on-line instructions and review the help screens provided to assure that the schedule of items is prepared properly. Bidders shall download and acknowledge any and all addenda files prior to submitting their final bid. Bids shall be submitted in accordance with the requirements of the Bid Express Web site.

At the designated time of the bid opening the Department will accept, as the official bid, the set of proposal forms generated from the Expedite Proposal file submitted by the bidder which includes the bid item sheets, bid bond submittal acknowledgement, addendum acknowledgement, and affidavit acknowledgement.

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

2.05 Delivery of Proposals.

The Bidder shall submit the proposal prior to the time set for opening of the bid.

2.06 Proposal Guaranty Required.

In order to insure the faithful fulfillment of its terms, each Proposal shall be accompanied by a bid deposit in the amount of 5 percent of the bid.

The bid deposit shall be a bid bond in a form satisfactory to the Department furnished by a surety company incorporated pursuant to Chapter 175, Section 105 of the General Laws or authorized to do business in the Commonwealth under Chapter 175, Section 106 of the General Laws and satisfactory to the Department; or cash; or a certified check drawn on a responsible bank or trust company (or a treasurer's or cashier's check issued by such bank or trust company), payable to the Massachusetts Department of Transportation.

2.07 Withdrawal of Proposals.

Prior to the designated bid opening time, the Bidder may electronically withdraw a proposal.

After the deadline for submitting bids, a bidder may submit a written request to withdraw its bid to the Department. The Department will only grant the request on a clear showing to the satisfaction of the Department that the bid amount resulted from bona fide clerical or mechanical error of a substantial nature or from other similar unforeseen circumstances. When the Department grants a request to withdraw a bid, the Department will return the bidder's bid deposit.

SECTION 2.00 (continued)**2.08 Public Opening of Proposals.**

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

2.09 Rejection of Proposals.

Proposals which fail to meet the requirements of Subsections 2.04, 2.05 and 2.06 or which are incomplete, conditional or obscure, or which contain additions not called for, 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 declared informal, provided however that the Department may, if it deems it to be in the public interest, waive any or all informalities as to form. Informalities as to substance, however, shall not be waived.

More than one Proposal 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 any Bidder is so interested in more than one Proposal for the work contemplated will cause the rejection of all Proposals made by him/her directly or indirectly. Any Proposals will be rejected if there is reason for believing that collusion exist among the Bidders. (See Subsection 3.01.)

In accordance with 720 CMR 5.00, Proposals may also be rejected if:

- (i) award of the contract would result in the Bidder exceeding the Aggregate Bonding Capacity established by its Surety Company, or the Bidder's Proposal exceeds its single project limit, or the Bidder was not prequalified in the specified class of work on or before the time of bid opening; or
- (ii) the Bidder is presently debarred from performing work of any kind under the provisions of Massachusetts General Laws, Chapter 29, Section 29F, or any other applicable debarment provisions of the Massachusetts General Laws or any rule or regulation promulgated thereunder; or
- (iii) the Bidder is presently debarred from performing work of any kind under the laws of any state other than the Commonwealth of Massachusetts, or by any Federal agency or authority; or
- (iv) there is substantial reason to believe that the condition of the Bidder's firm is less favorable than at the time of its last Application for Prequalification; or
- (v) the Bidder does not have sufficient equipment, or sufficient assets to provide necessary equipment either through purchase or lease agreements; or
- (vi) the Bidder's performance on past or current work with the Department or other awarding authorities is or has been unsatisfactory; or
- (vii) on current projects of the Department or other public authorities the Bidder frequently fails or has failed to pay its subcontractors or material suppliers in a timely manner, or that 5 or more subcontractors or material suppliers of the Contractor for a project currently under construction have filed demands for direct payment with the project's awarding authority in accordance with Massachusetts General Laws, Chapter 30, Section 39F; or
- (viii) the Bidder is not otherwise an eligible and responsible Bidder capable of performing the work.

2.10 Disqualification of Bidders.

Bidders whose Proposals have been rejected because of evidence of collusion may be subject to debarment under applicable provisions of state and federal law.

2.11 Determination of Lowest Bid.

The lowest bid shall be determined by the Department on the basis of the total price for which the entire work will be performed, arrived at by a correct computation of all the items specified in the Proposal at their estimated quantities and the unit prices submitted therefor.

SECTION 2.00 (continued)**2.12 Material Guaranty.**

Before any Contract is awarded, the Bidder may be required to furnish without expense to the Department 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 tests required by the Department to determine the quality and fitness of the material.

SECTION 3.00 AWARD AND EXECUTION OF CONTRACT

SECTION 3.00 AWARD AND EXECUTION OF THE CONTRACT.

(page SUPPLEMENT C2010-6) Replace this Subsection with the following:

3.01 Consideration of Proposals.

The Department reserves the right to reject any and all bids, or any bid item, to advertise for new Proposals for the project, to waive technicalities, to waive informalities as to form, or to proceed to do the work otherwise, as may be deemed to be in the best interest of the Department.

Nothing herein shall be construed as depriving the Department of the right to reject any bid when such bid does not fully comply with the specifications for the project or the applicable public bidding laws or regulations, or the Contractor is otherwise not eligible or responsible to receive award of the contract.

A proposal will be considered irregular and will be rejected if it is determined that any of the unit prices are materially unbalanced to the detriment of the Department. The bidder will be required to justify in writing the price or prices bid for the work in question before the Department decides to award the contract or reject the bid.

3.02 Award of Contract.

Subject to the reservations in Subsection 3.01, the Contract will be awarded to the lowest eligible and responsible Bidder.

It is anticipated that the Contract will be awarded within 30 days after the opening of bids, or, for projects requiring concurrence by the FHWA, or other Agencies, within 45 days after the opening of bids.

The successful bidder will be notified by mail or otherwise that his bid has been accepted and that he has been awarded the Contract.

No municipality may award a contract until the Department has determined that the bidder was prequalified in the specified class of work on or before the time of bid opening, and has not exceeded the Aggregate Bonding Capacity established by the bidder's surety company, and has, if applicable, a Single Project Limit in an amount equal to or in excess of the Proposal amount, and is otherwise in compliance with 720 CMR 5.00, "Prequalification of Contractors and Prospective Bidders for Statewide Engineering Field Survey Services".

3.03 Retention of Proposal Guaranty.

The two lowest Bidders shall keep their bids open for at least 30 days after the opening of bids, or, for projects requiring concurrence by the FHWA, or other Agencies, for at least 45 days after the opening of bids. The Proposal guaranties of the two lowest Bidders will be retained until after execution of the Contract, prior to which, however, either Bidder may substitute a bid bond, cash or certified check (or cashier's or treasurer's check), all as described in Subsection 2.06, for the guaranty already deposited with the Supervisor of Fiscal Management of the Department. The Department will endeavor to return the Proposal guaranties of all Bidders other than the two lowest Bidders within three days after the opening of bids.

SECTION 3.00 (continued)

After the bid has been kept open for the required number of days the low Bidder may withdraw his bid and request the return of his proposal guaranty, in which case the guaranty of both the two lowest Bidders will be returned and the second lowest Bidder's Proposal shall not be considered for award. After the bid has been kept open for the required number of days the second lowest Bidder may withdraw his bid and request the return of his proposal guaranty, in which case only the proposal guaranty of the second lowest Bidder will be returned.

3.04 Contract Bonds Required.

A Performance Bond in the full amount of the Contract will be required by the Department to ensure the faithful performance of the Contract and in accordance with Subsection 7.18.

A Payment Bond in an amount of the contract price will be required to be furnished by the Contractor to the Department as security for payment by the Contractor and Subcontractors for labor, materials, rental equipment and for such other purposes as are more specifically set forth in Massachusetts General Laws, Chapter 149, Section 29 and Chapter 30, Section 39A and all amendments thereto.

The payment bond referred to in Chapter 149, Section 29 and Chapter 30, Section 39A is the sole security under said sections for payment by the Contractor and Subcontractor for labor performed or furnished and materials used or employed therein; said security to remain in force until the validity of all such claims shall be established and finally determined and if determined and established as valid, all such claims shall be paid by the surety.

The Performance Bond and the Payment Bond shall be in a form satisfactory to the Department, furnished by a surety company incorporated pursuant to Chapter 175, Section 105 of the General Laws or authorized to do business in the Commonwealth under Chapter 175, Section 106 of the General Laws and satisfactory to the awarding authority. The name of the agency or agent writing these bonds shall be identified with or on the bond.

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.

3.05 Execution of Contract.

The prepared Contract forms, bond forms, certificate of insurance forms, and Certification of Construction Equipment Standard Compliance Form will be sent with the notification of award to the successful Bidder who shall execute and deliver the Contract and furnish the required forms and surety to the Department within 14 days after the date of the notice of award.

The Contract shall be in writing. When the awarding authority is the Massachusetts Department of Transportation, the Contract shall be executed in duplicate, one of which duplicates shall be kept by the Department and one delivered to the Contractor. When the awarding authority is a municipality it shall be executed in triplicate, one of which triplicates shall be kept by the municipality, one delivered to the Department, and one delivered to the Contractor.

3.06 Failure to Execute Contract.

Should the successful bidder fail to execute the contract and furnish the bonds and certificate of insurance within the time stipulated, the Department may, at its option, determine that the Bidder has abandoned the Contract and thereupon the Proposal and acceptance shall be null and void. In accordance with Chapter 30, Section 39M of the Massachusetts General Laws, the guaranty accompanying the Proposal may be retained and collected by the Department as liquidated damages for the delay and expense caused by the abandonment of the Contract.

SECTION 4.00 SCOPE OF WORK

SECTION 4.04 Changed Conditions.

(page 14 English, page 1.16 Metric) Replace the last three paragraphs of this Subsection with the following:

The provisions of Section 39N of Chapter 30 of the General Laws, as amended, do not apply to construction contracts entered into on behalf of a municipality under the provisions of Section 34, Chapter 90 of the General Laws.

SECTION 6.00 CONTROL OF MATERIALS

SUBSECTION 6.01 Source of Supply and Quality.

(page 20 English, page 1.26 Metric, page SUPPLEMENT C2010-10) Replace the 5th paragraph (English), 5th and 6th paragraph (Metric) with the following:

Fabricators of structural steel, miscellaneous steel and aluminum products, and producers of precast concrete and prestressed concrete must be on the Department's approved fabricators list on the date the bids are opened. Only approved fabricators will be allowed to perform work for the Department.

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. For any materials named or described in these specifications, an approved equivalent to that named or described in the said specifications may be furnished.

(page 20 English, page 1.26 Metric) Replace the 11th paragraph in the amended Subsection, which begins "Unless otherwise provided...", with the following:

Materials for permanent construction shall be new, conform to the requirements of these specifications, and be approved by the Engineer.

Materials for temporary construction need not be new, but shall conform to the requirements of these specifications and be approved by the Engineer.

SECTION 7.00 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

SUBSECTION 7.02 Prevention of Water Pollution – Sanitary Provisions.

(page 23 English, page 1.30 Metric) Change the title of this Subsection and the Air Pollution Requirements below to the beginning of this Subsection, followed by the header for the Water Pollution Requirements which pertains to the remainder of this Subsection.

7.02 Pollution Prevention.

I. Air Pollution Requirements.

A. Diesel Construction Equipment.

The Massachusetts Department of Transportation is a participant in the MassCleanDiesel Program established by the Massachusetts Department of Environmental Protection (DEP) and the purpose of this specification is to achieve documentable diesel emission reductions that result in beneficial air quality improvements to construction workers and the general public through the retrofit of diesel-powered non-road construction equipment.

SUBSECTION 7.02 (continued)

The Contractor shall certify that all Contractor and Sub-Contractor diesel-powered non-road construction equipment and vehicles greater than 50 brake horsepower (hp) that will be utilized in performance of the work under this contract (hereinafter “Diesel Construction Equipment” or “DCE”) have (1) engines that meet the EPA particulate matter (PM) Tier emission standards in effect for non-road diesel engines for the applicable engine power group or, (2) emission control technology verified by EPA or the California Air Resources Board (CARB) for use with “non-road engines” or (3) emission control technology verified by EPA or CARB for use with “on-road engines” provided that such equipment is operated with diesel fuel that has no more than 15 parts per million (ppm) sulfur content (i.e., Ultra Low Sulfur Diesel (ULSD) fuel) or (4) emission control technology certified by manufacturers to meet or exceed emission reductions provided by either “on-road” or “non-road” emission control technology verified by EPA or CARB. Emission control devices, such as oxidation catalysts or particulate filters, shall be installed on the exhaust system side of the diesel combustion engine equipment. The Contractor is responsible to insure that the emissions control technology is operated, maintained, and serviced as recommended by the manufacturer. **Note:** See Exemptions below regarding the use of rental equipment. See Compliance section regarding minimum emission reductions that must be provided by non-verified EPA or CARB emission control devices.

For the latest up-to-date list of EPA-verified technologies, see: <http://www.epa.gov/otaq/retrofit/verified.htm>.

For the latest up-to-date list of CARB verified technologies, see: <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>.

Exemptions

A. Rented diesel equipment greater than 50 brake hp that will be used on site for 30 days or less over the life of the project (i.e., 30 days cumulative) are exempt from this specification. However, if the rented equipment will be used more than 30 cumulative days, then the equipment must comply with this specification. In either case, rental equipment must be included as part of the detailed records of DCE under Submittals and Reporting. **Note:** Any contractor owned equipment that are more than 50 brake hp that are used on site for 30 cumulative days or less over the life of the project, are not exempt from complying with this specification.

B. Large cranes (such as Sky cranes or Link Belt cranes) which are responsible for critical lift operations are exempt from installing Retrofit Emission Control Devices if they adversely affect equipment operation. Technical justification must be submitted to the Engineer for approval to document the impact on operations.

C. The Engineer may create an exemption when there is a compelling emergency need to use diesel vehicles or engines that do not meet the contract conditions for emission controls. Examples include the need for rescue vehicles or other equipment to prevent or remedy harm to human beings or additional equipment required to address a catastrophic emergency such as structure collapse or imminent collapse. Once the emergency is controlled, such non-compliant equipment must be removed from the project. Meeting contract deadlines will not be considered a compelling emergency.

D. Diesel-powered non-road construction equipment greater than 50 brake horsepower need not be equipped with either EPA or CARB verified emission control technology if the non-road construction equipment diesel engine is certified to meet the EPA particulate matter (PM) Tier emission standards in effect for non-road diesel engines for the applicable engine power group. **Note:** If emissions from the DCE at the start of the project meets the most current EPA PM emissions standards in effect at the time, but are superseded by newer Tier emission standards (i.e., Tier 3 emission standards replaced by Tier 4 emission standards), then the superseded DCE must be retrofitted prior to the end of the contract with emission control technology per Section 2.

SUBSECTION 7.02 (continued)

E. If an additional DCE (greater than 50 brake hp), or permanent replacement is brought on site after work has commenced, the Contractor has 15 calendar days from the time the DCE is brought on site, to install emission control technology per this specification (unless the DCE has an engine that meets the EPA particulate matter (PM) Tier emission standards in effect for non-road diesel engines for the applicable engine power group).

Submittals and Reporting

The Contractor shall fill out and return the following forms within 14 days of the date of contract Award:

Certification of Construction Equipment Standard Compliance Form

Diesel Equipment Data Sheet

These forms are available on the MassDOT website at www.mass.gov/massdot/highway/

Should the successful bidder fail to execute the said form, MassDOT may, at its option, determine the Contractor has abandoned the Contract and shall take action in accordance with Subsection 3.06.

The Diesel Equipment Data Sheet is a certified list of all DCE to be utilized on the project and provide the following information for each DCE in tabular form.

Contractor/subcontractor name.

Identify if owned/rented equipment.

Equipment type.

Equipment make, model and VIN.

Engine model, year of manufacture and HP rating.

Type of fuel used.

Emission Control Device (ECD) type (DOC or DPF).

ECD manufacturer, make and model.

ECD EPA/CARB Verification Number or ECD performance certification provided by manufacturer(s) that the DOC or DPF meets or exceeds emission reductions when compared to an EPA or CARB verified device.

ECD installation date.

For each piece of DCE, the Contractor shall also submit digital color pictures showing the machine and the MassDOT-issued compliance label (with inspection tag number).

The Contractor and subcontractor shall maintain detailed records of all DCE used on the project, including the duration times the DCE is used on the project site. Records shall be available for inspection by MassDOT. The Engineer shall be immediately notified of any new DCE brought onto the project.

Compliance

A. All DCE that are not exempt, must comply with these provisions whenever they are present on the project site. If a non-verified EPA or CARB emissions control device is used for compliance with this specification, then the device must provide the following minimum emission reductions:

Diesel Oxidation Catalysts

Particulate Matter: 20%

Carbon Monoxide: 40%

Volatile Organic Compounds: 50%

Diesel Particulate Filters

Particulate Matter: 85%

Note: If emission reductions for a non-verified ECD appear to be questionable as determined by MassDOT, the Contractor shall provide all supporting emission test data, including test procedures, as requested by MassDOT for the ECD. If emission reductions cannot be substantiated by supporting test data, then the ECD in question must be replaced with a different ECD.

SUBSECTION 7.02 (continued)

B. Upon confirming that the Diesel Construction Equipment meets the EPA particulate matter (PM) Tier emission standards in effect for non-road diesel engines for the applicable engine power group or has the requisite pollution control technology installed, MassDOT will issue a non-transferable compliance label that will assign a compliance tracking number to the DCE.

C. All DCE subject to this Specification shall display the compliance label in a visible location.

D. When leased or rented equipment which has been retrofitted by the Contractor is returned to the rental company, the Contractor will remove the Compliance label and return the label to the Engineer.

E. Use of a DCE which has been issued a compliance label and which is found without the device is a breach of this contract and will be subject to a stipulated penalty of \$2,500 per day. See Non-compliance section below..

F. If an emission control device which was purchased and/or utilized on or after March 1, 2005 and was in compliance with the MassDOT diesel retrofit requirements in place between March 1, 2005 and the issuance of this specification, the retrofit device will be considered in compliance with this specification. Note: If a retrofit device (i.e., DOC or DPF) used between March 1, 2005 and issuance of this specification does not have a performance certificate which shows the pollutant emission reductions being provided by the retrofit device meets or exceeds emission reductions provided by either an EPA or CARB verified "on-road" or "non-road" emission control device, then the device will be considered non compliant with this specification.

Non-compliance

All DCE may be inspected by the Engineer or designated agent without prior notice to the Contractor. If any DCE is found to be in non-compliance, the Contractor must either remove the DCE from the project or retrofit it within 15 calendar days. Failure to comply will subject the Contractor to an Environmental Deficiency Deduction described below. A Notice of Non-Compliance will be issued by the Engineer or his agent at the time the noncompliance is identified.

If the Contractor fails to take corrective action within 15 calendar days of issuance of the Notice of Non-Compliance, a daily monetary deficiency deduction will be imposed for each calendar day the deficiency continues. The deduction will be \$2,500 per calendar day for each piece of DCE determined to be in non-compliance. The deficiency deduction is irrevocable and shall not be reimbursed. Pay estimates will be held and no payments made until all equipment is brought into compliance.

Costs

All costs associated with the installation of emission control technology are the responsibility of the Contractor and shall be considered incidental to the cost of the project. No additional compensation is provided. In addition, all DCE greater than 50 brake hp shall comply with the requirements of this specification at the start of work commencing on site. The Contractor's compliance with this specification shall not be grounds for claims.

II. Water Pollution Requirements.

SUBSECTION 7.09 Public Safety and Convenience.

(page 27 English, page I.35Metric) Add the following paragraph after the fourth paragraph:

The Contractor shall provide to the Engineer and to the police and fire departments of each affected municipality a contact list of contractor personnel who can be notified in the event of an emergency. The list shall have the names and telephone numbers of personnel available 24 hours a day, 7 days a week for the duration of the field work. The list shall be kept current, and shall include secondary contacts as needed to ensure that an authorized person is available at all times to mobilize crews as required to respond to emergencies. If contacted directly by emergency response personnel, the Contractor shall immediately notify the Engineer.

(page 27 English, page I.35 Metric) Replace the 6th paragraph with the following:

The safety and convenience of the travelling public takes precedence over the convenience of the Contractor.

Where the construction impacts the traveled way, traffic flow shall be maintained in accordance with the approved traffic management plan.

At any time during operations when a traffic delay occurs resulting in conditions which, as determined by the Engineer, significantly impede traffic or create a hazard to public safety, the Engineer will suspend the work and order the roadway opened to full available capacity. The Contractor shall immediately cease operations affecting traffic and provide a safe travel way.

No additional compensation will be paid for suspending the work. The sole allowance for any such suspension is an extension of time as provided by Subsection 8.10.

If significant, unexpected traffic delays are recurring, the Contractor may be required to modify the work hours and the traffic management plan.

When grading operations are in progress, each level of excavation or fill shall be graded as near as practicable to an even surface so as to provide a satisfactory passageway for the use of traffic.

SUBSECTION 7.13 Protection & Restoration of Property.

(page 29 English, page I.37 Metric and page SUPPLEMENT C-2010-14,) Replace the last paragraph with the following:

The Contractor shall adhere to all requirements established by Occupational Safety and Health Administration and take all necessary precautions for the protection of personnel and equipment. The bidders attention is directed to the Code of Federal Regulations Part 1926 - *Safety and Health Regulations for Construction*, Subpart CC, 1926.1408 *Power line safety (up to 350 kV)--equipment operations* which establishes the minimum clearance between the lines and any part of the crane or load. If the voltage is unknown the minimum clearance is 20 feet. If the line is known to be rated 50 KV or below the minimum clearance is 10 feet. For higher voltages consult the above referenced subsection. For protection of personnel and equipment, the Contractor should be aware of this regulation especially during paving operations using dump trucks.

SUBSECTION 7.16 Claims of Contractor for Compensation.

(page 35 English, page I.44 Metric and SUPPLEMENT C2010-14) Add (English) / Replace (Metric and Supplement) this paragraph above the last paragraph of the Subsection:

Interest on judgments for contractor claims filed with the Superior Court of Massachusetts shall be calculated pursuant to the provisions of M.G.L. c. 231, §6I from the date of the breach or demand. If the date of the breach or demand is not established, such interest shall be calculated from the date of the commencement of the action.

**DIVISION II
CONSTRUCTION DETAILS**

**SECTION 112
DEMOLITION OF BUILDINGS, STRUCTURES AND BRIDGES**

SUBSECTION 112.82 Payment Items.

(page 58 English, page II.9 Metric) Replace this Subsection with the following:

112.1.	Demolition of Building No. _____	Lump Sum
114.1	Demolition of Superstructure of Bridge No. _____	Lump Sum
115.1	Demolition of Bridge No. _____	Lump Sum
150.	Ordinary Borrow	Cubic Yard (m ³)

**SECTION 201
BASINS, MANHOLES AND INLETS**

SUBSECTION 201.40 General.

(page 91 English, page II.44 Metric) Replace the materials requirements for Precast Units with the following:

Precast Drainage Structures	M4.02.16
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SUBSECTION 201.61 Excavation.

(page 91 English, page II.44 Metric) Replace this Subsection with the following:

Excavation shall conform to the applicable portions of Section 140.

SUBSECTION 201.82 Payment Items.

(page 93 English, page II.46 Metric) Add payment item 222.3 and replace payment items 202.2, 202.3, 222., 222.1 and 222.2 with the following:

222.	Frame and Grate - MassDOT Bar Type	Each
222.1	Frame and Grate- MassDOT Cascade Type	Each
222.2	Frame and Grate - MassDOT Drop Inlet	Each
222.3	Frame and Grate (or Cover) Municipal Standard	Each
English:		
202.2.	Manhole (9 to 14 Foot Depth)	Each
202.3.	Manhole (14 to 18 Foot Depth)	Each
Metric:		
202.2.	Manhole (3 to 4 Meter Depth)	Each
202.3.	Manhole (4 to 5 Meter Depth)	Each

**SECTION 230
CULVERTS, STORM DRAINS AND SEWER PIPES**

SUBSECTION 230.64 Field Testing of Corrugated Plastic Pipe.

(page SUPPLEMENT C2010-29) Replace from Hand Measurement to the end of the page with the following:

- Measure manually any deflections of pipe larger than 36 inches (900 mm) nominal inside diameter.
- Must be done in the presence of the Engineer.

The minimum diameters, based on approximately 95% of base inside diameter at any point along the full length, are as follows:

<i>Nominal Size (inches / mm)</i>		<i>Allowable Deflected Diameter (inches / mm)</i>	
12	300	11.2	285
15	375	14.0	356
18	450	16.8	428
24	600	22.4	570
30	750	28.0	713
36	900	33.7	856
42	1050	39.4	1001
48	1200	45.1	1146
60	1500	56.5	1436

Any pipe deflected beyond acceptable limits shall be uncovered. If not damaged, as determined by the Engineer, the pipe may be reinstalled. Damaged pipe shall not be reinstalled and shall be removed from the work site. No other method or process to reduce or correct deflection shall be acceptable.

SUBSECTION 230.65 Strutting of Pipe.

(page 96 English, page II.50 Metric) Add this new Subsection:

Strutting shall be used as required to ensure the integrity of the pipe and all costs associated are incidental to the item.

SECTION 701
SIDEWALKS, WHEELCHAIR RAMPS AND DRIVEWAYS

SECTION 701. SIDEWALKS, WHEELCHAIR RAMPS AND DRIVEWAYS

(page SUPPLEMENT C2010-54) In the first sentence of 701.61, B. Placing and Finishing Cement Concrete. delete "(200 mm)".

SECTION 771
PLANTING TREES, SHRUBS AND GROUNDCOVER

SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER.

(page 204 English, page II.164 Metric) Replace this Section with the following:

771.20 General.

This work shall consist of furnishing, planting and/or transplanting specified trees, shrubs, vines and ground cover to locations as shown on the plans and/or as directed by the Engineer.

The work shall include excavation of pits, placing of backfill mixture, mulching, watering, staking or guying, wrapping for transport, adding fertilizing and/or other soil amendments, seeding, weeding, watering, care of the plants, and replacement of unsatisfactory plants and materials during the life of the contract.

The Contractor performing work under this Section shall have five years continuous experience and expertise in management, handling and installation of ornamental plant material in large-scale landscape construction projects. Site foreman shall have at least five years experience, able to read and interpret plans, and shall be on-site during all times of plant installation.

MATERIALS

771.40 General.

Materials shall meet the requirements specified in the following Subsections of Division III, Materials with the amendments and supplements contained herein:

Loam Borrow	M1.05.0
Organic Soil Additives	M1.06.0
Inorganic Amendments	M6.01.0
Fertilizer	M6.02.0
Wood Chip Mulch	M6.04.3
Aged Pine Bark Mulch	M6.04.5
General Planting	M6.06.0
Nursery Stock - General	M6.06.1
Wrapping for Transport	M6.07.1
Materials for Guying and Staking	M6.08.0
Water for Irrigation	M6.09.0

The Contractor shall furnish written certificates of compliance, including nursery shipping lists, in triplicate for each load of plant material showing where the plants were grown and listing all transplantings, age or size as specified, grade and quantity. All plants shall be tagged with botanical name, including cultivar, and size so that proper identification can be made.

All plants shall be northern grown nursery stock. Botanical and common names shall conform to the current edition of Hortus Third, compiled by the staff of L. H. Bailey Hortorium, Cornell University. The latest edition of the *American Standard for Nursery Stock* (ASNS) published by the American Association of Nurserymen, Inc. shall be the Department's standard for plants and for plant, root ball, and container size, as well as growth and form requirements. The term "plant" shall refer to any tree, shrub, herbaceous perennial, seedling, vine or groundcover.

SECTION 771. (continued)

All trees and shrubs shall be balled and burlapped (B&B) or containerized unless otherwise specified in the plans and special provisions. The caliper, height, age and other dimensions as specified for all planting material shall apply at the time planting is done and the plants will be inspected by the Engineer at this time as to these requirements as well as the quality or grade and varieties required. The Contractor shall remove all plants not approved by the Engineer from the project.

The following standards shall apply to the work of this Section.

Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada. L.H. Bailey Hortorium. 1976.

American Standard for Nursery Stock (ASNS), ANSI Z-60.1, latest edition, published by American Association of Nurserymen (AAN).

Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses. Michael Dirr. Stipes Publishing Company, latest ed.

ANSI A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance, Part 1: Pruning, available from Tree Care Industry Association and International Society of Arboriculture.

Examination of Conditions. The Contractor shall be responsible for judging the full extent of work requirements involved. This responsibility includes, but is not limited to, the following: transportation, purchase, temporary storage and maintenance of plants; plant rehandling prior to final installation; removal and off-site disposal of existing loam that has been determined unacceptable; purchase, transport, and supply of loam as required for backfill mixing operations.

771.41 Samples and Submittals.

The Contractor shall keep the Engineer apprised of the sources and availability of plant material in the Contract. Within 30 days of the pre-construction meeting, the Contractor shall provide nursery supplier lists indicating current and projected availability of all plant material for the project. All the material shall match species, cultivar, sizes and quantities specified in the Contract.

At least 120 days prior to planting, the Contractor shall submit to the Engineer for his approval a watering schedule for all planting in the project. Watering schedule shall include all methods for providing water to plants.

At the same time, the Contractor shall submit a confirmation of availability for all plants on the list, accompanied by nursery sources. When the specified types and sizes of plants are not available, the Contractor may submit written recommendations for substitutions for approval by the Engineer. Substitutions proposed by the Contractor shall have equivalent overall form, height, and horticultural characteristics and must be approved in writing by the Engineer prior to tagging.

For materials other than plants, at least 90 days prior to installation the Contractor shall submit material specifications and (where applicable) installation instructions attesting that the materials meet the requirements specified. No materials shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match the samples. All material samples shall include supplier's literature and certification stating that material meets specifications.

The Contractor shall submit for approval equipment and methods for testing soil moisture and soil pH.

The Contractor shall provide two moisture gauges, including instructions for use and batteries if required, for his use during the duration of the Contract. The meters shall be hand held and shall be capable of measuring moisture at a depth of 6 inches. Meter scale shall be sufficient to determine moist, dry, or wet soil. The meters shall be regularly checked for calibration against watered loam, and shall be replaced if found faulty at no additional cost.

In addition, the Contractor shall provide to the Engineer one copy of the "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by American Association of Nurserymen (AAN) for the duration of this Contract.

For work requiring an arborist, the Contractor will provide certification of Massachusetts Certified Arborist.

At least 60 days prior to planting, the Contractor shall submit a schedule for tagging material to the Engineer.

Materials may be temporarily stored within the highway layout as directed by the Engineer. Heavy equipment and fill material shall be stored outside of the drip line of existing tree canopy. If materials are stored within the layout, the Contractor shall restore the storage area to its original natural condition at the

his expense, including tilling of compacted soils and reseeding .

SECTION 771. (continued)

Arrangements shall be made, to the extent that it is practicable, to have plants delivered as the pits or beds are made ready for them. Delivery of plants shall be made to the site, only according to the Contractor's ability to handle and properly care for them. Whenever plants cannot be planted on the day of arrival, all those with bare roots shall be "heeled-in" in moist soil or mulch. The Contractor shall properly maintain all "heeled-in" plants until they are planted. In the event that "heeled-in" plant material must be held over until the next planting season such material shall be lifted and replanted in a satisfactory manner in nursery rows as directed by the Engineer, and shall be suitable for transplanting the following season. The root balls of B&B plants not planted immediately after delivery and inspection shall be covered with loam, mulch or wood chips and irrigated until planted. Throughout the work, care shall be taken to keep the roots of all plants from drying out, to preserve the solidity of the balls of B&B plants, and to prevent plants from being broken, scarred or damaged in any way. All emergency storage of materials shall be at the risk of the Contractor.

For B&B and container shrubs, a representative sample, up to three, shrubs of each species shall be washed of soil media for inspection of Engineer to confirm root conditions. If accepted, the sample plants shall be planted immediately and shall be subject to all planting performance guarantees.

771.42 Backfill Mixture for Plant Material

The Contractor shall provide testing of soils in planting locations. The Contractor shall provide test results and recommendations as necessary for soil amendment to the Engineer for his approval. Backfill shall be a blend of one part loam borrow, one part organic material and two parts existing subsoil.

CONSTRUCTION METHODS**771.60 General.**

Furnishing and planting of plant material shall include, but is not limited to, the following: digging of the pits and plant beds; amendment of loam as required to produce planting soil mix; provision of soil additives for pH requirements of specific plants; provision of additional amendments as required, including soil wetting agents; furnishing the plants as specified; plant installation; watering and maintenance, including weeding.

771.61 Seasons for Planting.

The purpose of the planting dates is to establish an appropriate period of time for planting. The Contractor may submit request for planting outside the scheduled timeframes in writing to the Engineer for approval. Calendar guidance for planting is as follows:

Spring:	Deciduous materials - March 21 through May 15 Evergreen materials - April 15 through June 1
Fall:	Deciduous materials - Oct. 1 through Dec. 1 Evergreen materials - Aug. 15 through October 15

Spring planting for bare root material shall be after the ground has thawed, but before leafing out, approximately mid March to early April. Fall planting for bare root plants may occur in late October, after leaf drop, through mid November.

771.62 Plant Tagging and Approval.

The Contractor shall locate and tag plants at least one month prior to the expected planting date. The Contractor shall be responsible for tagging the material at the nursery. The Contractor shall request that the Engineer provide a representative to approve tagged stock to be planted under this Section. The Contractor shall be responsible for any expenses associated with any necessary travel and overnight accommodations for the Engineer's representative during the period of time required to locate, select, and approve plant material.

SECTION 771. (continued)

All trees and representative samples of each shrub species on the Plant List shall be tagged by the Contractor at the nursery and approved by the Engineer or his representative, prior to digging, for conformity to specification requirements as to quality, size, and variety. All plants will have labels that list the common name, botanical name, and size.

Approval of tagged material at the nursery shall not prevent the right of inspection and rejection upon delivery at the site or during the progress of the work. Cost of replacement of materials rejected by the Engineer at the site shall be borne by the Contractor.

771.63 Plant Delivery and Planting Preparation.

Tree trunks shall be protected during shipping by a heavy walled cardboard sleeve or other suitable material. Plants shall either be shipped in enclosed trucks or all surfaces, leaves and branches shall be wrapped to prevent damage and desiccation. Damaged plants may be rejected by the Engineer at any time.

Locations for all plants shall be approved by the Engineer before any plant pits or plant beds are dug.

The Contractor shall locate all underground utilities within 10 feet of the proposed planting pits and notify the Engineer of any conflicts prior to digging plant pits.

Stake all tree locations, and all shrub and perennial beds, for Engineer approval prior to digging. Contact DIGSAFE and other utilities if coordination has not already occurred for other phases of project.

Prior to the installation of any plant material, the Contractor shall dig test pits and determine percolation rates. Percolation of less than 1 inch per hour shall require corrective measures as recommended by the Contractor and approved by the Engineer.

The Contractor shall notify the Engineer 5 working days prior to the proposed arrival of plant material on the site. All plants shall be planted within 5 days of arrival on site or shall be rejected by the Engineer.

Plants stored on site shall be shaded from direct sunlight at all times and shall not be stored on paved surfaces. Plants stored on site shall be watered daily.

771.64 Planting.

Pits excavated for plants shall be as shown on the plans. In general, pits shall be 3 times the width of the rootball or plant container. Depth of the pits shall correspond to the height of the rootball, measured from the bottom to the lower extent of the root flare, ensuring that the root flare will not be covered. The sides and bottom of pit shall be scarified to prevent glazed soils.

Plant material installed in infertile or manufactured soils shall have soil modification agents added per manufacturer specifications. After planting, the Contractor shall certify that appropriate agents have been used and properly applied per the manufacturer's specifications. Written certification shall be provided to the Engineer.

Place trees in the center of pit. Place shrubs and perennials in beds as a group, with grouping and spacing as noted on the plans.

For ball and burlap plants, remove all rope and wire baskets from the root balls. Burlap may be removed off the top and sides. Any excess burlap shall be cut away and disposed of off site. For container grown plants, score or butterfly cut the rootball of all container-grown plants prior to planting. For peat or other similar degradable containers, remove any portion of the projecting above the level of the soil. All metal, plastic or other non root-thru type container shall be completely removed during the process of planting.

Prepare planting soil mix as specified above to depths as shown on the drawings. Place backfill mix in layers of not more than 6 inches, and water each layer sufficiently to settle soil before the next layer is put in place.

Backfill mix shall meet finished grade after settlement. Shape edge of planting pit to form a saucer for holding water and place mulch as shown in the plans. On steep slopes, the mound around the saucer may be omitted on the uphill side. Do not cover the stem flare of the plants with mulch.

Water plants immediately following planting as necessary to thoroughly moisten rootball and planting soil. The Contractor shall be responsible for furnishing his own supply of water to the site at no extra cost.

The Contractor shall, at his own expense, replace any plants injured or damaged due to the lack of water, or due to the use of too much water, as determined by the Engineer.

SECTION 771. (continued)

Plants shall not be wrapped after installation, except as discussed below. Wounds shall not be painted. Trees shall not be staked unless wind or other local conditions require the additional protection.

Once the root ball is placed in the pit and the container, wires and burlap removed, carefully rake the root ball to spread the roots and partially backfill the pit, ensuring that the soil filters in among the roots. The backfill shall be placed with care taken not to injure or bruise the roots.

771.65 Bare Root Planting.

Bare root material shall be delivered to the site in a dormant condition. Evergreens will be rejected if the fine roots were lost in digging. All bare root plants shall be prepared with hydrogel at the nursery prior to planting. The backfill mixture of soil placed beneath the plant shall be firmed prior to setting the plant. Do not fertilize bare root plants.

771.66 Staking and Guying and Wrapping.

The Contractor shall consult with the Engineer to determine whether wind exposure, potential vandalism, or other conditions warrant tree staking and guying. Evergreen trees up to 4 feet high and deciduous trees up to 6 feet in height shall be supported by one stake driven firmly 2-3 feet into the ground. The stake shall be located far enough from the tree to avoid damaging the roots and so that the top of the stake shall be about 2/3 the height of the tree. The point of attachment to the stake shall not be more than 2 feet from the trunk. Secure the tree to the stake with biodegradable cloth webbing. Do not use wire for staking any plant.

Evergreen trees taller than 4 feet and deciduous trees taller than 6 feet, if less than 3 inches in caliper, shall be supported with two stakes on opposite sides and driven into the ground at least 2 feet. The stake shall not be higher than 3/4 the height of the tree. Any excess burlap shall be cut away and disposed of as directed.

Trees greater than 3 inches in caliper shall be securely guyed by biodegradable fabric webbing, protective material and anchors. Three anchors shall be equally spaced around the tree. Webbing shall be fastened around the tree trunk immediately above a substantial limb located 1/2 to 2/3 of the tree height above the ground and anchored at a distance from the trunk equal to 2/3 of the height of attachment to the tree. The anchor shall be a hardwood stake. The anchor stake shall be firmly driven at an angle and to a depth of at least 2 feet and the excess length of stake shall be cut off 3 inches above the ground.

Webbing shall be placed around the tree trunk and secured to the anchor stake.

Staking and guying shall be incidental to tree installation. Use cloth webbing rather than wire. Do not use hose.

All Flowering Cherries and Flowering Crabs shall be protected to a height of 12 to 18 inches above the ground from animals and rodents by a protective cage. The cage shall be of wire or plastic mesh or other approved material and shall not make any direct contact with the tree. Otherwise, do not wrap trees except for transport. Remove transport wrapping after installation of plant material.

771.67 Mulching.

No mulch shall be applied prior to the first watering of the plant. Trees and shrubs shall be mulched no later than one week after planting.

Mulch material shall be furnished and placed over all pit or saucer areas of individual trees and shrubs and over the entire area of shrub beds to the depth indicated on the plans. Pull mulch away from stem flare.

In areas to be planted with roses, vines, or ground cover, the entire area shall be mulched before planting. The mulch shall be parted at the location of each hole and carefully replaced around the plant immediately after planting.

Preparation for mulch areas of mass planting shall conform to the provisions of Subsection 767.60.

Mulch material shall be material as indicated on the plans or approved by the Engineer.

The Contractor shall, at his own expense, replace any plant material that has been damaged by too much or too little mulch, as determined by the Engineer.

SECTION 771. (continued)**771.68 Pruning.**

Pruning of all plants shall be done only by a Massachusetts Certified Arborist or Horticulturist, as follows: Initially, all broken or dead or injured branches shall be cut flush with the trunk or limb, and broken roots shall be pruned on the plant side of the break. If damage is significant, then plant will be replaced per direction of Engineer.

Pruning shall not deform or otherwise destroy the typical shape or symmetry of the tree or shrub and shall not reduce the height or overall size by more than 1/3. The leader of the tree shall not be cut back unless otherwise directed.

771.70 Care and Maintenance During Maintenance and Establishment Periods.

The Contractor will be held responsible for all planted material, providing plant care for the duration of the Maintenance and Establishment periods described below, until the project is completed and accepted. At the completion of the Establishment period, all plants shall be in a healthy, growing condition and free from weeds or other noxious materials or conditions. Care shall include watering, weeding, cultivating, pruning, re-mulching, trimming, adjusting of guys, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer, and by performing other operations as required to keep plants healthy and growing.

Pruning shall be in accordance with the ANSI standards for Class I, fine pruning, to preserve the natural character of the plant. All dead wood or suckers and all broken or badly bruised branches shall be removed. Do not cut leaders. The Engineer shall determine if plants require pruning, or should be rejected. All pruning work shall be done by a Massachusetts Certified Arborist. Contractor will submit a copy of the Arborist's current certification to the Engineer.

The Contractor will be responsible for weeding around planted materials. All weeding shall be completed before acceptance of the project. At no time shall weeds attain the height of 6 inches during the period of contract prior to acceptance. Newly planted material must be clearly visible in order to be approved for Conditional and Final Acceptance.

771.71 Watering.

All plants shall be watered during planting and all plants shall be watered at least twice each week during weeks where the average daily temperature exceeds 55 degrees (F) and when precipitation is less than 1 inch, as determined by local National Weather Service data. Watering shall be sufficient to provide moist soil to a depth of 6 inches, as determined by the Engineer. If soil is sufficiently moist, as determined by the Engineer, the required watering may be reduced.

Trees will require a minimum of 10 gallons of water each, and shrubs a minimum of 5 gallons per plant per watering. Watering may be achieved using individual drip irrigation bags.

Trees or shrubs planted after October 15 shall be thoroughly watered at the time of planting, after which subsequent watering will not be required until following season.

The Contractor shall maintain a watering log for all plants installed on the project, indicating dates of watering and weather events. Log shall be submitted for final payment.

771.72 Maintenance Period

The Maintenance Period shall begin immediately after all plants are planted and shall continue for a minimum of 60 days following the completion of all planting installations, or until the conditional acceptance of all planting work, whichever is a longer period of time. During the 60 day Maintenance Period, plants shall be inspected for watering, weeding, and other requirements at least twice each week.

Any decline in the condition of new plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall immediately notify the Engineer and engage professional arborists and/or horticulturists to inspect plant materials and to identify problems and recommend corrective procedures. Inspection and recommendation reports shall be submitted to the Engineer.

SECTION 771. (continued)

At the end of the Maintenance Period, the Contractor will request inspection by the Engineer at least 10 days before the anticipated date of inspection.

At the time of inspection, if the plant materials, workmanship, and maintenance practices are acceptable to the Engineer, the date of the inspection shall establish the end of the Maintenance Period and the commencement of the required one-year Establishment Period for planting work.

If in the Engineer's opinion, plant materials, workmanship, or maintenance is deficient, acceptance will not be granted, and the Maintenance Period for all the plants shall be extended until plant replacements are made or other deficiencies are corrected. All dead, declining, or unsatisfactorily maintained plants shall be removed promptly from the project. Replacement plants shall conform in all respects to the Specifications for the original plants and shall be planted in the same manner.

Absolutely no debris may be left on the site. The Contractor shall repair any damage to site as directed by the Engineer, at no additional cost.

771.73 Establishment Period

The purpose of the Establishment Period is to nurture plants through at least one full growing season and one full winter. Planted areas shall be free of weeds and debris, and plantings shall be re-mulched as necessary.

The Contractor is responsible for arranging inspection early enough in the season to allow adequate time to procure and install replacement material. The Engineer will inspect the replacement planting work upon the request of the Contractor. Request for inspection, shall be received by the Engineer at least ten days before the anticipated date of inspection.

At the end of the Establishment Period, each plant shall show healthy growth on at least 75 percent of its terminal stems, as determined by the Engineer. Determination of healthy growth shall include, but is not necessarily limited to, viable leaves (in season) and terminal buds, as well as live cambium. Plants found to be unacceptable shall be removed promptly from the site and replaced immediately or during the next normal planting season, as permitted by the specifications.

Stakes and guying shall be removed from all plants before Final Acceptance, and materials will be disposed of off site at no extra cost to the Contract.

771.74 Replacement of Defective Plant Material.

Any dead and unsatisfactory plants shall be replaced in kind and size with plants as originally specified, or on approval by the Engineer in writing, by alternate or substitute varieties of plant material of equal value.

Replacement plantings of evergreens shall be in place by October 15 and of deciduous by November 1. Replacement plantings shall conform to the provisions of this section, except the requirements for establishment.

A final inspection of all plant material for acceptance will be held after the replacement planting has been completed.

COMPENSATION**771.80 Method of Measurement.**

The quantity of plants to be paid for will be the number of living trees, shrubs, vines and ground cover plants of specified kinds and sizes furnished, planted and accepted in accordance with these specifications.

Mulch for planting beds and tree pits shall be incidental to the cost of the plants. Mulch used on areas other than over tree pits or planting beds will be measured by area and at the specified depth. The mulch taken from this measured volume and used for mulching trees and shrubs will be deducted on the basis of the volume of mulch placed over the rated size of each planting pit at a depth of 3 inches.

SECTION 771. (continued)

771.81 Basis of Payment.

The quantity of trees, shrubs, vines and ground cover plants measured as provided above will be paid for at the contract unit prices per each for planting of the types, species and sizes called for in the bid schedule. The unit price per planting item shall include furnishing and delivering all plants, furnishing and delivering prepared backfill soil, mulch, fertilizer, excavation for plant pits, planting, pruning, guying and staking, mulching, weeding, watering, cleanup, plant establishment work and care including replacements, and for all labor, equipment, tools and incidentals necessary to complete the work prescribed in this section, except that mulch for vines and ground cover plants will be paid for under the contract unit price for the mulch specified. Mulch for areas other than specified for trees and shrubs will be paid for at the contract unit price per cubic yard in place, under the item for Aged Pine Bark Mulch.

No payment will be made for mulching specified as required and included in payment for other contract items.

771.82 Payment Items.

772. to 774.	Evergreen Trees	Each
775. to 784.	Deciduous Trees	Each
785. to 787.	Evergreen Shrubs	Each
788. to 795.	Deciduous Shrubs	Each
796.	Vines and Groundcover	Each
767.6	Aged Pine Bark Mulch	Cubic Yard

**SECTION 820
HIGHWAY LIGHTING**

SUBSECTION 820.21 Definitions.

(page 240 English, page II.202 Metric) Replace paragraphs A and B with the following:

A. Highway Lighting Poles – An aluminum or galvanized steel structure providing up to a 50 foot mounting height for luminaires mounted on arms up to 10 feet long.

B. High Mast Tower – A steel structure providing a mounting height greater than 50 feet for luminaires and equipped with a lowering device to permit luminaire maintenance at ground level.

SUBSECTION 820.41 Design Requirements.

SUBSECTION 820.42 Equipment.

(page 241 English, page II.203 Metric) Combine 820.41 and 820.42 into subsection 820.41 and replace the existing title of Subsection 820.41 through section B of Subsection 820.42 with the following:

820.41 Design and Equipment Requirements.

The complete structures with all luminaires and appurtenances attached thereto shall be designed and constructed in accordance with the requirements of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" for the following AASHTO criteria, 1) Fatigue Category No. 1, 2) Design Wind Speed 130 MPH and 3) 50 Year Design Life.

Where aluminum alloy parts are fastened to steel or other dissimilar materials, the aluminum shall be kept from direct contact with the steel or other dissimilar materials by methods approved by the Engineer.

SUBSECTION 820.41 (continued)**A. Highway Lighting Poles**

1. Poles from 30 to 50 feet shall be made of aluminum or galvanized steel. Galvanizing shall meet the requirements of Section M7. Aluminum poles over 40 feet may be in two sections telescoped together and lapped not less than two times the pole diameter at the lapped-joint. Aluminum poles shall be produced from continuous extruded tube, and shall not be sleeved in the base portion to compensate for thinner walled tubing. Each pole shall be designed and fabricated in a manner that will accommodate a single or double arm ten feet in length.
2. Arms shall be designed for 2 inch slip fitter mounted with 75 pound luminaires that have a projected area of 3.3 square feet.
3. Poles shall have a handhole with a reinforced frame and cover. The opening shall be approximately 4 inches x 6 inches located approximately 12 inches from the bottom of the pole and placed 90 degrees to the arms. Pole cap shall be the same material as the pole, watertight and held securely in place on the pole by a set screw or screws or stamped cap.
4. Bonding and grounding shall be provided that will ensure an effective path for fault current that facilitates the operation of an overcurrent protection device.
5. Anchor bolts nuts, bolts, and washers shall conform to M8.01.5 and the Standard Drawings.
6. The arms shall be furnished with a finish similar to that of the pole. The exterior of the pole and arm shall be free of protuberances, dents, cracks, discolorations and other imperfections marring their appearance.
7. For shipping purposes, the pole and arm shall be protected to preserve the finish.
8. The dead load deflection at the top of the pole caused by the mass of the arm, luminaires and all appurtenances attached thereto shall not exceed 2% of the pole length.
9. Aluminum poles shall have a Combined Stress Ratio (CSR) no greater than 0.95. Aluminum poles over 20 feet in length shall have internal dampers installed to reduce vibrations.
10. An identifying tag shall be affixed to the pole at a readable location on the side of the pole away from traffic. Information on the tag shall include, manufacturer's name and order number, date of manufacture and pole material.

B. High Mast Towers.

All high mast towers shall be made of galvanized steel.

Anchorage shall consist of four or more high strength steel bolts, having two heavy duty hex nuts, and fabricated from high strength low alloy steel having a minimum yield of 50 ksi positioned and designed to withstand the forces corresponding to the moment which will cause failure to the shaft.

Anchor bolts shall be furnished with a template and a prefabricated reinforcing cage welded to the bolts.

SUBSECTION 820.82 Payment Items.

*(page 245 English, page II.208 Metric) Delete pay items 820.80 to 822.82 Area Lighting Pole *__ft. Mounting Height *(40-50 ft.) (Metric description similar.) Replace pay items 822.83 to 822.88 and 822.89 to 822.98 with the following:*

822.83 to 822.98	High Mast Tower (___ Foot (Meter) Mounting Height)	Each
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**SECTION 828
TRAFFIC SIGNS**

SUBSECTION 828.44 Demountable Reflectorized Delineators.
(page 249 English, page II.212 Metric, and page SUPPLEMENT C2010-69) Delete this Subsection.

SUBSECTION 828.56 Demountable Reflectorized Delineator.
(page 253 English, page II.215 Metric) Delete this Subsection.

SUBSECTION 828.60 General.
(page 254 English, page II.216 Metric, and page SUPPLEMENT C2010-71) Replace the entire subsection with the following::

Warning clusters (H1-2) shall be mounted on one standard P-5 breakaway post assembly. The reflectors shall be amber (Type A), conforming to the requirements of Subsection 828.44-A.

Abutment warning sign (H1-3) shall be constructed of aluminum panel (Type A) as specified. Posts shall be one standard P-5 breakaway assembly, conforming to Department standards.

Demountable reflectorized station markers and project markers shall be fabricated and erected as shown on the plans and/or as directed by the Engineer.

Demountable reflectorized reference posts shall be mounted on new P-9 Steel posts or on existing posts as shown on the plans and as directed.

Demountable reflectorized hazard marker (H1-1) shall be mounted on a standard P-9 post. The reflectors shall be yellow (amber) (Type A) as specified under Section 828.44-A.

Demountable reflectorized guard rail delineators shall be attached to the bolts located in the valley of the guard rail beam at the spacing as follows:

1. Delineators are to be installed on every seventh guard rail post. In guard rail runs of less than seven posts, a minimum of two delineators shall be used, one at either end.
2. On curves delineators shall be spaced on every Nth guard rail post based on the radius as specified in the table below.

Delineator Spacing: Every N Posts	Horizontal Curve Radius, r (feet)
1	$r \leq 50$
2	$50 < r \leq 250$
3	$250 < r \leq 500$
4	$500 < r \leq 900$
5	$900 < r \leq 1500$
6	$1500 < r \leq 2100$
7	$r > 2100$

3. Leading and trailing ends at bridges – 3 delineators: one at the connection of the terminal: the connector and 25 foot (7.62 m) plate; one at the middle of the 25 foot (7.62 m) plate; and one at the connection of the 25 foot (7.62 m) plate and the normal guard rail panel.

4. In no instance shall delineators be installed on sections of guard rail which deviate substantially from the alignment (vertical or horizontal) of the roadway or which are located more than 8 feet (2.5 m) from the edge of the paved surface.

5. Exceptions and/or modifications to the above shall be made only with the approval of the Engineer in the field.

SUBSECTION 828.60 (continued)

When roadway alignment permits, the reflector portion of each delineator shall be positioned so that it will be clearly visible for a distance of 1000 feet (300 m) under normal weather and atmospheric conditions when illuminated by the high beam of standard automobile headlights on vehicles in the lane adjacent to the delineator.

Delineation for Guard Rail Termini shall be mounted within 6 inches (150 mm) perpendicular to the web of the first and last full height guard rail posts in a section of guard rail.

Street name signs shall be mounted on one standard P-5 breakaway post assembly. Street name signs shall be fabricated and erected as shown on the plans and/or as directed by the Engineer.

SUBSECTION 828.80 Method of Measurement.

(page 255 English, page II.217 Metric, and page SUPPLEMENT C2010-71) Revise the 7th paragraph to read as follows:

Demountable Reflectorized Delineator - Guard Rail shall be measured by the unit, complete in place, with P-9 post or bracket.

SUBSECTION 828.81 Basis of Payment.

(page 255 English, page II.217 Metric, and page SUPPLEMENT C2010-71) Revise the 6th paragraph to read as follows:

Demountable Reflectorized Delineator - Guard Rail will be paid for under the contract unit price each complete in place.

SUBSECTION 828.82 Payment Items.

(page 256 English, page II.218 Metric, and page SUPPLEMENT C2010-72) Delete payment items 833.1, 833.11, 833.2, 833.3 and 833.4.

SECTION 945 DRILLED SHAFTS

SUBSECTION 945.50 Personnel Qualifications.

(page SUPPLEMENT C2010-119) Replace the last paragraph of this Subsection with the following:

The Contractor shall have on site during all drilled shaft construction activity a minimum of one person who has fulfilled the qualifications required for drilled shaft field inspector certification. The representative will be responsible for the Contractor's Quality Control (QC) of the drilled shafts during all phases of construction. The Contractor's QC representative shall have proof of certification as a Drilled Shafts Inspector by the NorthEast Transportation Training and Certification Program (NETTCP) or an equivalent certification program approved by MassDOT.

SECTION 960 STRUCTURAL STEEL AND MISCELLANEOUS METAL PRODUCTS

SUBSECTION 960.61 Design, Fabrication and Erection.

(page SUPPLEMENT C2010-136) Delete the first sentence from FABRICATION., Fabricators., which reads; All metal fabricators shall have been approved by the Engineer on or before the bid opening date.

SECTION 995
BRIDGE STRUCTURE

SUBSECTION 995.81 Basis of Payment.

(page 324 English, pages 11.296/297 Metric) Replace the last sentence of the first paragraph and the second through sixth paragraphs (English) / Replace the last sentence of the second paragraph of the subsection and the third through seventh paragraphs (Metric) with the following:

Walls, other than wingwalls or connecting walls between the structures, will not be included for payment under an item for Bridge Structure.

When the Engineer orders changes from the contract plans of a bridge structure, the cost of such changes will be negotiated based on the provisions of Subsections 4.03 and 9.03.

DIVISION III
MATERIALS SPECIFICATIONS**SECTION M3**
BITUMINOUS MATERIALS**SUBSECTION M3.11.03 Job-Mix Formula.**

(page 337 English, page III.17 Metric, and page SUPPLEMENT C2010-182 through C-184) Replace this subsection with the following:

M3.11.03 Hot Mix Asphalt Job-Mix Formula.

The composition limits in Table A are master ranges for the development of Hot-Mix Asphalt (HMA) job-mix formulas (JMFs). In order to obtain standard texture, density and stability, the Contractor will furnish to the Engineer a specific job-mix formula for the particular uniform combination of materials and sources of supply to be used on each project. The job-mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of performance graded asphalt binder (PG binder) to be added to the aggregate and for batch plants, the number of seconds for dry mixing time and the number of seconds for wet mixing time. AASHTO T 195 (Ross Count) with a coating factor of 98% will be used when necessary to evaluate proper mixing time. The job-mix formula shall specify a single consistent source of aggregate for an entire calendar day.

The use of reclaimed materials will be permitted at the option of the Contractor and provided that the end product is in conformance with the designated job-mix formula. The proportion of reclaimed materials (including reclaimed asphalt pavement (RAP), processed glass aggregate (PGA), and manufactured asphalt shingles (MAS)) in the total mix 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 courses shall be 15%, except no reclaimed materials will be allowed in the open graded friction course (OGFC). The use of PGA or MAS is not allowed in surface courses.

Two or more job-mix formulas 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 calendar day. The job-mix formula shall bind the Contractor to furnish paving mixtures not only within the master ranges, but also conforming to the exact formula thus set up for the project, within the engineering limits in Table B:

SUBSECTION M3.11.03 (continued)

Table A
Specifications for Hot Mix Asphalt
Percent by Weight Passing Sieve Designation

Sieve Designation and % Binder Content	HMA Base Course	HMA Base/ Intermed. Course - Binder	HMA Intermed. Course Dense Binder	HMA Surface Course - Dense Binder	HMA Surface Course - Standard Top	HMA Surface Course - Modified Top	HMA Dense Mix	HMA Surface Treatment	HMA OGFC
2 inches	100								
1 inch	57 - 87	100	100	100		100			
¾ inch		80 - 100	80 - 100	80 - 100		95 - 100			
5/8 inch					100				
½ inch	40 - 65	55 - 75	65 - 80	65 - 80	95 - 100	79 - 100	100		100
3/8 inch					80 - 100	68 - 88	80 - 100	100	90 -
No. 4	20 - 45	28 - 50	48 - 65	48 - 65	50 - 76	48 - 68	55 - 80	80 - 100	30 - 50
No. 8	15 - 33	20 - 38	37 - 49	37 - 49	37 - 49	33 - 46	48 - 59	64 - 85	5 - 15
No. 16					26 - 40	20 - 40	36 - 49	46 - 68	
No. 30	8 - 17	8 - 22	17 - 30	17 - 30	17 - 29	14 - 30	24 - 38	26 - 50	
No. 50	4 - 12	5 - 15	10 - 22	10 - 22	10 - 21	9 - 21	14 - 27	13 - 31	
No. 100					5 - 16	6 - 16	6 - 18	7 - 17	
No. 200	0 - 4	0 - 5	0 - 6	0 - 6	2 - 7	2 - 6	4 - 8	3 - 8	1 - 3
Binder	4 - 5	4.5 - 5.5	5 - 6	5.1 - 6	5.6 - 7.0	5.1 - 6	7 - 8	7 - 8	6 - 7

Percentages shown in table above for aggregate sizes are stated as proportional percentages of total aggregate for the mix.

Unless authorized by the Engineer, no Job-Mix Formula will be approved which specifies:

- Less than 6% binder for HMA Surface Course - Standard Top.
- Less than 5.5% binder for HMA Surface Course - Dense Binder and HMA Surface Course - Modified Top for mixes containing RAP.

Table B
Engineering Limits for HMA Aggregate Gradation and PG Binder Content

Sieve Designation / Binder Content	Engineering Limit for OGFC	Engineering Limit for all other mixes
Passing No. 4 sieve and larger sieve sizes	JMF Target ± 5%	JMF Target ± 7%
Passing No. 8 to No. 100 sieves (inclusive)	JMF Target ± 3%	JMF Target ± 4%
Passing No. 200 sieve	JMF Target ± 1%	JMF Target ± 2%
Binder	JMF Target ± .3%	JMF Target ± 0.4%

All relevant provisions of M3.11.0 shall apply to OGFC with the exceptions noted below:

- A polymer additive consisting of unvulcanized Styrene Butadiene Rubber (SBR) in liquid latex form, with a total latex rubber solids content percentage by weight of 60-72, shall be added. The quantity

of latex rubber solids shall be 3% by weight of the binder content of the mix.

SUBSECTION M3.11.03 (continued)

(Example: A latex polymer weighs 8 pounds per gallon and contains 70% latex rubber solids by weight. For a HMA design requiring 6% binder; the weight of binder per ton of HMA mix is $2000 \text{ lb} \times 6\% = 120 \text{ lb}$; the weight of latex rubber solids per ton is $120 \text{ lb} \times 3\% = 3.6 \text{ lb}$; the volume of liquid latex polymer additive required per ton is $3.6 \text{ lb} / (8 \text{ lb} \times 70\% \text{ solids}) \text{ lb/gal} = 0.643 \text{ gallons per ton}$)

The polymer modifier (latex) is injected into the mix at the time of manufacture. In a drum plant, the polymer is pumped into the asphalt binder through a spud welded to the asphalt binder line just prior to where it enters the drum. The constant rate at which the polymer is pumped is determined by the mix speed of the drum. In a batch plant, the amount of polymer per batch is determined by the size of the batch and is introduced as follows: A feed hose from the polymer pump is inserted into and above the mixer or pug mill and the polymer is pumped directly into the mix 5 seconds after the asphalt binder starts to dump into the pug mill. Mix time per batch after polymer is pumped in is 45 to 60 seconds.

The manufacturer will have a professional representative available at the asphalt plant during the first day of mix production and placement, and as required thereafter by the Engineer.

The manufacturer of the SBR latex shall provide certified test results for Styrene Butadiene ratio, total rubber solids percentage by weight, pH, ash content, and viscosity to the Engineer prior to mix production.

b) Mixing temperatures for OGFC shall be between 290 and 325°F (143 and 163°C). This will require close control over aggregate drying and asphalt storage temperatures so that the resulting mix temperatures will fall within the limits stipulated herein.

c) Placing temperature for OGFC shall be between 275 and 310°F (135 and 155°C). As placing temperature is a critical factor in this type of mix, hauling time to the project should be limited so as to avoid mix temperature from dropping below the required minimum. All mixes should be covered during transportation.

d) Tack coat – *Asphalt Emulsion*, RS-1 when needed, applied at the rate of 0.05 gallons per square yard (0.25 L/m²).

e) Silicone shall be added to the asphalt in the amount of 1.0 ounce per 5,000 gallons of asphalt (1.5 g/m³).

f) OGFC hot mix asphalt meeting the requirements of this specification shall be placed to a compacted thickness of 1 inch (25 mm).

Should a change of sources of materials be made, a new JMF shall be established by the Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new JMF.

The aggregate will be accepted in stockpile at the plant site. The asphalt binder will be accepted on certificate of analysis (COA).

If the Contractor elects to furnish hot mix asphalt from more than one plant, the same JMF must be adhered to by all plants.

SUBSECTION M3.11.04 Mineral Aggregate.

(page 340 English, page III.20 Metric) Replace C. Reclaimed Asphalt Pavement (RAP) with the following:

Reclaimed Asphalt Pavement (RAP) shall consist of the material obtained from Massachusetts state highways or streets by crushing, milling or planing existing pavements. This material shall be transported to the HMA plant and processed through an approved crusher so that the resulting material will contain no particles larger than the maximum aggregate size of the HMA mixture in which it will be used. If the material comes from a micro-milling operation then the material may be reduced in size over a screen to achieve a product having a gradation of passing the ½" sieve. The remaining material retained on the ½" sieve shall be processed as above by crushing methods.

The RAP shall be stockpiled on a free draining base, kept separate from the other aggregates and covered. The RAP contained in the stockpiles shall have a reasonably uniform gradation from fine to coarse and shall not be contaminated by foreign materials.

SUBSECTION M3.11.04 Mineral Aggregate.

(page SUPPLEMENT C2010-185) Replace E. Reclaimed Asphalt Shingles (RAS) with the following:

E. Manufactured Asphalt Shingles (MAS).

Manufactured Asphalt Shingles (MAS) shall consist only of the by-product materials obtained from the roofing shingle manufacturing process. Post-consumer shingle waste and re-roofing shingle scrap will not be allowed. The Contractor or the plant shall provide written certification from the roofing shingle manufacturer that MAS material provided is a by-product of the shingle manufacturing process. This material shall be transported to the HMA plant yard and processed through an approved crusher so that the resulting material will contain no particles larger than ½ inch (12.5 mm).

The material shall be stockpiled on a free draining base, kept separate from the other aggregates and covered. The material contained in the processed stockpile shall not be contaminated by foreign materials.

MAS may be allowed in HMA base, intermediate and leveling course hot mix asphalt mixtures at a maximum rate of 5% by weight only when RAP is not included in the job mix formula.

SUBSECTION M.3.11.06 Bituminous Materials.

(page 340 English, page III.20 Metric, and page SUPPLEMENT C2010-185) Replace this Subsection with the following:

Performance Grade Asphalt Binder shall be the grade designated by the Engineer and shall conform to the requirements of M3.01.0. When required, an approved anti-stripping additive conforming to M3.10.0 shall be added to the asphalt cement.

Bituminous material for the tack coat on the existing surface, where required and specified, shall be emulsified asphalt, grade RS-1 conforming to M3.03.0.

For any hot mix asphalt containing reclaimed materials, the Contractor shall submit in addition to the Job-Mix formula, the amount and type of asphalt modifier to be added to the mixture to restore the asphalt binder properties of the reclaimed materials to a level that is consistent with the requirements for new asphalt binder. The restored asphalt binder when recovered by the Abson Method AASHTO T 170 from the recycled mixture shall have a minimum penetration at 77°F (25°C) of 50 and a maximum absolute viscosity at 140°F (60°C) of 8000 Poises. Only Performance Graded Asphalt Binder grades PG 64-28 or PG 52-34 will be used as modifiers and shall meet the requirements of AASHTO M 320.

The maximum quantity of recycled binder from RAP and MAS combined shall not exceed 40% of the specified PG binder content for drum plants and 20% of the specified PG binder content for batch plants.

The PG binder grade for mixes combining RAP and/or MAS shall be PG 64-28 if recycled binder content is 25% or less. If recycled binder content exceeds 25%, the PG binder grade shall be 52-34.

SECTION M4 CEMENT AND CEMENT CONCRETE MATERIALS

SUBSECTION M4.02.00 Cement Concrete.

(page SUPPLEMENT C2010-187) Replace the second paragraph from the bottom of the Subsection with the following:

Concrete which will be subjected to conditions of severe exposure will be 4000 PSI (30 MPa) with air-entrained content of 7.0 % ± 1.5% when so specified. Concrete that is used to construct drilled shafts shall have an entrained air content of 4.0% ± 1.5%.

SUBSECTIONS M4.02.06 Proportioning.

(page SUPPLEMENT C2010-190) Replace paragraph B., 4. Air Content, with the following:

The air content of the concrete by volume shall be as shown in the table above when tested in accordance with AASHTO T 152. A tolerance of ± 1.5% in the above percentages will be allowed.

SECTION M5 PIPE, CULVERT SECTIONS AND CONDUIT

SUBSECTION M5.03.0 Asphalt Coated Corrugated Metal Pipe.

(page SUPPLEMENT C2010-200 and 201) Replace this Subsection with the following:

M5.03.0 Corrugated Metal Pipe.

This pipe shall consist of metallic coated (galvanized or aluminized) corrugated metal pipe and couplings. The coating shall completely cover the inside and outside of all pipe and couplings.

Galvanizing shall conform to M7.10.0.

Aluminizing shall conform to M7.15.0

Aluminized and galvanized pipe components shall not be used together in a pipe run.

The pipe shall conform to AASHTO M 36. Pipe 8 inches (200 mm) or less in diameter shall be constructed of sheets not less than 0.052 inches thick. End sections shall be 16 gage for all pipes 24 inch (600 mm) diameter and under, 14 gage for all 30 and 36 inch diameter pipes and 12 gage for all diameters greater than 36 inches (915 mm). The coating on end sections shall match the coating on the pipe connected to it.

SUBSECTION M5.03.1 Perforated Asphalt Coated Corrugated Metal Pipe.

(page SUPPLEMENT C2010-201) Replace this Subsection with the following:

M5.03.1 Perforated Corrugated Metal Pipe.

This pipe shall meet the requirements of M5.03.0 and contain perforations conforming to AASHTO M 36, Type III. The pipe shall conform to AASHTO M 36 except that reinforcing the ends of the pipe will not be required.

SUBSECTION M.5.03.10 Corrugated Plastic Pipe..

(page SUPPLEMENT C2010-201) Replace the last paragraph with the following:

Pipe used for drainage pipe shall have a smooth interior and shall have a nominal inside diameter of 12, 15, 18, 24, 30, 36, 42, 48 or 60 inches (300, 375, 450, 600, 750, 900, 1050, 1200 or 1500 mm).

SECTION M6 ROADSIDE DEVELOPMENT MATERIALS

SUBSECTION M6 ROADSIDE DEVELOPMENT MATERIALS.

(page 372 English, page III.60 Metric, page SUPPLEMENT C2010-203 and 204) Replace this Section with the following:

M6.00.0 General.

This section describes requirements for materials used for soil amendments, seed, plant material, mulches, and other materials required for the care and establishment of plants.

M6.01.0 Inorganic Amendments.

Limestone shall consist of pulverized limestone obtained by grinding either calcareous or dolomitic limestone such that 95% of the material will pass a 20 mesh sieve and at least 50% will pass a 100 mesh sieve. The limestone shall meet the applicable provisions of State and Federal laws which relate to commercial fertilizers.

SECTION M6 (continued)

Sulfur for adjustment of loam pH shall be elemental or flours of sulfur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, and net weight appearing on each container.

Gypsum for soil structure amendment and de-icing salt mitigation shall be agricultural grade, 80 percent calcium sulphate (CaSO₄ × 2H₂O), in granular or slurry form, with 100 percent passing a 2 mm screen, and 90% passing through 150 μm screen. Gypsum may be derived from natural sources or from recycled wallboard.

Soil wetting agent shall be a synthetic, non-toxic acrylic polyacrylamide or natural soluble plant extract. Application rates shall be per manufacturer’s recommendations. Submit supplier specifications and certification.

M6.02.0 Fertilizer.

Fertilizer shall meet the applicable provisions of State and Federal laws and be furnished in containers plainly marked with the chemical analysis of the product.

Fertilizer for general planting shall be slow release and shall be commercial grade 10-10-10, or sufficient to meet the recommendations for soil amendment. At least 40% of the nitrogen content shall be slow release, phosphorus shall be available phosphoric acid, and potassium shall be water-soluble potash.

M6.03.0 Long Term Seed Mixes for Lawns and Slopes

The seed mixture specified for slopes and shoulders consists of a tough hardy type for use on slopes graded at the rate of 1 vertical to 4 horizontal, and steeper slopes, and on shoulders adjacent to the roadway pavement or as otherwise directed. The mixture for lawn grass plots is of a finer type that will produce finer turf.

Grass seed shall be of the previous year’s crop and in no case shall the weed seed content exceed 1% by mass. All Bluegrass, Fescue, and Ryegrass shall be within top 25% of either of two most recent National Turfgrass Evaluation Program reports. The grass seed shall conform to the requirements of the following tables:

<u>Grass Type</u>	<u>Proportion</u>	<u>Germination Minimum</u>	<u>Purity Minimum</u>
<u>Lawn Grass Areas</u>			
Creeping Red and/or Chewings Fescue	55%	85%	95%
Kentucky Blue	30%	85%	90%
Perennial Rye	5%	90%	98%
Redtop	5%	85%	92%
Dutch White Clover	5%	85%	96%
<u>Slopes and Shoulders</u>			
Creeping Red, Chewings, and/or Hard Fescue	50%	85%	95%
Tall Fescue	35%	85%	95%
Perennial Rye	5%	90%	98%
Red Top	5%	85%	92%
Dutch White Clover	5%	85%	96%
<u>Warm Season Mix</u>			
	<u>Proportion (Pure Live Seed)</u>		
Canada Wild Rye	20%		
Switchgrass	20%		
Big Bluestem	15%		
Indiangrass	15%		
Little Bluestem	15%		
Partridge Pea	15%		

SECTION M6 (continued)

The seed shall be furnished and delivered premixed in the proportions specified above. All seed shall comply with State and Federal seed laws. Clover shall be pre-inoculated.

Contractor will supply a manufacturer's Certificate of Compliance to the specifications shall be submitted by the manufacturers with each shipment of each type of seed mix. Certificates will be attached to the seed bags for inspection. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net mass and date of shipment. No seed may be sown until the Contractor has submitted the certificates.

M6.03.1 Short Term Erosion Control Seed.

This seed shall consist of a mixture of the previous year's crop and shall contain the following mixture by weight with 98% purity:

<u>Seed Type</u>	<u>% by Weight</u>	<u>Germination Minimum %</u>
Winter Rye	80 minimum	85
Red Fescue (Creeping)	5 minimum	80
Perennial Rye Grass	5 minimum	90
Dutch White Clover	3 minimum	90
Other Crop Grass	0.5 maximum	
Noxious Weed Seed	0.5 maximum	
Inert Matter	1.0 maximum	

A manufacturer's certificate of compliance will be required as specified in Subsection M6.03.0 above.

M6.04.0 Mulch.

Materials to be used in mulching shall conform to the following requirements:

M6.04.1 Hay Mulch.

Hay Mulch shall consist of mowed and properly cured grass, clover or other acceptable plants.

M6.04.2 Straw Mulch.

Straw Mulch shall be seed free, consisting exclusively of stalks or stems of grain after threshing.

M6.04.3 Wood Chip Mulch.

Wood chip mulch shall consist of wood chips produced by cutting branches, limbs of trees, brush or shrubs with chippers or from the chipping of stumps, and shall be free of topsoil, stones, and other extraneous material. The chippers shall be approved for use by the Engineer. Wood chip mulch must be free from long stringy material over 4 inches in length and from live, rot-free wood and bark, except that 35% or less by volume of the wood chip mulch may consist of "slab wood", chipped to an acceptable size by chippers equipped with a ¼ inch knife set and thoroughly mixed with the live material. Wood Chip Mulch containing an excess of fine particles, such that mulch will blow or wash away, decay too quickly, or percolate too slowly, will not be acceptable. Wood Chip Mulch may be produced on the project from acceptable cuttings. Wood chip mulch containing remnants of invasive species such as Japanese Knotweed and Bittersweet shall not be used.

M6.04.4 Wood Fiber Mulch.

Wood Fiber Mulch shall consist of wood fiber produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered on the project. Recycled material may be evaluated for acceptance based on evaluation of submitted sample, specifications and certified test results from an approved laboratory, per the requirements of Section M1.06.0, Organic Soil Additives.

SECTION M6 (continued)

M6.04.5 Aged Pine Bark Mulch.

This mulch shall consist of the outer bark of pine trees and a minimum of hardwood bark. Bark shall be processed by removal from the limbs and trunks of trees.

Bark mulch shall be shredded pine bark aged a minimum of six months. The mulch shall be dark brown in color, free of chunks and pieces of wood thicker than 1/4 inch and shall not contain, in the judgment of the Engineer, an excess of fine particles. Do not use wood chips, recycled, dyed, wood product, or crumb rubber mulch.

Mulch must be free from long stringy material.

M6.05.0 Sod.

Sod shall be composed of the grass mixture recommended by the New England Sod Producer's Association and shall be specified as:

<u>Sod Type / Species</u>	<u>Percent by turf area*</u>
No. 1 - For full sun turf areas: (6 or more hours direct sunlight in growing season)	
Kentucky Bluegrass	50 - 80%
Fine Fescues	10 - 30%
Perennial Ryegrass	0-20%
No. 2 - For partial shade turf areas (4-6 hours minimum direct sunlight in growing season)**	
Fine Fescues	75 - 90%
Kentucky Bluegrass	10 - 25%
Perennial Ryegrass	0-10%
No. 3 - For multi-use turf areas (and minimum 4-6 hours minimum direct sunlight in growing season)**	
Tall Fescue	50 - 90%
Fine Fescues	20-50%
Kentucky Bluegrass	0 - 20%
Perennial Ryegrass	0 - 20%

*All species with >70% of the mix shall have at least 3 varieties; >40% shall have at least 2 varieties.

**Areas receiving less than 4 hours per day of direct sun during growing season should not receive sod.

Lawn sods shall have been nursery grown on cultivated agricultural land used specifically for sod purposes. Grasses shall be drought tolerant cultivars.

The sods shall be free of objectionable grassy and broadleaf weeds. Sods shall be considered free of such weeds if less than 5 such plants are found per 10 square yards of area.

The sod shall be machine cut at a uniform minimum thickness of 3/4 inch at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads and torn or uneven ends will not be acceptable.

Sod that has dried out, or that has been unplanted over 3 days (including weekends) since harvest, will be rejected.

M6.06.0 General Planting.

The Contractor shall furnish all plants as shown on the plans.

SECTION M6 (continued)**M6.06.1 Nursery Stock – General.**

All scientific and common plant names of the items specified shall conform to the current edition of Hortus Third, compiled by the staff of the L.H. Bailey Hortorium, Cornell University. These standards shall determine all requirements of acceptable shrub and seedling nursery stock names. All plants will have durable, non-fading labels applied at the nursery that clearly bears the correct botanical name, including cultivar, as well as common name and size. Caliper or spread shall govern over height specifications. The Contractor must obtain written permission from the Engineer for any substitutions of types or sizes specified.

All plants shall be grown in a certified nursery. All plants shall be typical of their species or variety in growth habit. Plant sizes, habit, rootball dimensions, stem and cane count shall conform to the requirements of the American Standards for Nursery Stock (ASNS) standards as a minimum requirement for acceptance.

Container sizes shall also be consistent with the guidance per plant size per the ASNS. Each plant shall have plenty of fibrous roots, healthy buds, and shall be free of disease and insect pests. No plant material from cold storage will be accepted. All plant parts shall show active green cambium when cut and shall be densely foliated when in leaf.

Deciduous shrubs shall have 4 to 6 canes coming from the roots and shall have a well-branched root system.

Vines and ground cover shall be minimum 2-year No. 1 stock. Herbaceous plants shall be minimum 1-year No. 1 stock, and clumps shall have not less than 6 buds, eyes, or crowns.

The trunk of each tree shall be free from sunscald, frost cracks, or wounds resulting from abrasions, animal pest, fire or other causes. Pruning wounds shall be no larger than 2 inches and shall show vigorous scar tissue. No trees with double-leaders or twin-heads will be acceptable without the written approval. The plants must be in a vigorous condition and free from dead wood, bruises and other root or branch injuries. Deficient plants may be rejected at any time.

Any species (including all cultivars) listed on the Massachusetts Department of Agricultural Resources Prohibited Plant List shall not be used including but not limited to the following:

Norway Maple (*Acer platanoides*)
Sycamore Maple (*Acer pseudoplatanus*)
Japanese Barberry (*Berberis thunbergii*)
Autumn Olive (*Eleagnus umbellata*)
Burning Bush or Winged Euonymus (*Euonymus alatus*)
Glossy or European Buckthorn (*Frangula alnus*)
Dames Rocket (*Hesperis matronalis*)
Yellow Iris (*Iris pseudoacoris*)
Border Privet (*Ligustrum obtusifolium*)
Honeysuckle -- Japanese, Amur, Morrow's, Tatarian, Bell's (*Lonicera japonica*, *L. maackia*, *L. morrowii*,
L. morrowii x tartarica)
Plume grass (*Miscanthus sacchariflorus*)
Forget-me-not (*Myosotis scorpioides*)
Reed Canarygrass (*Phalaris arundinacea*)
Amur Cork Tree (*Phellodendron amurense*)
Common Buckthorn (*Rhamnus cathartica*)
Black Locust (*Robinia pseudoacacia*)
Wild Rose (*Rosa multiflora*)

SECTION M6 (continued)**M6.06.2 Nursery Stock – Balled and Burlapped.**

All plants that are to be balled and burlapped previous to shipment are designated “B&B”. B&B plants shall be dug so as to retain as many fibrous roots as possible. All B&B plants shall come from soil that will hold a firm root ball and the solidity of the ball shall be carefully preserved. B&B plants shall be wrapped with untreated 8-ounce burlap, firmly held in place by a stout cord or wire. Wire containers shall be of adequate size to allow root development for the plant size as per ASNS requirements. Plants prepared with plastic or other non-biodegradable wrappings will not be accepted. Rootballs shall remain intact during all operations. No plant will be accepted if the rootball has been cracked or broken prior to, or during, the process of planting. All plant materials shall be dug with reasonable care and skill immediately prior to shipment.

M6.06.3 Nursery Stock – Container Grown.

All container grown plants shall be healthy, vigorous and well rooted in the container in which they are sold. They shall have tops that are of good quality and are in healthy growing condition. No single-stemmed shrubs or sparsely leafed plants will be accepted. The side branches must be generous and well twigged, and the plant as a whole must be well-branched to the ground or typical of the species or cultivar. Container-grown stock shall have been grown in the container long enough for the root system to develop sufficiently to hold the soil together firmly. No plants shall be loose in the container. Container-grown plants shall not be pot bound with spiraling roots or roots growing densely against the sides of the container. The container shall be sufficiently rigid to protect the root mass during shipment and sizes shall be provided in accordance with the ASNS standards. The size of plant, as well as minimum number of stems or canes, will conform to the type of plant per ASNS standards.

The soil medium for container-grown plant material shall be a uniformly blended, stable medium free from weeds, weed seeds, disease organisms, insects, herbicide residue, and all other harmful organisms or materials. The soil shall fill the container to at least 85% of its height, serving as a stable base for the anchorage and support of the plant growing in it. It shall be well-aerated sandy loam or fine sandy loam, per USDA Soil Classification, and of sufficient structure to provide adequate moisture to plants.

The certificate of compliance for container grown plants shall contain, in addition to the requirements listed in Subsection 771.40, the guaranteed composition of the potting mixture and the date of planting in the container. Plants shall have been grown in the container for a minimum of 12 weeks. A random sample is required from each delivery for soil and root inspection upon request of the Engineer.

M6.06.4 Nursery Stock -- Bare-Root.

Bare-root material shall be dug during dormancy within 72 hours of shipping and shall be kept moist and stored in a cool, shaded location until planting. All bare-root material shall be accompanied by certification of digging date. The roots of bare-rooted material shall be dipped in soil wetting agent and carefully protected with wet straw, moss or other suitable material that will ensure the arrival of the plants at the site of the work in good condition. All bare-root material shall be installed within 48 hours of arrival on the construction site, and shall be kept moist and out of wind or direct sunlight until planting. Maximum time between digging for shipping and installation shall be one week.

M6.06.5 Nursery Stock – Seedlings.

Seedlings shall have well developed root systems and shall be acclimated and suitable in all respects for field planting. All conifers must have dormant buds and secondary needles.

Evergreen seedlings shall be two year transplants, bare rooted.

Lining out stock seedlings shall be two year seedlings.

Root cuttings shall be established in peat pots 2.5 inches deep by 2 inches wide at the open end and tapered to 1 inch wide at the closed end (inside measure).

SECTION M6 (continued)**M6.06.6 Nursery Stock – Trees.**

Per the requirements of the ASNS, the sizes of trees shall be as called for on the plans and measurements shall be determined by caliper at a point 6 inches above the ground for plants specified up to 4 inches in caliper. Larger minimum caliper shall be measured 12 inches from ground.

Trees for streetscape plantings (i.e. in or adjacent to walkways) shall have a single straight leader not cut back.

They shall have a symmetrical development of strong, healthy branches beginning at least 7 feet from the ground; and below this point, the trunk shall be clean for street trees. Coniferous Evergreens shall be dug before spring “candling” of new growth.

Grafted and budded trees may branch lower and be pruned off 2 feet from the ground where directed. Flowering trees shall be balled and burlapped and kept moist for delivery.

M6.06.7 Nursery Stock -- Shrubs, Vines, Groundcover and Perennials.

Shrubs shall have the form required per ASNS. Specified spread shall govern over height requirements.

Vines and ground cover in this group shall be 2 year, No. 1 stock.

Herbaceous plants in this group shall be minimum 1 year, No. 1 year stock, and clumps shall have not less than 6 buds, eyes or crowns.

M6.07.0 Delivery and Protection.

All plants shall be packed so as to arrive at the delivery point in good growing condition, and shall be kept moist for delivery and during transit. Special precautions shall be taken to avoid any unnecessary injury to, or removal of, fibrous roots. Each species or variety shall be handled and packed in the approved manner for that particular plant having regard to the soil and climatic conditions at the time and place of digging, transit and delivery, and to the time that will be consumed in transit. All precautions that are customary in good trade practice shall be taken to ensure the arrival of the plants at the site of the project in good condition for successful growth.

Shipment of plant material shall be scheduled to minimize the time between arrival and installation at the construction site. Plants may be stored at the construction site for up to 3 days on in an approved location that is out of direct sunlight and wind. Contractor shall store plants in wood chips and shall provide watering to maintain containers and root balls in moist condition at all times prior to installation.

M6.07.1 Wrapping for Transport.

Wrapping material shall be used for transport only. Wrapping material for root balls shall be 8-ounce jute burlap; plastic is not acceptable. Material for tree trunks shall be 4 to 6 inch wide strips of burlap, paper, cardboard, or plastic manufactured for this purpose. Fastening for the wrapping material shall be either adhesive weather resistant tape or a minimum of 3-ply jute twine. Wrapping must be removed once tree has been installed.

M6.08.0 Materials for Guying and Staking.

The stakes shall be unpainted spruce or other suitable wood free from large knots, dimensioned 2x2 by 8 feet in length and sharpened at one end. Binding and guying shall be bio-degradable webbing. Stake fastenings shall be 10 penny galvanized nails. Trees shall not be wrapped.

M6.08.1 Temporary Fencing for Tree Protection.

Temporary Tree Protection Fence shall be brightly colored polypropylene barricade or wooden snow fencing for tree protection or safety fencing. Fencing shall be a minimum of 4 feet high and supported by steel or hardwood stakes spaced at a maximum of 8 feet on center or by other means acceptable to the Engineer.

SECTION M6 (continued)

M6.08.2 Trunk Cladding for Tree Protection.

Cladding for trunk protection shall be 2x4 or 2x3 nominal lumber, at least 6 feet in length, sufficiently tall to protect tree trunk from construction activities, and bound together with wire. Alternatively, trunks may be shielded with sections of corrugated plastic pipe of sufficient diameter and height to shield trunk from construction activities. Trunk protection shall include burlap, which shall be untreated 8-ounce burlap.

M6.08.3 Sheeting for Tree Root Protection.

Sheeting for tree root protection shall be minimum 3/4" thickness plywood, cut and trimmed to required sizes and configurations.

M6.09.0 Water for Irrigation.

Water used for irrigation of plant materials shall be free from any substance injurious to vegetation, such as oil, acids, alkalis and salts. Water shall be free from impurities injurious to vegetation.

Submittal shall be required, including anticipated demand, irrigation method, watering schedule, sources of water, and any incidental work required to provide water for the plants.

**SECTION M8
METALS AND RELATED MATERIALS**

SUBSECTION M8.01.9 Mechanical Reinforcing Bar Splicer.

(page SUPPLEMENT C2010-208) Replace this Subsection with the following:.

Mechanical reinforcing bar splicers are devices to join two steel reinforcing bars subject to tension, compression, fatigue, and/or cyclic loading. All mechanical reinforcing bar splicers shall meet the following requirements:

DESCRIPTION	REQUIREMENT
Ultimate Tensile Strength of Mechanical Coupler System (California Test No. 670)	90% of ultimate tensile strength of reinforcement bars (80,000 psi minimum for AASHTO M 31 Grade 60, 560 MPa minimum for AASHTO M 31M Grade 420). During testing, the ultimate failure of the spliced reinforcing bar system shall occur either in the reinforcing bar being joined or in the splicing device at a minimum of 150% of the yield strength of the reinforcing bar.
Allowable Slip (California Test No. 670)	0.01 inch, maximum for #14 and smaller bars, 0.03 inch maximum for #18 bars (0.25 mm, maximum for #43 and smaller bars, 0.76 mm maximum for #57 bars)
Yield Strength of Mechanical Coupler System	125% of yield strength of reinforcement bars, minimum

Mechanical reinforcing bar splicers shall be epoxy coated or shall be galvanized and shall be tested with epoxy coated or galvanized reinforcing steel as applicable. The mechanical splicer must be either epoxy coated or galvanized consistent with the reinforcement to be spliced. The final assembly shall be in conformance with the specifications for epoxy coating or galvanizing.

SUBSECTION M8.01.9 (continued)

Mechanical reinforcing bar splicers which have been successfully tested and met all of the above requirements shall be placed on the *Qualified Construction Materials List*. Only products on the *Qualified Construction Materials List* maintained by the MassDOT Highway Research and Materials Section are acceptable for use.

The contract time will not be extended to allow for the testing and approval process required for inclusion on the *Qualified Construction Materials List*.

SUBSECTION M.8.18.0 Signal Posts.**SUBSECTION M.8.18.1 Octagonal Bases.****SUBSECTION M.8.18.2 Pedestal Bases.****SUBSECTION M.8.18.3 Aluminum Signal Posts and Bases.****SUBSECTION M.8.18.4 Mast Arms.****SUBSECTION M.8.18.5 Steel Supports.****SUBSECTION M8.18.6 Aluminum Supports.**

(pages 394 to 396 English, page III.83 to III.85 Metric, and pages SUPPLEMENT C2010-220 to 221)
Replace these Subsections with the following:

M8.18.0 Traffic Signal, Highway Lighting and Sign Supports.

This section covers the poles, posts, masts, arms and bases for traffic signals, highway lighting and sign supports.

M8.18.1 Traffic Signal Supports.**POSTS**

Steel signal posts shall be 4 inch diameter Schedule 40 seamless pipe conforming to ASTM A53, Grade A or B. Interiors shall be coated as specified in Underwriters Laboratories UL-6 for enameled conduit, or aluminum conduit conforming to M5.07.1C.

Aluminum signal posts shall be 4 inch diameter Schedule 40 pipe conforming to aluminum alloy 6063-T6 (ASTM B221, B429 or B241).

POLES AND MAST ARMS

Structures shall be made of steel. Structural steel material over ½ inch thick that is part of main load carrying tension members shall meet the Charpy V Notch impact requirements of 15 ft-lbs at 40° F.

Tapered shafts shall conform to ASTM A595, Grade A, or AASHTO M270 Grade 50.

The arms shall conform to ASTM A595, Grade A; or ASTM A1011/A1011M, or ASTM A500 Grade B. Steel shall have a minimum yield of 50 ksi.

The shaft cap shall conform to ASTM A126, Class A.

All hardware shall be stainless steel or AASHTO M 164, fully galvanized.

Baseplates and all other standard structural shapes shall conform to AASHTO M 270 Grades 36 or 50.

Anchor bolt covers shall meet the requirements of ASTM A181/A181M or ASTM A126, Class A or AASHTO M 103M/M 103, Grade 450-240 (Grade 65-35) or ASTM A36/A36M.

Galvanizing shall be in accordance with Section M7.

BASES

Bases shall be the same materials as the poles.

Octagonal bases are for use with posts and shall be cast iron conforming to AASHTO M 105 or cast aluminum alloy conforming to Aluminum Association No. 356.0 T-6 (ASTM B26, B108).

Pedestal bases are for use with posts and poles and shall be made of not less than No. 10 gage steel and galvanized in accordance with Section M7 or cast aluminum alloy conforming to Aluminum Association No. 356.0 T-6 (ASTM B26, B108).

SUBSECTION M8.18 (continued)**M8.18.2 Highway Lighting Poles and Arms.****Aluminum**

Tapered aluminum poles shall conform to ASTM B221, alloy 6063-T6 or 6061-T6. Structural aluminum shapes shall conform to ASTM B308, alloy 6061-T6. Bases shall conform to ASTM B108, alloy 356.0-T6.

Steel

Structural steel material over ½ inch thick that is part of main load carrying tension members shall meet the Charpy V Notch impact requirements of 15 ft-lbs at 40° F.

Tapered components shall be fabricated from steel conforming to ASTM A595, Grade A; or ASTM A1011M, Grade 55; or AASHTO M 270, Grade 50.

Gussets, flanges, baseplates, wing plates, connecting end plates, and all other standard structural shapes shall conform to AASHTO M 270 Grades 36 or 50.

Anchor Bolts

Anchor bolts shall conform to Subsection M8.01.5 and be fully galvanized in accordance Subsection M7.

M8.18.3 Sign Supports

Structural steel material over ½ inch thick that is part of main load carrying tension members shall meet the Charpy V Notch impact requirements of 15 ft-lbs at 40° F.

Supports shall be fabricated from steel conforming to ASTM A595, Grade A; ASTM A1011M, Grade 55; AASHTO M 270, Grade 50; ASTM A500, Grade B; or API-5LX-52.

Gussets, flanges, baseplates, wing plates, connecting end plates, and all other standard structural shapes shall conform to AASHTO M 270 Grades 36 or 50.

Truss and cantilever beam connections shall be furnished with the necessary beam support clamps. The ends of beams shall have a mounting clevis and closure plate fabricated from steel plate as an assembly.

All structural steel and steel hardware shall be galvanized in accordance with Section M7. Anchor bolts, nuts, and washers shall conform to Subsection M8.01.5 and be fully galvanized in accordance with Subsection M7.

Sign Posts – P5.**Square Tube Posts.**

Square tube posts shall be square tube fabricated from 12 gage hot-rolled carbon steel conforming to the requirements of ASTM A1011, Grade 50.

Galvanizing shall be in accordance with ASTM A653, Coating Designation G140 with a minimum coating of 1.4 ounces per square foot total of zinc on both sides under triple spot tests; or a minimum coating of 1.15 ounces per square foot total of zinc on both sides under triple spot tests and after all fabrication and re-galvanizing the posts shall be coated with a chromate conversion coating and sealed with an air-dried clear organic polymer topcoat.

Posts shall be welded directly in the corner by high frequency resistance welding or equal and externally scarfed to agree with standard corner radius of 5/32 inch ± 1/64 inch. The corner weld and holes shall be zinc coated after scarfing operations. Holes shall be 7/16 inch in diameter and shall be placed 1 inch on center.

